

**Field, Lab and Museum:
The Practice and Place of Life Science in Yorkshire, 1870–1904**

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Summary

Later Victorian Yorkshire was home to a vigorous community of life science practitioners. In studying them, I reassess three dichotomies familiar to the contextualist historian of Victorian science: field and laboratory, science and society, and amateur and professional. I outline the refashioning of amateur and professional roles in life science, and I provide a revised historiography for the relationship between amateurs and professionals in this area and era. While exploring these issues, I examine the complex net of cultural and educational institutions where the sites for the practice of life science emerged and existed. Natural history practices shaded imperceptibly into other facets of civic culture. I present natural history as a leisure activity and as a resource utilised by the maturing provincial middle classes, one of a range of cultural activities within a network of voluntary associations.

This thesis is arranged by institution: philosophical society, museum, civic college and field club. Each of these corresponds, loosely, to a site for science: respectively, lecture hall, museum, laboratory and field. The traditional 'field versus lab' historiography ignores the many and varied sites for life science in this era, and conceals how far field-based natural history endured alongside the laboratory as it emerged as the hegemonic site for life science. I explore these and other issues by using the career of Louis C. Miall (1842–1921) as a narrative thread. Despite his activities as a lecturer, curator, field club president and laboratory biologist, Miall sought to construct a professional identity based solely on the authority of the laboratory, in contrast to that of the amateur naturalist. To take his partisan rhetoric at face value, however, is to ignore the variety and vitality of life science practices in Victorian Yorkshire.

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Conventions

Language

English (UK) is used throughout, following E.S.C. Weiner, *The Oxford Guide to English Usage* (Oxford: Oxford University Press, 1981).

Style

Formatting generally follows the *MHRA Style Book: Notes for Authors, editors, and Writers of Theses*, 5th edition (London: Modern Humanities Research Association, 1996); notable exceptions are that double quote marks are used, and numbers greater than twelve in the text are written in figures.

Spelling and Capitalisation

The modern spelling of place names has been employed throughout (“Middlesbrough” rather than “Middleborough”). Specific institution names are capitalised (“Sheffield Literary and Philosophical Society”, “Huddersfield Mechanics’ Institute”, “Leeds Naturalists’ Club”), whereas generic institutions are not (“literary and philosophical societies”, “mechanics’ institutes”, “field clubs”).

Footnotes

Short titles used in footnotes; full details can be found in the bibliography. Titles of books are listed in italics; articles, chapters and dissertations in single quotes, and untitled material in plain text. Where the source of a quote is unpaginated, but has a specific date (in diaries, for example), the date is used. For cases in which there is no way of identifying the specific place in the source, “unpag.” is used (this includes newspaper clippings that have no page number). Quotes are referenced first in footnotes; otherwise, references are generally listed in alphabetical order, unless the structure of the main text necessitates a specific order to avoid ambiguity. For brevity, abbreviations are used wherever possible in footnotes (see list of abbreviations). For clarity, I have not used ‘ibid.’, ‘idem’ or ‘*op. cit.*’. ‘Passim’ is implicit throughout.

Bibliography

The bibliography is split between sources written or published up to and after 1921, the year of the death of the central character in this thesis. For unique material and those items of limited circulation, the archive or library is listed following each entry. Runs of periodical publications can be found in the relevant bibliography according to their start date; years listed of runs are of those volumes consulted. ‘The’ and ‘A’ are omitted from periodical titles, except for *The Times* and *The Naturalist*.

ABBREVIATIONS

| | |
|--------------------|---|
| BAAS | British Association for the Advancement of Science |
| BM (NH) | British Museum (Natural History) |
| BPS | Bradford Philosophical Society |
| CFPLM | [Borough of Sheffield] Committee of the Free Public Libraries and Museum |
| DNB | Leslie Stephen and Sydney Lee [eds.], <i>Dictionary of National Biography</i> , 63 volumes (London: Smith, Elder and Co., 1882–1900) |
| DSA | Department of Science and Art |
| DSB | Charles Coulston Gillispie [ed.], <i>Dictionary of Scientific Biography</i> , 16 volumes (New York: Charles Scribner's Sons, 1970–1980) |
| FCS | Firth College, Sheffield |
| HNS | Huddersfield Naturalist (and Photographic) Society |
| HRI | Hull Royal Institution |
| HTC | Huddersfield Technical College |
| HTS | Huddersfield Technical School and Mechanics' Institution |
| lit and phil | [generic] literary and philosophical society |
| LNC | Leeds Naturalists' (Field) Club and Scientific Association |
| LPLS | Leeds Philosophical and Literary Society |
| LPS | [generic] literary and philosophical Society |
| MA | Museums Association |
| MI | [generic] mechanics' institute |
| OED | James A.H. Murray [ed.], <i>A New English Dictionary: On Historical Principles</i> , ^{10 volumes} (Oxford: Clarendon, 1888–1933) |
| SLPS | Sheffield Literary and Philosophical Society |
| SMI | Sheffield Mechanics' Institute |
| SMS | Sheffield Microscopical Society |
| SNC | Sheffield Naturalists' Club |
| SPM | Sheffield Public Museum (Weston Park) |
| UCL | University College London |
| UCS | University College Sheffield |
| WRCNS | West Riding Consolidated Naturalists' Society |
| YBE | Yorkshire Board of Education |
| YCS | Yorkshire College (of Science) |
| YMCA | Young Men's Christian Association |
| YNU | Yorkshire Naturalists' Union |
| YPS | Yorkshire Philosophical Society |
| YUMI | Yorkshire Union of Mechanics' Institutes |

Chapter 1: Introduction

“I have belonged to many natural history clubs but have found hardly any of them profitable”, complained Louis Miall in 1904; “natural history recreations, of an instructive but by no means profound kind, are all that most amateur clubs can wisely attempt.”¹ At that time, Miall was professor of biology at the newly-chartered University of Leeds, head of a growing community of laboratory-based professionals. We might not be surprised to find a professional biologist decrying the practices of incompetent amateur field naturalists from his remote laboratory, several degrees removed from the grubby bug-hunters and cobwebbed curators. Such far-removed practitioners would surely have viewed each other with suspicion across the rift that separated them.

Delving deeper, however, we find that Miall had long been an active member of a number of such field clubs; that he had in his time spent several decades as a museum curator. Moreover, not only had his department just recently been firmly established, but it owed its very existence to the efforts of many of those same amateurs of whom Miall was so critical. Analysing this comment will require a detailed tour of the many Yorkshire institutions in which life science was practised in the last three decades of the nineteenth century. Before embarking, however, I will introduce this enigmatic individual in more detail, for Miall’s life and work provides the narrative thread that runs through this work. The following chapters mark his career through the spaces for life science; his background reflects the extent to which life science was embedded in civic culture; and his outspoken views provide a useful insight into the amateur-professional relationship in provincial England at that time. In this thesis I examine these sets of issues, and I re-assess three traditional dichotomies in the history of science: field and laboratory, science and society, amateur and professional. Although these dichotomies provide useful points of departure, they need careful unpacking and reassessment. In order to interrogate them fully, I present an intensive study of the practice and place of life science in Yorkshire in the late nineteenth century.

Louis Compton Miall (1842–1921) was brought up in a middle-class family of teachers and Congregationalist ministers.² His grandfather, Moses Miall – author of *Practical Remarks on Education* (1822) – moved from Hampshire to London to establish a

¹ Miall, *House, Garden and Field*, 81.

² Anon., Manuscript Biography of L.C. Miall; Baker and Bayliss, ‘Louis Compton Miall’; Binfield, *So Down to Prayers*, 101–124; Miall, Manuscript Autobiography; Wager, ‘Louis Compton Miall’.

school. Moses' second son Edward, Congregationalist minister turned politician and editor, personified the liberal-dissent bond. He occupied a prominent position in the national Congregational network; as editor of the *Nonconformist* (1841 to 1884) he promoted himself as the mouthpiece for 'modern Independents'. A Liberal MP for Rochdale and later for Bradford, he founded the disestablishmentarian Liberation Society in 1853, which grew to include the Yorkshire plutocrats Edward Baines and Titus Salt. Louis' father was Edward's half-brother James Goodeve Miall (1805–1895), chair of the Congregationalist Union in 1861, minister of the Salem congregation in Bradford from 1837 to 1875. A native of Portsmouth, James married into a medical family, continuing a Miall tradition of using marriage to enhance their connections with professional networks (Edward had married the niece of his college principal). Louis was the fifth of the seven surviving children of J.G. Miall and Elizabeth Symonds Mackenzie.

Although Louis renounced his faith at the age of 20 (to the distress of his family), he was still very much a part of the Leeds-Bradford Congregationalist network. An anonymous relation wrote, "though he broke away from the Congregationalist Church & was in no doubt embittered by the conflict he had to fight for freedom of belief, [Louis] retained a great deal of his religious attitude towards life and never scoffed at religion".³ He seems to have inherited a passion for education, and it was into this sphere that he channelled those talents that his family felt had destined him for the ministry. Miall began teaching aged 15, while still a pupil at Silicoates School, a Quaker college near Wakefield. Although he "had no special interest in [natural history] as a boy", his older brother Philip – then a medical student in Edinburgh – encouraged him to study botany, and Louis was soon devouring Philip's textbooks and the scientific articles in the *Penny Cyclopaedia*.⁴ He joined a botanical society at Todmorden, and in 1865 the newly-formed Bradford Philosophical Society hired him as curator and secretary. They were not to hold him for long: the young naturalist soon moved to the much grander premises of the Leeds Philosophical and Literary Society, and took up residence in the fashionable suburb of Headingley. Although he continued to curate the society's museum for two decades, in 1875 he was appointed lecturer in biology in the new Yorkshire College of Science in Cookridge Street in the centre of Leeds. At the college he spent thirty years building up a department, for which he was rewarded by the new University of Leeds in 1904 with an honorary doctorate. In that same year, Miall – already a fellow of the Royal Society – was

³ Anon., Manuscript Biography of L.C. Miall, 7.

⁴ Miall, Manuscript Autobiography, unpag.

appointed Fullerian Professor of Physiology at the Royal Institution of London. He retired from the university in 1907.

Following Miall's career through the diverse spaces for science, then, I examine the practice and place of life science in Victorian Yorkshire; first in philosophical societies and mechanics' institutes; then in museums; in civic colleges such as the Yorkshire College; and finally in the many field clubs active during this period. I use this introductory chapter to set out the background for this study. The early sections situate the thesis within the historiography of Victorian life science; the latter half places this work within the context of the history of middle-class Yorkshire.

1.1 *Historiography*

That science was an integral part of Victorian culture, and not distinct from it, is now such a commonplace within history of science writing that to approach it in this way no longer requires lengthy justification.⁵ I want to go a shade further than many contextualist historians of science, however, and adopt an *ecological* approach to the history of life science. Most contextualist histories, for all their attention to wider culture and society, still focus on one particular development or biography within science. My focus on Miall notwithstanding, I set out to study a broad sweep of individuals and institutions, their relationships with each other and with other sectors of civil society. I approach the Victorian city as a civic ecosystem, in which changes in one quarter could affect many other facets of society. By analogy with plant ecology, just as the morphology and physiology of flora is affected by external factors, so the form and function of natural history practices were shaped to some extent by the civic environment. Only in an intensive study, necessarily limited in geography and chronology, can the historian tease apart the manifold connections between these civic organisms. This ultra-contextualism is common among academic local historians, many of whom examine every aspect of civic life.⁶ Scientific practices, like many other aspects of regional history, were locally contingent, reflecting and dependent upon other elements of provincial culture.

1.1.1 Practice and Place

I do not approach science as a network of concepts and beliefs: rather, I examine here contingent sets of empirical, textual and theoretical practices. By 'practice', I refer to an

⁵ Lightman, 'Introduction [to *Victorian Science in Context*]'.
⁶ Pythian-Adams, *Re-Thinking English Local History*.

everyday individual or group activity rather than a macroscopic socio-cultural enterprise.⁷ These activities and their informal guidelines are notoriously difficult to recover, given the extent to which they rely on tacit knowledge and skills, rather than explicit regulations. They are nonetheless – and perhaps even more so because of this – an integral and important part of the history of science. By studying Victorian science in practice we see clearly the extent to which it was enmeshed in other aspects of society and culture.⁸

Most historians and sociologists of science who exercise the concept of practice in this way apply it to experimental activities, rather than to museological or field-based science.⁹ A notable exception is Anne Secord, whose studies of artisanal botany resound throughout the present work.¹⁰ Of all the accounts to date of non-laboratory science in practice, Secord's most clearly situates literary production and theorising within a broad range of activities. Through works such as Secord's, this thesis is informed by the approach of Pierre Bourdieu.¹¹ I will not, however, be explicitly using his concept of *habitus*, the regularised macro-practice of a given community produced (somehow) by the combination of day-to-day micro-practices. Although this apparent bridge between specificity and generality is beguiling, I remain agnostic regarding its applicability throughout.

This thesis is concerned with multiplicity of practices, and their differences and similarities between sites. I study what naturalists, curators and biologists actually *did* on a day-to-day basis: how they presented their lectures, how they arranged their displays, how they taught in their labs and what went on during their excursions. Like many historians of science in practice I treat science as work, but also, as I explain below, as form of play. Looking at science in practice encourages us to widen our historical gaze from grand theorists to the countless others who also participated. It encourages us to look beyond texts to instruments, to specimens, to techniques; and to the buildings and spaces in which individuals and groups practised science.

The study of practice – particularly in Bourdieu's work – is intimately connected with position, with geography, with place. The spaces in which science was practised and produced have been a recurring theme in contextualist histories of science for the last two decades.¹² Many of these studies, again, are concerned with laboratories, but their central

⁷ Golinski, 'The Theory of Practice and the Practice of Theory'; Gooday, 'Practice'.

⁸ Turner, 'Practicing Science'

⁹ Collins, *Changing Order*, Latour and Woolgar, *Laboratory Life*.

¹⁰ Secord, 'Science in the Pub', 'Corresponding Artisans', 'Artisan Botany'.

¹¹ Calhoun, *Critical Social Theory*, 132–161; Fowler, *Pierre Bourdieu and Cultural Theory*.

¹² Chadarevian, 'Laboratory Science Versus Country House Experiments'; Golinski, *Making Natural Knowledge*, 79–102; Hannaway, 'Laboratory Design and the Aim of Science'; James, *The Development of the Laboratory*,

historiographical message – that specific locale and the shapes of the places for science influence the practices therein – can also be applied to other sites for science. Much of this place-centred scholarship is concerned with how the laboratory came to be such a sacred space of modern western science: a story that is continued in the present work.

“The ordering of space in buildings”, argue Hillier and Hanson, “is really about the ordering of relations between people.”¹³ To look at the spaces of history is to examine boundaries, not only physical, but social. Spaces are defined by these perimeters, and access is therefore a critical issue: and so I look beyond the rhetoric of educationalists, and examine the permeability of the spaces for the production, consumption and display of science; to ‘the public’, to women, and to the working classes. To limit our studies of place to a discussion of power relations, however, is to provide a rather cramped analysis; a bias derived from Foucault, who was arguably responsible for the ‘spatialisation’ of history.¹⁴ “The emphasis on control”, writes Forgan, “tends to have the effect of turning all buildings into objects of oppression.”¹⁵ Other discourses, of production and consumption, of continuity and change, of juxtaposition and negotiation, are also fruitful. Foucault’s power/knowledge dyad is useful, but it comprises only one weapon in the historian’s arsenal.

When studying science in the spaces that comprise the built environment, an analysis of the architecture of scientific establishments can be revealing, as Forgan’s work demonstrates.¹⁶ She applies the techniques of the historian of architecture and of the theorist of social spaces to the buildings of science, investigating the impact of architecture upon practices and social relations.¹⁷ Forgan incorporates both symbolic and functional aspects of the architecture of science, and demonstrates the extent to which disciplines were formed by the spaces they occupied. Naturalists, biologists and curators developed their own spaces at different times, a diversification evident in science as in other sectors of civic life. In these buildings (at least, in those designed specifically for these purposes) the architecture reflected the functions, forms and social mores of scientific activity. The

Ophir and Shapin, ‘The Place of Knowledge’; Outram, ‘New Spaces in Natural History’; Shapin, ‘The House of Experiment’; Shapin and Schaffer, *Leviathan and the Air Pump*; Smith and Agar, *Making Space*.

¹³ Hillier and Hanson, *The Social Logic of Space*, 2. In Foucault’s writing, similarly, architecture “is not only considered as an element of space, but is especially thought of as a plunge into the field of social relations”. (Foucault, ‘Space, Knowledge and Power’, 253.)

¹⁴ Flynn, ‘Foucault and the Spaces of History’; Foucault, *Discipline and Punish*, ‘Space, Knowledge and Power’, ‘Of Other Spaces’; Markus, *Buildings and Power*.

¹⁵ Forgan, ‘Constructions of Authority’, 162.

¹⁶ Forgan, ‘Context, Image and Function’, ‘The Architecture of Display’, ‘Museum and University’, ‘But Indifferently Lodged...’, ‘Bricks and Bones’; Forgan and Gooday, ‘A Fungoid Assemblage of Buildings’, ‘Constructing South Kensington’.

grand Grecian pillars of the Yorkshire Museum and the neo-Gothic front of the Baines Wing of the Yorkshire College symbolised the place of science in civic society, just as their interiors standardised scientific activity, disciplined access and regimented disciplinary hierarchy. Forgan writes that these buildings represented “claims to territories, both physically and metaphorically, and in a concrete sense embodied that claim and clothed it with institutional respectability. Public recognition followed hard upon the demarcation of institutional territory”.¹⁸

Not all science, however, has an architecture that can be studied. It is possible, however, to apply some of those methods developed by historians of space to the outdoors. ‘The field’ stubbornly refuses to be defined, ranging from deep ocean to mountain range to a back garden. At times historians dwell upon its inaccessibility (jungles, mountains); at other times, the opposite: its democratic side, for there are no physical boundaries to the field. In principle, the field is not exclusive. And yet behavioural codes were as evident in the field as in the laboratory, arguably more so in order to account for the lack of architectural regulation. In the field it is most difficult to disentangle ‘scientific’ from other cultural practices; for, as Kuklick and Kohler write, “unlike laboratories, natural sites can never be exclusively scientific domains. They are public spaces, and their borders cannot be rigorously guarded”.¹⁹ For this reason I do not study natural history as a science *per se*, but as a stable of cultural and social practices, carried out in the field, laboratory, museum and lecture hall.

1.1.2 Amateur and Professional

During the course of the nineteenth century, a variety of occupational groups began to seek similar privileges, authority, expertise and status to the old professions of medicine, law and the clergy.²⁰ That the professional sector nearly doubled in membership between 1851 and 1891 was largely due to the emergence of new professions, while traditional professionals remained a constant proportion of the populous throughout.²¹ Among the new breed were men of science, carving out a space in society for the ‘scientist’. This study inevitably includes many of them: their relationship with other life science practitioners and the shifting definitions of ‘professional’ and ‘amateur’ constitute one of the core historical issues that I address.

¹⁷ Forgan, ‘Constructions of Authority’; Galison and Thompson, *The Architecture of Science*; Markus, *Buildings and Power*; Pevsner, *A History of Building Types*.

¹⁸ Forgan, ‘Context, Image and Function’, 91.

¹⁹ Kuklick and Kohler, ‘Introduction [to *Science in the Field*]', 4.

²⁰ Perkin, *Origins of Modern English Society*, 252–270, *The Rise of Professional Society*, 1–61.

²¹ Hoppen, *The Mid-Victorian Generation*, 40–45.

The historical study of the concept of ‘professionalisation’ has been heavily criticised, but as historians of science such as Morrell have shown, used sensitively the concept can still yield fruit when assessing changes in the social structure of the sciences.²² Rather than prescribing a set of requisites by which an occupation may be classified as a profession, historians have outlined similar characteristics exhibited in distinct combinations at various times by different modern professional groups.²³ Professionalisation can thereby be viewed as a set of occupational strategies. Accordingly, I do not attempt to define ‘profession’; rather, I study the attempts of Yorkshire biologists to establish for themselves a number of imbricated privileges that we would now, as they did then, associate with professionalism: status, salaried posts, security, opportunities for advancement, career structures, and exclusive spaces. In short, the establishment of the power of the paid expert by accretion of social, cultural, symbolic and economic capital.²⁴ Gieryn’s notion of *boundary construction* will prove helpful in my analysis of this venture.²⁵ Men of science, he argues, construct boundaries between themselves and ‘outsiders’, be they non-scientific, pseudo-scientific, or practitioners in other disciplines. They attribute to themselves different characteristics when contrasting their approaches with different groups. This strategy can be seen very clearly in the career of Louis Miall, who worked hard to distinguish academic biologists from museum curators on the one side and from amateur naturalists on the other. Professions are defined *in contrast* to other professions, to women, and to amateurs.

Etymologically, the amateur (from the French) began as “one who loves or is fond of”, but gradually over the course of the nineteenth century the term acquired the connotation, “one who cultivates anything as a pastime, as distinguished from one who prosecutes it professionally”.²⁶ The amateur came to be represented as avocational and recreational; a dilettante, a dabbler, a hobbyist or an enthusiast. Historians have made several attempts to provide a sensitive terminology for nineteenth-century amateur practitioners during this shift: Robert Kargon’s coinage of ‘devotee’ and Nathan Reingold’s

²² Morrell, ‘Professionalisation’; Golinski, *Making Natural Knowledge*, 67–78. In fact, many of the criticisms levelled are unjustified: essentialist accounts of professionalisation are rare, and scholars of the professions have displayed historical sensitivity since Carr-Saunders and Wilson in 1933. (Carr-Saunders and Wilson, *The Professions*.)

²³ Carr-Saunders and Wilson wrote, “the drawing of a boundary-line [between profession and non-profession] would be an arbitrary procedure, and we shall not offer, either now or later, a definition of professionalism. Nevertheless [...] it will emerge that the typical profession exhibits a complex of characteristics”. (Carr-Saunders and Wilson, *The Professions*, 3–4.) Reader, too, avoids defining ‘professional’. (Reader, *Professional Men*.)

²⁴ Bourdieu’s concepts, as outlined in Fowler, *Pierre Bourdieu and Cultural Theory*.

²⁵ Gieryn, ‘Boundary-Work and the Demarcation of Science’, *Cultural Boundaries of Science*, 1–35.

²⁶ OED, vol. I, 265.

‘cultivators’ were applauded, but rarely used, largely because of their historical and regional specificity.²⁷ As one sociologist of amateurs – of whom there are far fewer than those of the professions – astutely observed, “the term ‘amateur’ is applied to too many people with too little in common, such as practitioners, consumers (audiences, spectators, and the like), nonpracticing experts, and critics”.²⁸

Amateur, field-based naturalists are often depicted as slowly being superseded by professional, laboratory biologists.²⁹ By this account, amateurs are separated into two camps: the incompetent hobbyists, and the gentlemen of science. The former are considered outsiders, not contributing to the scientific enterprise, merely a step away from the general public; useful as an audience, perhaps, but not much besides. The endurance of the ethos of the gentleman amateur, meanwhile, is often the culprit for the delay, relative to the Continent, of the establishment of a professional community in Britain. Morris Berman argued this case most authoritatively, drawing on Gramscian *hegemony*, and on Walter Bagehot’s notion of quintessentially English deference.³⁰ Even when professionals achieved any kind of authority, according to Berman, they continued to subscribe to aristocratic ideals, which permeated British society unchallenged until the Great War. Contrary to this account, the particular case of the Yorkshire researcher Henry Clifton Sorby, discussed below, shows that far from inhibiting the growth of a professional community, gentlemen amateurs themselves played a vital role in the propagation of a professional ideal.

Berman’s argument permeates the social history of Victorian natural history, a discipline whose scholars otherwise treat amateurs with sensitivity. Allen, the doyen of this community, adopted Berman’s argument wholesale in his *Naturalist in Britain* (1976/1994), pointing to the inherent conservatism of many naturalists (particularly Charles Babington and Alfred Newton) as the root of an amateur-professional rift. The ‘new’ biologists of the 1870s and 1880s, he argued, subsequently adopted a singularly violent attitude towards all amateurs, be they noble dilettantes or middle-class dabblers. As a result, laboratory practitioners, advancing in leaps and bounds, left the demoralised amateurs behind.³¹ More

²⁷ Kargon, *Science in Victorian Manchester*, 34–85; Reingold, ‘Definitions and Speculations’. Kargon, outlining the particular situation in Manchester, proposed the ‘devotee’ amateur as a bridge between gentleman dilettante and new professional.

²⁸ Stebbins, ‘The Amateur’.

²⁹ As recognised in Farber, ‘The Transformation of Natural History’. This relationship has been studied in the American context by a number of scholars. (Benson, ‘American Natural History and Biology’, ‘From Museum Research to Laboratory Research’; O’Rand, ‘Knowledge Form and Scientific Community’.)

³⁰ Where hegemony is defined as “a kind of cultural supremacy which sanctions the social authority of the ruling class”. (Berman, ‘Hegemony’ and the Amateur Tradition’, 32.)

³¹ Allen, *The Naturalist in Britain*, 158–174, ‘The Early Professionals in British Natural History’.

recently, however, Allen has qualified his thesis to encompass the continued participation of amateurs, and their shifting relationship with the new professional community.³² Allen recognises three sites for this collaboration: the new discipline of plant ecology; school nature study; and systematic vegetation surveys. The former has been studied in detail by Lowe, who argues that the subject facilitated interaction until the Great War.³³ All three are discussed in chapters 4 and 5 below.

Star and Griesemer have also examined the amateur-professional relationship, proffering a model of collaboration using ‘standardisation of practice’ and ‘boundary objects’.³⁴ These objects may be physical, such as a museum display; or abstract, such as a taxonomic system. Boundary objects mean different things to different groups, but their common use facilitates co-operation, which is then further aided by the imposition of common methods – standardisation – across the groups. Star and Griesemer astutely observe that consensus is neither imposed by nature nor is it necessary for co-operation. Although their account is suitably practice-based, Star and Griesemer have a tendency to assume homogeneity within their groups, and despite their avowed multi-viewpoint analysis, their account is largely told from the perspective of the professionals. And so although their approach is useful, I shall not be adopting it wholesale. All of these arguments, sociological or historical, specific or general, have gone some way towards generating a historical understanding of the amateur-professional configuration, and the present work continues this.

1.1.3 Metropolis and Province

Economic, social and cultural historians have long realised the value of local studies, and a number of historians of science have utilised them to great effect. When writing about a specific locale, a delicate path must be taken between parochial antiquarianism and bland generalisation. One apologist for academic local history writes that the regional historian “should study local societies [...] for what they were: localized and highly variable expressions not simply of powerful historical trends, but as singular expressions of wider contemporaneous society in which they were planted”.³⁵ The relationship between national and local history is uneasy; I present here a combination of localised national history (broad themes explored at a local level) and local history *per se*. Yorkshire is part of England; but

³² Allen, ‘The Survival of the Amateur Tradition’, ‘On Parallel Lines’.

³³ Lowe, ‘Amateurs and Professionals’.

³⁴ Star and Griesemer, ‘Institutional Ecology, ‘Translations’ and Boundary Objects’. Their approach has been applied to oncology in Fujimura, ‘Crafting Science’.

³⁵ Pythian-Adams, *Re-Thinking English Local History*, 3.

like other regions, a *distinct* part. Further work may reveal some nationalisation of the local developments discussed herein.

Within the history of science, Manchester – England’s second city and the purported birthplace of the industrial revolution – has been the most intensively studied of the provincial towns, most famously by Kargon and by Thackray.³⁶ In many ways I have shaped this work in response to Kargon’s multi-institutional account. His study is grounded in local politics and industry, and is comprehensive with respect to the many institutions for science exhibited in a Victorian city. So concerned is Kargon with university teaching and research, however, that from the establishment of Owen’s College onwards he largely neglects other sites for science. Thackray’s 1974 paper ‘Natural Knowledge in Cultural Context: The Manchester Model’ remains the exemplary study of science in a provincial city, and I emulate his prosopographical study of scientific societies and his focus on the cultural meanings of science. Thackray, however, is almost exclusively concerned with the relations between science and industry (or lack thereof), whereas this is but one factor in the present work. In many ways, Manchester had more in common with London than with other northern cities. More immediate models for the current work can be found in local studies of Yorkshire, in the writings of Morrell and Inkster.³⁷ Like Inkster, I examine the cultural geography of science; like Morrell, I ground my study very firmly in the local environment. Their work, however, is largely concerned with the first half of the nineteenth century, and besides Lowe’s study of ‘heroic provincialism’ discussed below, there is a want of work for the later period.³⁸

Many historians of science who study provincial science in earnest do so as part of a discussion of centres and peripheries. The very discourse of metropolis and province, however, implies a single metropole and an homogeneous ‘province’; neither of which, of course, stand up to scrutiny. One could argue that the provinces were defined as such by the metropolis; but was Manchester metropolis or province? Was Leeds? What constitutes ‘centre’ and what ‘periphery’ depends very much on the scale of analysis.³⁹ This is *not* primarily a tale of metropolis and province, of centre and periphery. Rather, it is an account of the interactions within, and stretching out from, one region; the inhabitants of which no doubt did not consider London or Manchester to be a ‘centre’ in many respects.

³⁶ Butler, ‘Nature, Amateurs and Academe’; Field and Pickstone, *A Centre of Intelligence*; Kargon, *Science in Victorian Manchester*; Kraft, ‘Building Manchester Biology’; Thackray, ‘Natural Knowledge in Cultural Context’.

³⁷ Inkster and Morrell, *Metropolis and Province*; Inkster, ‘Science and the Mechanics’ Institutes’, ‘The Public Lecture as an Instrument of Science Education’, ‘Aspects of the History of Science and Science Culture’; Morrell, ‘Economic and Ornamental Geology’, ‘Wissenschaft in Worstedopolis’.

³⁸ Lowe, ‘Locals and Cosmopolitans’.

³⁹ Gizycki, ‘Centre and Periphery’.

Comparisons with London, Manchester and other provinces are made throughout when they serve to illuminate Yorkshire natural history, rather than as this work's *raison d'être*. To focus exclusively on the centre-periphery relationship would be to ignore a great deal of the practices and activities in Yorkshire which had no comparison with London or Oxbridge. This was, after all, the era of “prideful independent provincialism”.⁴⁰ This work is thereby comparable to recent scholarship on science in the British colonies that addresses *intercolonial* interactions as well as the relationship between Britain and the colony.⁴¹ This is an inter- and infra-provincial study.

1.2 Sites for Life Science in the Nineteenth Century

There were many sites for the practice of life science in Victorian Britain; in almost all of the secondary literature they have been studied independently. I will discuss the history of each of those spaces with a distinct historiography in turn: field, lab and museum.

1.2.1 The Field

Natural history encompassed a range of different topics, the scope and substance of which varied over time and between naturalists. Generally, it was taken to include botany, zoology and the palaeontological and mineralogical areas of geology, but there were also considerable overlaps with ethnology, antiquarianism and archaeology.⁴² In the current work, for brevity, I have limited my study to the biological end of this varied scale, while other areas are used for comparison throughout. What each focus of study had in common, however, was an ostensible emphasis on field practices. There is extant a vast array of scholarship on science in the field, and on Victorian natural history. I focus here on certain trends that I draw upon.

Field practices have been studied in detail in a number of recent studies of nineteenth-century geological controversies,⁴³ and in accounts of European naturalists in the colonies.⁴⁴ Authors of the former expertly reveal how observations were theory laden, generally presenting field practices as the lowest rung on the Baconian ladder, where the facts were gathered to plug into the wider schemes formulated in the debating chambers of the Geological Society. Historians of ‘imperial science’ treat more exotic climes than

⁴⁰ Inkster, ‘Aspects of the History of Science and Science Culture’, 35.

⁴¹ Barton, ‘Haast and the Moa’; Endersby, ‘A Garden Enclosed’; Sheets-Pyenson, *Cathedrals of Science*.

⁴² All these areas were studied together as chorography throughout the eighteenth century (Jankovic, ‘The Place of Nature and the Nature of Place’); by the Victorian era, however, they were more distinct.

⁴³ Oldroyd, *The Highlands Controversy*; Rudwick, *The Great Devonian Controversy*, 37–41; Secord, *Controversy in Victorian Geology*, 24–38.

provincial England, of course; rather, they examine the field practices of the great Victorian voyages, of Darwin on the Galapagos Islands or Wallace in the Malay Jungles.

Nevertheless, I take from both of these bodies of work their close attention to the day-to-day activities of men of science in the field.

Many of these historians of Victorian field science, however, focus only on the practices of a handful of élite male naturalists – and occasionally on those of their lesser-known correspondents or guides – implicitly excluding the hordes of invisible practitioners alongside whom they naturalised.⁴⁵ And yet there has been much recent work on women and the working classes in Victorian natural history. Anne Secord has studied natural history from the artisan's perspective, and scholars have addressed in detail the ways in which women continued to practice and to write about the floral world after the mid-century 'defeminisation' of botany.⁴⁶ One writer who has been the subject of much recent work was based in Yorkshire: the phycologist Margaret Gatty (1809–1873), author of *The History of British Seaweeds* (1863).⁴⁷ Her absence from this thesis is not without consideration. Like Suzanne Sheffield, I have been unable to find evidence of her involvement in any of the groups detailed herein, except for the posthumous donation of some of her specimens to the Sheffield Public Museum (see chapter 3). This thesis is concerned with natural history institutions dominated by middle-class men; and while I examine the limited participation of women within these institutions, and the attempts at their exclusion, naturalists such as Gatty who practised outside their auspices have been studied elsewhere. Similarly, I engage with the small working-class presence in these groups – they were often the intended audience – but it is often their *absence* that is noteworthy. Very few records of artisan botany groups in Yorkshire survive. Although this thesis is informed by Secord's studies of working-class botany, my focus is on bourgeois natural history.

As well as Anne Secord's work, Allen's *Naturalist in Britain* (1976/1994) is obviously an exemplar for my project (with the reservations outlined above). Allen's breadth of focus produced a volume that has spawned a discipline: the social history of natural history.⁴⁸

Allen first wrenched the history of taxonomy away from the battlegrounds of high theory

⁴⁴ Browne, 'Biogeography and Empire'; Camerini, 'Wallace in the Field', 'Remains of the Day'; Hevly, 'The Heroic Science of Glacier Motion'; Kumar, 'The Evolution of Colonial Science'; McCook, 'It May Be Truth, But It Is Not Evidence'; Stafford, 'Annexing the Landscapes of the Past'.

⁴⁵ Shapin explores the notion of invisible practitioners in science. (Shapin, 'The Invisible Technician'.)

⁴⁶ Secord, 'Corresponding Interests', 'Science in the Pub', 'Artisan Botany'; Gates, *Kindred Nature*; Lightman, 'The Voices of Nature'; Sheffield, *Revealing New Worlds*; Shteir, *Cultivating Women, Cultivating Science*.

⁴⁷ Ewing, 'Margaret Gatty'; Maxwell, *Mrs Gatty and Mrs Ewing*; Rauch, 'Parables and Parodies'.

and natural theology and situated it firmly in the social realm, using cultural rather than intellectualist tools. Like him I approach the cultural geography of natural history: a dense network of locally grounded practices rather than a disparate network of disembodied ideas. Allen's scope is national, supported by detailed knowledge of the intricate workings of science in the provinces; a closer working knowledge of individual regions, however, adds a great deal. In this I answer Secord's call to arms, in which he noted that "Allen's survey points the way ahead, but for all its merits it remains a first attempt". Rather, "what is especially needed at this point is a much more intensive study of the entire community of naturalists".⁴⁹ By narrowing focus to one third of a century and to one county (albeit the largest), such a level of detail is provided.

Various lesser-known works present surveys of natural history in various parts of the country, but although they are immensely useful, they tend to take the form of biographical lists or histories of individual institutions with little social analysis.⁵⁰ Lowe, however, studies Victorian provincial natural history activities in detail, in his epic 1978 master's dissertation 'Locals and Cosmopolitans'. His study draws heavily on Yorkshire, and has been of great assistance to my project. Like him, I study the institutional development of natural history, and the relationship between amateurs and professionals. (Museums, however, are noticeably absent in his account.) Unlike Lowe and some other historians of Yorkshire natural history, however, I do not concentrate exclusively on the publications of these groups.⁵¹ Lowe falls into Kargon's trap of studying each breed of institution in turn within a specific period: first philosophical societies, then field clubs, and so on.⁵² And although I have ordered the current work in a similar fashion, I study all the institutions over the same period of time. Lowe's work also engages to a considerable extent with the British Association for the Advancement of Science (BAAS); partly for this reason, mine does not.⁵³ There is already a considerable body of scholarship devoted to the

⁴⁸ Barber, *The Heyday of Natural History*; Jardine, Secord and Spary, *Cultures of Natural History*; Keeney, *The Botanizers*; Merrill, *The Romance of Natural History*; Wheeler and Price, *From Linnaeus to Darwin*.

⁴⁹ Secord, 'Natural History in Depth', 183.

⁵⁰ Blockeel, 'The Early Bryologists of South West Yorkshire'; Charlesworth and Ellis, *The History of a Society*; Donnan, 'The Leeds Naturalists' Club'; Lunn, *A History of Naturalists in North East England*; Maltby and Winter, *Fifty Years of Local Science*; Spalding, 'Natural History in the Early Years of the Sheffield Literary and Philosophical Society'; 'Notes on Naturalists in the Sheffield Area'; Ward, 'The History of the Sorby Society'.

⁵¹ Bayford, 'Some Notes on the History of *The Naturalist*', 'The Predecessors of *The Naturalist*'; Donnan, 'A Note on the Publications of the Leeds Naturalists' Club'.

⁵² Kargon, *Science in Victorian Manchester*.

⁵³ Lowe published this aspect of his dissertation in 'The British Association and the Provincial Public'.

association, and so while the BAAS meetings feature herein where they had an impact on local practice, I do not study the association itself.⁵⁴

1.2.2 Laboratories

The late nineteenth century has been identified as the era of the European ‘laboratory revolution’ in both physics and medicine, during which large institutional research and teaching laboratories supplemented and replaced other sites for science.⁵⁵ This fundamental change in the practice and place of science was recognised at the time: one observer proclaimed in 1884, “the modern laboratory is almost unrestricted in its scope and possibilities. It is the most remarkable and influential creation of science in our time”.⁵⁶ The establishment of laboratories was symbiotically related to the development of new ways of practising and teaching science. Biology has been largely passed over in accounts of the ‘laboratory revolution’ just as laboratories have been excluded from many accounts of late nineteenth-century biology (and so what follows is more history than historiography).⁵⁷ Despite this lacuna in the literature, as I show in chapter 4, the emergence of teaching laboratories was perhaps as significant for biologists as it was for physicists, chemists and clinicians.⁵⁸ As William Thomson told the University College of Bangor in 1885, “the naturalist in his laboratory with his microscope and appliances for the keenest examination, learns to know more than can be learned merely by looking at external beauties. [...] No university in the world can now live unless it has a well-equipped laboratory”.⁵⁹

Any discussion as to how these sentiments came to be applied to biology must start with the teaching methods of Thomas Huxley. While lecturing at the Royal School of Mines on Jermyn Street, Huxley complained, “I cannot teach my own brand of science properly, because I have nothing answering to a dissecting room, or biological laboratory.”⁶⁰ He was able to correct this at his teacher training college in South Kensington, officially opened in 1872. From the previous year, however, Huxley had been teaching classes in a makeshift

⁵⁴ Howarth, *The British Association for the Advancement of Science*; MacLeod, Friday and Gregor, *The Corresponding Societies of the British Association for the Advancement of Science*; Macleod and Collins, *The Parliament of Science*; Morrell and Thackray, *Gentlemen of Science*. The BAAS visited Yorkshire five times during the period covered by this thesis: Bradford in 1873; Sheffield in 1879; the association’s birthplace, York, for its jubilee in 1881; Leeds in 1890; and Bradford in 1900.

⁵⁵ Cunningham and Williams, *The Laboratory Revolution in Medicine*; Gooday, ‘Precision Measurement [1990]’; James, *The Development of the Laboratory*; Jewson, ‘The Disappearance of the Sick-Man’; Pickstone, ‘Ways of Knowing’; Sviedrys, ‘The Rise of Physics Laboratories in Britain’. On the early importance of the laboratory to chemistry, see Morrell, ‘The Chemist Breeders’.

⁵⁶ Anon., ‘The Laboratory in Modern Science’, 173.

⁵⁷ A treatment as thorough as Gooday’s of physics teaching laboratories is wanting in the history of Victorian life science. (Gooday, ‘Precision Measurement [1989]’.)

⁵⁸ Gooday, ‘Nature’ in the Laboratory’.

⁵⁹ Thomson, ‘Scientific Laboratories’, 409, 412.

⁶⁰ Cited in Forgan and Gooday, ‘Constructing South Kensington’, 443.

laboratory in the South Kensington Museum. He felt that “the essential part of the whole teaching, and that which I regard as really the most important part of it, is a laboratory for practical work, which is simply a room with all the appliances [especially microscopes] needed for ordinary dissection”.⁶¹ At the Normal School (later the Royal College of Science) Huxley enlisted a group of young demonstrators, who later went on to work in universities and other institutions across the country and the world.⁶² E. Ray Lankester went to University College, London, and later to Oxford and the Natural History Museum; William Thiselton-Dyer to Kew; H. Newell Martin to Johns Hopkins; William Rutherford to Edinburgh; Michael Foster to Cambridge; and T. Jeffrey Parker to Otago. They were not the first to implement practical pedagogical schemes in life science,⁶³ but the training they advocated was novel in its uniformity and its subscription to the ‘new biology’.⁶⁴ Biology chairs were inaugurated during the late nineteenth century in Birmingham, Dundee, Durham, Bedford College and elsewhere.

The term ‘biology’ had been used by a number of men of science since the early century – Cuvier and Whewell among them – but Huxley and his allies fashioned it into a coherent disciplinary entity in late-century Britain.⁶⁵ They emphasised the physico-chemical basis of the living world; the microscopic rather than the macroscopic; and man was very firmly to be included. By the late 1870s, Darwinian evolution became a central tenet of their curricula. Huxley advocated the detailed study of a few key organisms rather than a grand taxonomic sweep of nature. Students therefore studied life sciences by system, rather than by classification; and they were taught with a handful of representative types. The new biologists drew heavily on traditions of practical physiology and on German research methods, and embryology played a central role in their studies. Amidst an era of specialisation, they insisted on a unified study of life; as Huxley wrote, “a fundamental unity of structure pervades the animal and vegetable worlds [...] plants and animals differ from one another simply as diverse modifications of the same great general plan”.⁶⁶ Biology had only been “divided into Zoology and Botany as a matter of convenience”, and the new

⁶¹ Huxley, ‘On the Study of Biology’, 154.

⁶² Desmond, *Evolution’s High Priest*, 11–14; Geison, *Michael Foster*, Lester, *E. Ray Lankester*.

⁶³ Henry Acland set up a laboratory for physiology teaching in Oxford in 1860, although by 1872 it had become “notorious that he does nothing”. (Huxley, Letter to E. Ray Lankester, 18th December 1872, unpag.) George Rolleston, inspired by Huxley, also taught some practical zoology at Oxford; and John Willis Clark organised a practical anatomy class at the Zoological Museum of Trinity College, Cambridge. (Desmond, *Huxley: Evolution’s High Priest*, 29–50; Huxley, *Life and Letters*, vol. II, 82–87; Shipley, *A Memoir of John Willis Clark*, 270–272.)

⁶⁴ Desmond, ‘Redefining the X Axis’; Nyhart, ‘Natural History and the ‘New’ Biology’.

⁶⁵ Caron, ‘Biology’ in the Life Sciences’. Pauly studies the emergence of biology in American academe, where Huxley’s concept of the discipline was also influential. (Pauly, ‘The Appearance of Academic Biology’.)

⁶⁶ Huxley, ‘On the Study of Biology’, 146.

biologists were largely responsible for ushering in ‘biology’ as a synthetic discipline, drawing together disparate traditions from animal physiology and practical botany; this, as Caron argues, was the ‘propagandistic beginning’ of biology.⁶⁷ (Caron’s emphasis on the creation of biology as an institution is one that I wish to expand upon.)

Just as Latour’s Pasteur set up his research laboratories as passage points in vaccination practice, so Huxley sought to establish his London teaching laboratory as a passage point in biological pedagogy.⁶⁸ From this self-appointed centre, Huxley’s teachers went out to schools, and his demonstrators to other labs. They in turn implemented similar laboratory demonstration systems, hiring their own assistants in turn. Slowly, a community emerged. Advocacy of laboratory research and teaching was thus closely tied with the construction of professional identities. Biologists wanted to emulate the cultural authoritative of physicists, riding high after the success of transatlantic cable telegraphy (which Thomson and others hailed as being a direct result of laboratory methods), and so adopted the techniques and spaces of the physical sciences. “Biology is a physical science,” preached Huxley, and so “the method of studying it must be analogous to that which is followed in the other physical sciences. [The biologist] should actually perform the fundamental experiments in the laboratory for himself”.⁶⁹ The microscope emerged as an authority device for expert opinion; just as the laboratory became the definitive macro-space for Huxley’s biology, so the micro-space was enlisted to confer authority on his testimony.⁷⁰ Huxley contrasted this exclusive, professional biology with traditional amateur field natural history; although, as I argue throughout this thesis, he thereby ignored the contemporaneous changes within natural history (see especially chapters 5 and 6). Huxleyan pedagogy, laboratory methods and the experimental ideal were attractive to young biologists, hungry for status and employment.

Although Huxley undoubtedly played a significant role in the emergence of laboratory biology, those who adopted the ‘new biology’ and implemented practical instruction did so in a variety of civic and institutional environments, utilising local resources and appealing to contingent markets. Miall, as we shall see, appropriated Huxleyan pedagogy in his own way and for his own purposes without being a direct product of the Huxley school.

⁶⁷ Huxley and Martin, *A Course of Elementary Instruction in Practical Biology*, ix; Caron, ‘Biology’ in the Life Sciences’.

⁶⁸ Latour, ‘Give Me a Laboratory and I will Raise the World’.

⁶⁹ Huxley, ‘On the Study of Biology’, 151.

⁷⁰ Gooday, ‘Nature’ in the Laboratory’.

1.2.3 Museums

It is commonplace in the history of natural history museums to attribute their pedigree solely to renaissance curiosity cabinets;⁷¹ the *musaeum*, however, was originally a temple of the nine muses, goddesses of the arts and sciences.⁷² As Forgan notes, to concentrate only on the cabinet as antecedent would be to ignore the rich and varied interconnections of the history of museums and of artisanal gathering traditions, zoological and botanical gardens, temples, treasuries, curiosity shows, menageries, philosophical societies, libraries and exhibitions.⁷³ By the late eighteenth century, museums were prominent in civic cultural life, and had emerged as the hegemonic site for natural history.⁷⁴ A century later, Europe and North America witnessed a massive growth in museum building.⁷⁵ The novelties of these new museums were their sheer size, and their new, public-oriented access policies. The first museum open to the public in England was probably that of John Tradescant – ‘Tradescant’s Ark’ – early in the seventeenth century.⁷⁶ They were few and far between, however, until the late nineteenth century, when, gradually, local and national governments began to take advantage of the Museums and Libraries Acts and asserted control over those collections previously owned by private individuals and philosophical societies.

Local historians and museum professionals have long studied the history of museums.⁷⁷ More recently, however, an entire community of museum scholars has taken shape, while historians of science have studied museums in more detail as sites for scientific practice; disparate strands that I bring together. Firstly, there are a number of techniques that I purloin from museum scholars: from Hooper-Greenhill and others I take the detailed attention to display, and developments inside museums; like Bennett I chart the cultural context of these institutions (although on a civic scale rather than his international scope); I follow Pearce in her emphasis on institutionalised collecting (unlike

⁷¹ Findlen, *Possessing Nature*, 17–154; Impey and MacGregor, *The Origins of Museums*; MacDonald, ‘Exhibitions of Power and Powers of Exhibition’; Sheets-Pyenson, *Cathedrals of Science*, 1–23.

⁷² Pearce, *Museums, Objects and Collections*, 92–3.

⁷³ Forgan, ‘The Architecture of Display’; Altick, *The Shows of London*; Brain, *Going to the Fair*; Brears and Davis, *Treasures for the People*; Crowther, ‘The Museum as a Teacher of Nature-Study’; Lustig, ‘Cultivating Knowledge’.

⁷⁴ Outram, ‘New Space in Natural History’; Pickstone, ‘Ways of Knowing’, ‘Museological Science?’.

⁷⁵ Between 1884 and 1914, lavish public museums were established in London, Genoa, Berlin, Paris, Hamburg, New York and Washington. (Nyhart, ‘Creating a ‘Public’ Nature’; Pevsner, *A History of Building Types*, 111–138.)

⁷⁶ Pevsner, *A History of Building Types*, 132; Whitehead, *The British Museum*, 7; Yanni, *Nature’s Museums*, 20–24.

⁷⁷ Addison, *The Bradford Museums*; Allison, ‘Learned Societies and Museums’; Baggaley, ‘Some Notable Museums’; Bartlett, ‘Learned Societies, Museums, and Art Gallery’; Brears, ‘Temples of the Muses’, *Of Curiosities and Rare Things*; Brears and Davis, *Treasures for the People*; Browne, *Chapters of Whitby History*; Davies, ‘The Making of a Municipal Museum’; Markham, *A Rhino in High Street*; Norris, ‘Natural History’; Parkin, ‘Reminiscences of a Museum Assistant’; Pyrah, *The History of the Yorkshire Museum*; Simms, ‘Towards a History of Natural History Collections’; Wilmot, ‘The Yorkshire Museum’.

her, however, I allow room for the influence of the lone curator with all his idiosyncrasies); and I draw upon on Hudson's detailed study of visitors' experiences of museums.⁷⁸ Hill's focus on the place of the museum in civic society has proved useful, and like her, I examine the specific locale of Victorian museums, and how they drew on local resources.⁷⁹

Much of this museum scholarship bears Foucault's powerful imprint. The great museum, argued Foucault, encompassed the entirety of knowledge, and used space as a control mechanism.⁸⁰ Items of interest from around the globe were captured in a specific, metropolitan mini-regime, and arranged in an orderly and appealing fashion that was not possible in the broader, other, *outside*, space. Throughout this Foucauldian discourse is an unrelenting emphasis on power. It is useful to explore the museum as social machinery, given its central role in the programmes of many middle-class Victorian reformers, and the importance of pedagogy to museum professionals.⁸¹ Some museum scholars, however – Hooper-Greenhill especially – focus on this issue to the detriment of detailed study of other aspects of museum history, treating museums only as instruments of the nation-state.

A number of historians of science have studied museums, and, while they do not ignore issues of power and control, they base their accounts on developments concerning science and its publics.⁸² Historians of natural history museums, however, tend to focus on those institutions that were solely devoted to life science, which is to ignore the natural history exhibited within general civic museums. Museums have also provided historians of science with a prime site for the study of space. The museum's layout, or even its very architecture, could embody important scientific principles. Forgan's studies, discussed above, weave together issues surrounding space, layout and display, research, communication, access and audience.⁸³ She recognises the heterogeneity of museums and their functions, the discrepancies between what curators presented and what audiences experienced, and the difficulties of recovering the latter. This study supplements Forgan's metropolitan studies with a detailed examination of the collecting procedures and day-to-day practices of curators in Victorian Yorkshire.

⁷⁸ Hooper-Greenhill, *Museums and the Shaping of Knowledge*; MacDonald, 'Exhibitions of Power and Powers of Exhibition'; Bennett, *The Birth of the Museum*, 17–88, 'Speaking to the Eyes'; Pearce, *Museums, Objects and Collections*, 36–88; Hudson, *A Social History of Museums*.

⁷⁹ Hill, 'Municipal Museums in the North-West', 'Thoroughly Embued with the Spirit of Ancient Greece'.

⁸⁰ Foucault, 'Of Other Spaces', *The Order of Things*, 125–165.

⁸¹ Greenwood, *Museums and Art Galleries*, 15–24.

⁸² See for example Findlen, *Possessing Nature*; Sheets-Pyenson, *Cathedrals of Science*.

⁸³ Forgan, 'The Architecture of Display', 'But Indifferently Lodged...', 'Bricks and Bones'.

The ‘new museum’ idea evident in the late nineteenth century, as studied by Nyhart and others, is relevant here.⁸⁴ Curators subscribing to this ideal sought to establish a conceptual and physical distance between collections for serious research and selected specimens intended for display to the public. The research collections were kept in separate rooms in row after row of densely packed cabinets. As well as saving space, this meant that access to the collections was limited to those deemed suitable by the curator, thus regimenting museum research and, as Nyhart has argued, elevating the status of curators in the eyes of their laboratory counterparts and the public. Prevalent in Germany in the 1880s, new museums were also championed by James Edward Gray and William Flower at the British Museum. Whether or not the new museum concept had a lasting influence, it was an integral part of the realignment of a professional identity within the museum space. The ‘new museum’ idea – like the ‘new biology’ – was a way of presenting concepts (not all of them entirely novel) as a package that was then associated with a disparate group of new professionals eager to assert their authority over a particular space.

This study incorporates the multifarious sites for Victorian life science into one integrated account: for it is not possible to comprehend fully the practice of biology and natural history in any one of these spaces without detailing what went on in the others. Too often, historians concentrate on one space or institution at the expense of the others. Rather, I follow Outram, Pickstone, and Forgan and Gooday by comparing and contrasting the various sites for science.⁸⁵ By juxtaposing studies of field, lab and museum (with the lecture hall as backdrop), I am able to present an account of the movements, rivalries and interactions of practitioners between them.

1.3 Life Science in Urban Society

Within the contextualist history of life science, and within the history of provincial England, I focus specifically on the practices and uses of science by the middle classes in urban Yorkshire. I argue throughout that natural history was a leisure activity of the urban élite, and this would be meaningless without a contextual survey of three interconnected ‘rises’ studied in recent historical literature: those of the middle classes, of towns, and of

⁸⁴ Nyhart, ‘Creating a ‘Public’ Nature’; Flower, ‘Address’, ‘Museums Association’; Sheets-Pyenson, *Cathedrals of Science*, 6–8; van Keuren, ‘Museums and Ideology’.

⁸⁵ Forgan, ‘The Architecture of Display’, ‘Museum and University’; Forgan and Gooday, ‘A Fungoid Assemblage of Buildings’, ‘Constructing South Kensington’; Outram, ‘New Spaces in Natural History’; Pickstone, ‘Ways of Knowing’, ‘Museological Science’.

leisure. It was within these arenas that amateur and professional practitioners alike sought to capture constituencies and to find legitimating audiences.⁸⁶

1.3.1 The Middle Classes

“We do not believe”, proclaimed Edward Baines of Leeds in 1842, “that there is in the world a community so virtuous, so religious and so sober minded as the middle classes of England.”⁸⁷ These middle classes provided the support, the audiences, and the practitioners of life science that are studied in this thesis. This is not to ignore the importance of upper-class naturalists or the significance of high politics; nor is it to discount the existence of an independent working-class natural history. I simply claim that the significance of bourgeois culture has often been overlooked in the history of life science, and this work is intended to restore the balance. Aristocratic and artisanal cultures of natural history surface frequently throughout this work: the former in the shape of patrons and landowners; the latter as botanical pub groups and as the (intended) members of mechanics’ institutes; however, my central focus is on middle-class patrons, practitioners and audiences. All the institutions that I present in the following chapters were dominated, explicitly or implicitly, by various sectors of the maturing urban *bourgeoisie*.

Just who comprised this temperate, wholesome society? Throughout modern history there have always been groups who fall outside the ruling/working and land/labour dichotomies; groups composed especially of the professional and trading classes. According to many schools of thought (particularly Marxian approaches), this ‘middle class’ came into its own in the nineteenth century.⁸⁸ Established during the turn-of-the-century turbulence; facilitated by capitalist economics, imperial growth and industrial manufacturing; and buttressed by the 1832 Reform Act, the *bourgeoisie* expanded both in numbers and in power. Middle-class hegemony – especially in urban society – was further strengthened by the incorporation of boroughs in the wake of the 1835 Municipal Corporations Act, and by the campaign against the Corn Laws, which were finally repealed in 1846. As well as these political devices, the explosion in printed communication served to cement middle-class consciousness, and provincial urbanisation gave the *bourgeoisie* a sprawling new base.⁸⁹ They differentiated themselves from the riotous lower class and the

⁸⁶ Desmond, ‘Redefining the X Axis’.

⁸⁷ Baines writing in his newspaper, the *Leeds Mercury*, in 1842, cited in Fraser, ‘The Baines Family’, 96.

⁸⁸ See for example Thompson, *The Making of the English Working Class*; Perkin, *Origins of Modern English Society*; Hobsbawm, *The Age of Revolution*.

⁸⁹ Curran and Seaton, *Power Without Responsibility*, 11–48; Morris and Rodger, ‘An Introduction to British Urban History’.

decadent aristocracy; instead, they stood for intelligence, honesty, piety, sobriety, respectability and responsibility.

Over the last 30 years, this orthodox account of the rise of the middle class has been revised almost beyond recognition. First of all, the notion of an homogeneous middle class – never seriously proposed by a twentieth-century historian – is of course unsupportable. Rather, the ‘middle ranks’ of society consisted of a broad spectrum of occupations, encompassing a great variety of locations and economic bases. The lower middle classes (the *petite bourgeoisie*) included small businessmen, petty shopkeepers, and, increasingly, a vast array of ‘white-collar’ workers: clerks, middle managers, commercial travellers, schoolteachers, and some shop assistants.⁹⁰ The élite, or *haute bourgeoisie*, comprised merchant and manufacturing capitalists, rentiers, bankers, higher professionals and upper-level administrators. Bourgeois annual incomes could be as low as £50 (less than some skilled artisans) or as much as £1000 (more than some minor gentry).⁹¹ Their political and denominational affiliations spanned liberal and conservative, dissenting and Anglican.

The chronology of the rise of the middle classes has been challenged, not least because the accepted timescale of industrial revolution (so integral to the formation of the middle classes) has spread far beyond the period 1790 to 1830.⁹² Recent scholarship has extended the period of class formation up to the 1870s, and there have been a number of accounts of the ‘middling sort’ in the eighteenth century and earlier.⁹³ Just as the chronology of the rise of the middle classes has been questioned, so has this ascent itself. Reacting against traditional accounts of the success of the middle classes, an unlikely consortium of historians wrote accounts of their failure.⁹⁴ Some even deny their existence altogether. For Wahrman, the middle class was a rhetorical formation, an artefact of political discourse. The impact of the Reform Acts and the repeal of the Corn Laws had more to do with creating a middle-class ideal, than with creating the middle class.⁹⁵

⁹⁰ Crossick, ‘The Emergence of the Lower Middle Class in Britain’.

⁹¹ Davidoff and Hall, *Family Fortunes*, 265–271; Hoppen, *The Mid-Victorian Generation*, 31–40.

⁹² Indeed, the occurrence of the industrial revolution itself has been questioned by scholars who point to the prevalence of other forms of capitalism, as outlined in Hudson, *The Industrial Revolution*, 218–225.

⁹³ Cannadine, *Class in Britain*, 24–105; Wahrman, *Imagining the Middle Class*, 1–18.

⁹⁴ Gunn, ‘The ‘Failure’ of the Victorian Middle Class’. According to left-wing scholars such as Anderson and American historians such as Wiener, the middle classes lost their nerve after 1832; failed to realise their hegemonic ambitions; and either underwent a symbiosis with the landed gentry or spent the rest of the century yearning for gentrification and the rural ideal. Instead of a northern industrial bourgeoisie dominating English society, Anderson and Wiener point to the endurance of southern ‘gentlemanly capitalism’, largely unaffected by industrialisation. (See for example Anderson, ‘Origins of the Present Crisis’; Wiener, *English Culture and the Decline of the Industrial Spirit*.)

⁹⁵ Wahrman, *Imagining the Middle Class*, 328–376.

Where, then, does this leave the historian seeking to use the category of middle class to study urban life science practices? Historians should follow Wahrman in questioning the 'bourgeois paradigm'. And yet I am loath to disregard the existence of the middle classes entirely. 'Middle-class' was an actor's category,⁹⁶ and combined with a little acknowledged presentism – we would not hesitate to deem Miall middle-class today – it would be difficult not to use this language. Were the middle classes as wholesome as their spokesmen claimed? Surely not. But did they exist as a social group, however heterogeneous? Surely so. Of course the tag 'middle class' encompassed a diverse assortment, perhaps best defined by what they were *not*, but even as a consciously anachronistic label, it serves a pragmatic purpose in classifying the individuals studied here. Gender, region and religion were also significant factors in shaping social identity, and I treat them accordingly. Nevertheless, late nineteenth-century urban Yorkshire was home to a maturing, self-aware network of individuals and groups who can usefully be deemed *middle-class*. And they dominated late-Victorian natural history and biology in urban Yorkshire.

1.3.2 Towns and Civic Pride

That I write of 'urban Yorkshire' is not without due reflection, for this thesis is based in the towns of the North.⁹⁷ The exponential growth of urban England during the nineteenth century – unlike perhaps the emergence of the middle classes – is undeniable.⁹⁸ By mid-century, half the population lived in towns; by the Great War, over four-fifths. But population growth alone does not account for urbanisation, which relies on a particular organisation of that growth. A new relationship was forged between city and citizen, environment and society: qualitative change accompanied quantitative. Gradually, town and country became separate domains. The élite within these towns sought to control all aspects of cultural life – including natural history – and to base them within civic institutions. Naturalists may have practised in the hills and Dales, but their organisation rested in urban centres.

Two characteristics of the growing Victorian towns are noteworthy for present purposes: firstly, that many of the great industrial cities were in the North; and secondly, the strength of the middle classes therein. London was an unusual urban area in many respects, and the typical industrial city, the real-life 'Coketown' (which Dickens based on

⁹⁶ By the 1840s, the term 'middle classes' was in common general usage. (Williams, *Keywords*, 60–69.)

⁹⁷ Although I am aware of the technical definitions of a city, for simplicity I often use the term as synonymous with 'large town'.

Preston), was to be found in Lancashire or Yorkshire.⁹⁹ The rise of the northern city and the rise of the middle classes were intimately related.¹⁰⁰ Towns consolidated middle-class identity, providing the heterogeneous *bourgeoisie* – originally ‘those who inhabit boroughs’ – with a polymorphous base.¹⁰¹ They erected grammar schools, infirmaries and civic colleges; funded libraries, galleries and museums; and, as I discuss below, formed voluntary associations in order to assert their identity, thereby stamping their influence on the face of the town.

We should not forget, however, that the ‘middling sort’ were still a minority in society as a whole, if not in the institutions for natural history. In few towns did they constitute more than one-fifth of the adult male population: perhaps approaching this proportion in the ports of Hull and Whitby and the county capital at York, and falling to less than ten per cent in many parts of the industrial West Riding.¹⁰² Nevertheless, they were a powerful, expanding minority, keen to assert themselves; and they out-voted the masses. Within the towns, this fraction cemented their control over urban society through dense networks of marriages, businesses, political alliances, congregations and societies; networks that extended to other provincial towns, and to the metropolis.¹⁰³ As Gray writes, “industrial towns were significant venues for the making and enactment of a liberal middle-class culture. That culture was national in scope, defined by a series of intersecting formal and informal networks and institutions”.¹⁰⁴ Biologists manipulated these networks, and were manipulated by them.

However strong inter-city links were, regional identity was a powerful force, clearly exhibited through ‘civic pride’. Its most obvious (and aggressive) symptom was the intense rivalry between the towns: the establishment of a philosophical society, museum, library or college in *their* town was always greeted with a flood of public and private calls for a bigger, better version in *our* town. As Waller writes, civic pride was an admixture of “pride and prejudice, generosity and pettiness”.¹⁰⁵ The results, however, were often stunning.

Through their architecture the middle classes presented their cities as heirs to ancient and

⁹⁸ Briggs, *Victorian Cities*, 11–87; Dennis, *English Industrial Cities*; Hey, *Yorkshire From AD 1000*, 245–301; Morris and Rodger, ‘An Introduction to British Urban History’; Waller, *Town, City and Nation*.

⁹⁹ Dickens, *Hard Times*.

¹⁰⁰ Gunn, ‘The Public Sphere, Modernity and Consumption’; Hoppen, *The Mid-Victorian Generation*, 49–55; Morris, ‘The Middle Class and British Towns’, *Class, Sect and Party*; Morris and Rodger, ‘An Introduction to British Urban History’.

¹⁰¹ Williams, *Keywords*, 60–69.

¹⁰² Hoppen, *The Mid-Victorian Generation*, 49–55; Morris, ‘The Middle Class and British Towns’; Perks, ‘Late Victorian and Edwardian Politics’.

¹⁰³ Gunn, ‘The ‘Failure’ of the Victorian Middle Class’; Morris and Rodger, ‘An Introduction to British Urban History’.

¹⁰⁴ Gray, ‘The Platform and the Pulpit’, 145.

renaissance city-states.¹⁰⁶ Provincial towns sported gleaming trade exchanges and grand town halls, housing exhibitions and a plethora of societies, clubs and associations. Leeds town hall, erected in 1858 to host the BAAS, was part of the trappings of a city before Leeds technically became a city, which status it was only awarded by Parliament in 1893 (in the same year as Sheffield; Manchester, by contrast, had already been a city for nearly half a century). 'Civic', after all, pertains to citizenship in general rather than necessarily to the characteristics of a city; and the lack of official city status no doubt further fuelled these ventures.

Civic pride was big business. In the staunchly Liberal environment of mid-century Yorkshire, corporation paternalism was shunned in favour of voluntary educational and cultural institutions, as in the cases of private libraries, societies and museums.¹⁰⁷ If money for any of these activities was to be had, it was through voluntary subscription by local grandees and businesses.¹⁰⁸ As the Victorian era drew to a close, however, the nature of civic pride changed, as the parsimonious corporations began to take over more of those areas of civic life previously funded by the voluntary sector. Responsibility for galleries, museums, parks, colleges and libraries was gradually transferred from the voluntary sector to the corporations, exemplifying the shift from liberal non-interventionism to more proactive municipal support and control of civic enterprises. Transferred from the private sector during the same period were amenities such as gas, electricity, reservoirs and public transport.¹⁰⁹ This *municipalisation* did little to diminish the middle-class domination, expanding as it did their political power in the wake of the reorganisations of local government.¹¹⁰ Hill has studied the role of museums in this shift, and likewise I examine its impact upon other civic institutions.¹¹¹

1.3.3 Leisure and the Voluntary Association

Closely (although not exclusively) associated with the emergence of a distinct urban middle-class culture, was a marked transformation in recreational activities, which historians have dubbed the 'rise of leisure'. I situate natural history firmly within this development. Life science is most often studied as an academic discipline, a full-time

¹⁰⁵ Waller, *Town, City and Nation*, 78.

¹⁰⁶ Hill, 'Thoroughly Embued with the Spirit of Ancient Greece'.

¹⁰⁷ Both Briggs and Heaton, commentator and contemporary respectively, commented on these institutions as manifestations of city pride. (Briggs, *Victorian Cities*, 139–183; Reid, *A Memoir of John Deakin Heaton*, 203–244.)

¹⁰⁸ Taylor, 'Victorian Leeds'.

¹⁰⁹ Markham, *The Book of Hull*, 75–92; Moriarty, 'Politics and Education in Huddersfield'; Sigsworth, 'Modern York'.

¹¹⁰ Meller, *Leisure and the Changing City*, 65–71.

vocation; and yet for many practitioners – probably the majority – it was a hobby, a recreational pastime. Science lectures, museum visiting and natural history excursions were all leisure activities, and were integral facets of the middle-class project of ‘rational recreation’. It will pay, therefore, to outline briefly Victorian leisure, and the species of institution most responsible for structuring leisure activities in the provincial town: the voluntary association.

As real wages rose and working hours were formalised over the course of the nineteenth century, greater swathes of society could afford to indulge in a wider variety of leisure activities.¹¹² This did not, however, arrest the compartmentalisation of leisure along what might be deemed class lines. The morally rewarding pursuits of the *bourgeoisie* – many of which centred on church or chapel – set them apart from the rowdy workers and the frivolous aristocracy. Like urbanisation, leisure was part and parcel of the formation of class identity. And as in other arenas, the *bourgeoisie* sought to effect their imprint on the lower orders. Social reformers became increasingly concerned with the ‘problem of leisure’, for vice and recreation were never far apart. Informal domestic leisure activities were supplemented with more regimented activities in the public eye. Ideally, these activities were to be morally, mentally and physically healthy. Gambling and drinking were frowned upon; reading and seaside holidays were encouraged. Bourgeois programmes of ‘rational recreation’, however, were never entirely successful, given the discrepancy between middle-class perceptions and working-class wishes. This is illustrated here by the failure of mechanics’ institutes to attract working-class audiences.

Besides the seaside holiday, reading, performing and visual arts, gardening, travel and organised sport, with which the Victorian middle classes filled their time, there was that most characteristic of urban middle-class entities, the voluntary association.¹¹³ The literary and philosophical society was but one variety of this cultural form, and many of the other groups discussed below bore the impress of the voluntary association. Although they were not novel to the Victorian age, during the first half of the nineteenth century voluntary associations underwent a considerable growth, and took the forms that would survive into the next century. Replacing the pub and gentleman’s club of earlier eras, these

¹¹¹ Hill, ‘Municipal Museums in the North-West’.

¹¹² Bailey, *Leisure and Class in Victorian England*; Cunningham, *Leisure and the Industrial Revolution*, 9–14; Golby and Purdue, *The Civilisation of the Crowd*; Harris, *Private Lives, Public Spirit*, 134–139; Meller, *Leisure and the Changing City*; Price, *British Society*, 192–233; Thompson, *The Rise of Respectable Society*, 246–306; Walvin, *Leisure and Society*, 2–125.

¹¹³ Crossick, ‘The Emergence of the Lower Middle Classes’; Davidoff and Hall, *Family Fortunes*, 416–449; Green, ‘In Search of Bourgeois Civilisation’; Morris, *Class, Sect and Party*, 161–203; Price, *British Society*, 192–233.

more formal coalitions were instrumental in forming a middle-class identity. As Davidoff and Hall articulate:

This network of associations redefined civil society, creating new arenas of social power and constructing a formidable base for middle-class men. Their societies provided opportunities for the public demonstrations of middle-class weight and responsibility; the newspaper reports of their events, the public rituals and ceremonials designed for their occasions, the new forms of public architecture linked to their causes.¹¹⁴

Edward Baines listed a sample in 1843: “mechanics’ institutes, literary societies, circulating libraries, youth’s guardian societies, friendly societies, temperance societies, medical charities, clothing societies”, and so on.¹¹⁵ The activities of the voluntary associations thus spanned many aspects of society: philanthropy, business and – of concern here – culture, education and science. The middle-class élite – such as the Baines family – governed them, and the *petite bourgeoisie* populated them. They generally shared a common format: limited formal rules, public meetings, published accounts, branch structures, and what Morris has termed a ‘subscriber democracy’ – within their ranks they were ostensibly democratic, but entry was policed by hefty subscriptions, and sometimes by membership by election.¹¹⁶ By avoiding the volatile topics of religion and politics – as philosophical societies routinely did – voluntary associations brought together an otherwise divided section of society. The alliances and networks formed therein were more extensive than any that family, party or denomination could provide; stretching to other provincial regions, and to the metropolis (many were branches of national-scale organisations).

Even in such a brief review of the history of nineteenth-century leisure and associations, two apposite issues become apparent. Firstly, that many cultural practices were carried out under the civic gaze, in the public sphere, which I address in the following section. And secondly, that natural history has been all but ignored in this context, which lacuna I redress in the following chapters. Science was an integral part of this network of voluntary associations, and any regional history must present it as such.

¹¹⁴ Davidoff and Hall, *Family Fortunes*, 416.

¹¹⁵ Cited in Morris, *Class, Sect and Party*, 168.

¹¹⁶ Morris, *Class, Sect and Party*, 161–203.

1.4 Victorian Yorkshire

In recent decades, a new wave of local scholarship has re-assessed the history of nineteenth-century Yorkshire. Collections and monographs such as Fraser's *History of Modern Leeds* (1980); Wright and Jowitts' *Victorian Bradford* (1981); Koditschek's *Class Formation and Urban-Industrial Society* (1990); Haigh's *Huddersfield* (1992); and *The History of the City of Sheffield* (1993) edited by Binfield and others, have added the historiographical tools of social, religious, cultural, economic and political history to the solid surveys of the *Victoria County Histories*. One regional historian noted the "interest which academic historians began to take in local history, as they came to see it as capable of contributing more to national, and international, history than the mere creakings of the parish pump".¹¹⁷ My thesis draws upon this formidable body of scholarship, and in this section I pick out the apposite elements from the history of the county.

1.4.1 Population and Industry

Yorkshire experienced an unprecedented demographic explosion in the nineteenth century.¹¹⁸ The county's population increased by a factor of four (to over three million); and in the larger towns, fuelled by mass immigration from the countryside and from overseas, the increase was much greater. The greatest expansion, however, was in the West Riding, where the textile districts housed one of the greatest population concentrations in England, outside London.¹¹⁹ By 1870, Leeds was the fifth largest town in England, after London, Liverpool, Manchester and Birmingham. But it sat amidst a sprawling conurbation that incorporated Bradford, Huddersfield, Halifax and dozens of smaller industrial settlements. By the century's end, the West Riding's population was more than three times greater than the total of the North and East Ridings.

This thesis, accordingly, like many histories of 'Yorkshire', exhibits a bias towards the West Riding. Besides the population density, the south-western part of the county exhibited a greater topographical, floral and faunal diversity than the coastal plains of the East or the moors of the North. This great variety attracted swarms of natural history practitioners from the dense centres of population. Accordingly, the West Riding had the greatest concentration of mechanics' institutes, colleges and field clubs. Although comparisons between towns are difficult to make because of shifting boundaries and definitions, four of the six largest towns in the county – Leeds, Sheffield, Bradford, and

¹¹⁷ Wright, 'Introduction [to *Victorian Bradford*]', 1; Pythian-Adams, *Re-Thinking English Local History*.

¹¹⁸ Hey, *Yorkshire From AD 1000*, 245–250.

¹¹⁹ Counce, 'Urban Systems, Identity and Development'.

Huddersfield – were in the West Riding. In the present work I concentrate on these towns, and on Hull and York (ranking as fourth and fifth largest, respectively). And so although I do not ignore them, further intensive research into the East and North Ridings is a task for another day.

The dominant factor in Yorkshire's population growth was the industrial activity in the West Riding: the textile trades that lured workers from around the country. It was to these quarters that biologists appealed for potential patrons of their departments. By mid-century, Bradford was producing nine-tenths of the nation's worsted goods; Leeds was a centre for the production and trade of flax, cotton and yarn; and Huddersfield's manufacturers enjoyed worldwide fame for their fancy goods.¹²⁰ Modern Yorkshire was shaped by the industrial revolution; a visitor to Leeds in 1866 observed "a forest of tall chimneys lifting their heads above a canopy of black smoke [and] gaunt red-brick woollen warehouses [...]. It is a dingy sombre town, marred by the workhouse order of architecture and ugly-coloured bricks".¹²¹ Despite large-scale mechanisation, however, workshop-style weaving economies survived alongside the new factories.

To stamp 'textile district' onto the whole of the West riding, however, is to ignore the majority of the middle classes who were *not* directly involved in textiles.¹²² Labelling a town with a single industrial characteristic belies economic, industrial and social versatility, which was reflected in the occupations of life science practitioners. Even in the heart of these textile districts other industries became more significant later in the century, as international competition and international tariffs damaged the woollen and worsted trades. Iron-mouldering, coal-mining and engineering had always been part of the West Riding's versatile economy, and they expanded in the late century, as did the leather and chemical industries. Leeds in particular was an important commercial centre.

Outside the textile districts, of course, non-textile industries had always been significant. Sheffield exhibited perhaps the most homogeneous industrial profile, dominated by steel.¹²³ It was steel money that provided the wealth of Henry Clifton Sorby, a major character in my story. Over the course of the century, small cutlery workshops had gradually been overshadowed by vast steel and engineering works – such as those of the Firth family, whose fortune paid for Firth College – which supplied the national rail,

¹²⁰ Crump, *History of the Huddersfield Woollen Industry*; Honeyman, *Well Suited*, 20–52; Jenkins, 'Textiles and Other Industries'; Wright, 'Introduction [to *Victorian Bradford*]'; Taylor, 'Victorian Leeds'; Jowitt, 'Review of Recent Writing'.

¹²¹ Anon., 'A Dash into Yorkshire', 419.

¹²² Briggs, *Victorian Cities*, 139–183; Connell and Ward, 'Industrial Development'; Morris, *Class, Sect and Party*.

¹²³ Smith, *Conflict and Compromise*, 225–247; Pollard, 'Labour'.

shipping and armament industries. Nevertheless, the 'little mesters' continued to thrive, so that the town exhibited more of a village-type social, economic and industrial environment. A regional capital with no region, surrounded by hills, the railway only reached Sheffield in 1870. York, with little industry, actually declined in population over the early century (as it was declining in significance), while Bradford doubled every ten years. Only with the coming of the railways and the consequent growth in manufacturing did the old county capital recapture some of its vigour.¹²⁴ Hull, by 1870 the third largest port in Britain, was characterised by sea trade (which brought with it many exotic donations for the city's museum); gargantuan docks dominated its waterfront, and it too benefited from increasingly efficient rail connections.¹²⁵ Much of the rest of the East Riding was characterised by vast swathes of agricultural land.

Yorkshire's industry, however, was but one of a range of factors that affected the practice of life science in the county. I want to broaden our historical gaze from the science-industry nexus to other facets of Yorkshire life.

1.4.2 Nonconformity and Liberalism

Late Victorian Yorkshire exhibited a heterogeneous industrial makeup; its religious and political characteristics, however, appear to have been less variegated. Urban Yorkshire was a hotbed of dissent, and this denominational environment plays an important part in this thesis.¹²⁶ Miall's Congregationalist background, I will argue, was particularly significant; and the support of the dissenting plutocracy was essential to science, as it was to any civic activity.

Although the expansion of 'new dissent', particularly Methodism, was the most marked, old dissenters (Quakers, Unitarians, Baptists and Congregationalists) also gained in prominence. Over the course of the nineteenth century, northern nonconformists wrenched control over much of civic life and education from the Church of England, especially after the mid-century reform of municipal government allowed dissenters greater participation in local politics. Their nonconformity set them apart from the predominantly Anglican gentry. Denominational partitions, ostensibly based on doctrinal issues, mapped onto social divisions: Independent, Quaker and Unitarian congregations included many of the middle-class élite, whereas Methodists and Baptists tended to be more petty bourgeois.

¹²⁴ Feinstein, 'Population, Occupation and Economic Development'; Sigsworth, 'Modern York'.

¹²⁵ Brown, 'Modern Hull'; Markham, *The Book of Hull*, 75–92.

¹²⁶ Binfield, *So Down to Prayers*, 54–100, 'Religion in Sheffield'; Brown, 'Modern Hull'; Koditschek, *Class Formation and Urban-Industrial Society*, 165–347; Munson, *The Nonconformists*; Royle, 'Religion in Huddersfield', 'Religion in York'; Stubbley, *A House Divided*; Tillott, 'Religious Life'; Yates, 'The Religious Life of Victorian Leeds'.

Once again the West Riding stands out. The *de facto* established religion in Leeds, as one vicar commented in 1837, was Methodism.¹²⁷ On census Sunday, Bradford and Leeds were among the most dissenting towns in the country. After the numerous (but schism-plagued) Methodists, Congregationalists (or Independent Chapels) formed the second largest dissenting group: it is this sect that had the largest sway on professional biology in Yorkshire. Independents tended to operate with small but powerful town-centre chapels. They founded 18 new chapels in Leeds over the course of the Victorian era, of which the congregation at East Parade played the most prominent role in civic life. In Bradford, focal points of Congregational life were the chapel at Horton Lane (the ‘Cathedral of Nonconformity’) and its sister congregation at Salem. The former acted as a training ground for Bradford’s civic elite, producing four of Bradford’s first five mayors, including Titus Salt. Congregationalism also enjoyed a particularly prominent place in Huddersfield, thanks to the efforts of Robert Bruce and his congregation of political heavyweights at Highfield Chapel. The other major chapel, Milton, was the place of worship of Thomas Woodhead, professor of biology at the Huddersfield Technical College. Quakers and Unitarians suffered a gradual decline in numbers over the course of the century, although the Mill Hill Chapel in Leeds retained its influential status. The established church, meanwhile, continued to grow throughout the century (particularly under the High Church W.F. Hook in Leeds), but was hindered by the lack of churches in many towns: only in Sheffield did Anglicanism represent a serious threat to nonconformist hegemony.

Politics and religion went hand in hand in provincial Britain, and although it was not the case that all dissenters had Whig sympathies, such a generalisation is meaningful.¹²⁸ Victorian civic politics in the North can be characterised by the power struggle between this Liberal dissenting manufacturing élite and the Tory Anglican landed gentry, a struggle in which the former group was almost always dominant. Nonconformists participated to a considerable extent in the Liberal dominance of Leeds politics from 1832 to 1880, a development mirrored almost everywhere else in the county. Gradually, dissenting Liberalism spread from the local to the national stage. By mid century, MPs rubbed shoulders with industrialists and editors in chapel. This dominance eventually crumbled in the late-century fragmentation brought about by bitter divides over Home Rule; by the Boer conflicts; by an increasing distance between the middle and working classes; and by the emergence of Trade Unionism. Huddersfield, for example, returned its first

¹²⁷ Cited in Hey, *Yorkshire From AD 1000*, 295.

Conservative MP in 1893. Nevertheless, like many other Yorkshire towns, it was a Liberal stronghold in an almost unbroken succession from the 1830s to the Great War. Only then did a new threat, in the form of Labour, emerge.

The strength of Yorkshire Liberalism was sustained by a network of powerful nonconformist dynasties, with interests in almost every aspect of civic life, including natural history. Prominent dissenting families are evident in every town: the Huddersfield Hirsts and Crowthers; in Bradford, the Byleses; the Crossleys in Halifax; and the Birkses and the Leaders in Sheffield.¹²⁹ All had interests in local politics and culture, and most had a controlling interest in a local newspaper.¹³⁰ Perhaps most famous were the Salts of Bradford. Titus Salt Senior, founder of the ideal township of Saltaire, towers over the history of the town.¹³¹ In Leeds, their equivalent was the Baines family.¹³² From 1801, when their patriarch Edward Baines bought the *Leeds Mercury*, until the 1870s, when his son lost his Leeds parliamentary seat, the Congregationalist Baineses were central to Leeds civic life. Baines the elder masterminded the Liberal take-over of the city in the early century, which gave rise to the 'Bainesocracy' in Leeds; a nonconformist monopoly of local politics and media with emphases on thrift, self-help and non-intervention. His eldest son, Matthew Talbot (actually an Anglican), sat for both Leeds and Hull; and another son, also Edward (1800–1890), took over the *Mercury*, and also represented Leeds in Parliament until 1874, sharing the same Liberal backbenches as Edward Miall. The Baineses' uncompromising voluntarism suffered fierce criticism over the years, but it had an undeniable role in orchestrating civic policy.

The shape of educational establishments in the county was, to a great extent, determined by these policies. The Byleses and the Crossleys are to be found on the donor lists of the Yorkshire College, which establishment bore the characteristic imprint of Edward Baines Junior.¹³³ He spent seven years on the college council, pushing for the same brand of liberal education he had advocated in Parliament; and he provided the bulk of the funding for the Baines Wing of the college. The nonconformist network, of which

¹²⁸ Brown, 'Modern Hull'; Fraser, 'Politics and Society in the Nineteenth Century'; Moriarty, 'Politics and Education in Huddersfield'; Perks, 'Late Victorian and Edwardian Politics'; Sigsworth, 'Modern York'; Taylor, 'Victorian Leeds'.

¹²⁹ This is not to ignore the presence of powerful Tory Anglican landowners such as the Ramsdens of Huddersfield. I am grateful to Professor Clyde Binfield for sharing with me his encyclopaedic knowledge of dissenting dynasties.

¹³⁰ The Leaders steered the *Sheffield Independent*; the Byleses the *Bradford Observer*, and the Woodheads the *Huddersfield Daily*.

¹³¹ Jowitt, 'Review of Recent Writing'; Munson, *The Nonconformists*, 6–34; Reynolds, *The Great Paternalist*.

¹³² Fraser, 'Politics and Society', 'The Baines Family'; Lowerson, 'The Political Career of Sir Edward Baines'; Markham, *The Book of Hull*, 70.

¹³³ Brown, *The Private Donor*.

the Baineses were such an integral part, also infiltrated many voluntary associations. Dissenters were prominent in literary and philosophical societies, and were amongst the most vocal supporters of mechanics' institutes. (Robert Leader, for example, was closely involved in the Sheffield Naturalists.) The links between these dynasties and Yorkshire biologists, a recurring theme throughout this work, illuminate precisely how important the dissenting quasi-nobility were in every aspect of urban life.

1.4.3 Education, Culture and the Public Sphere

From the late eighteenth century, the self-appointed *cognoscenti* of urban Yorkshire formed improvement groups, church institutes, Athenaeums, YMCAs and numerous other organisations devoted to adult education.¹³⁴ These endeavours – including those aimed at other sectors of society – were almost entirely populated by the rising urban *bourgeoisie*. As the nineteenth century wore on, control over education, like many other civic amenities, shifted from the voluntary sector to local government; and the towns began to replace this irregular array with a more co-ordinated stable of educational institutions. The higher educational establishments discussed in chapter 4 comprise part of these developments, especially as civic colleges, technical schools and medical schools were formed and amalgamated.

These explicitly educational establishments were only one part of the complex web of civic cultural institutions.¹³⁵ Private subscription libraries of varying quality emerged in the late eighteenth century, to be supplemented by public libraries a century later; galleries and museums demonstrated the cultural maturity of the civic élite to the visitors' eye, as theatres and music festivals did to their ear. The same industrial and commercial wealth that funded these spilled over into parks, gardens and zoos. Also extant were a myriad of statistical societies, debating clubs, friendly societies; and archaeological, historical and architectural clubs. It was in these 'cultural' environs that many of the urban Victorian middle classes passed their leisure hours.¹³⁶ Dickens' Mr Gradgrind was thus an unjust caricature of the 'philistine' northern urban *bourgeoisie*.¹³⁷

The middle classes asserted themselves in the social realm in which these educational and cultural activities were carried out, where formalised leisure was practised;

¹³⁴ Brown, 'Modern Hull'; Mercer, 'Education in Sheffield'; Moriarty, 'Politics and Education in Huddersfield'; Smith, *Conflict and Compromise*, 104–159; Taylor, 'Victorian Leeds'.

¹³⁵ Allison, 'Learned Societies and Museums'; Briggs, *Victorian Cities*, 59–87; Hey, *Yorkshire From AD 1000*, 294–301; Markham, *The Book of Hull*, 75–92; Morris, 'Middle-Class Culture'; Sigsworth, 'Modern York'.

¹³⁶ Following Williams, I take as my primary definition of culture, "the works and practices of intellectual and especially artistic activity". (Williams, *Keywords*, 90.)

¹³⁷ Dickens, *Hard Times*. This stereotype has been perpetuated by Anderson and Wiener. (Seed and Wolff, 'Introduction [to *The Culture of Capital*].')

an arena that Habermas characterised as the *public sphere*.¹³⁸ His notion, although flawed, will be useful in this context. He provides insights into the character of bourgeois culture, and useful hints as to the motivations behind cultural practices. Habermas' public sphere is that social domain in which collective activities may be enacted, and where public opinion can be formed; that which is bounded by, and mediates between, the private and the political. Within this realm, voluntary associations, clubs and educational establishments bound the middle classes together and helped shape their identity. These institutions, and the public sphere's relationships with the individuals and the state, changed over time and place. And although Habermas' liberal public sphere had dissolved by mid century, late-Victorian towns still exhibited a public sphere, albeit one inhabited by different types of institutions, and with its perimeters altered. I want to situate life science within this realm, in the dense network of institutions, and in doing so I am extending the work of scholars such as Stewart, Golinski and Cannon, who have examined the uses of science in public culture in earlier periods.¹³⁹

I am conscious, however, that Habermas conspicuously ignored most of society, especially the working classes, and women. The 'public' was an expanding group, but it was by no means all-inclusive. The bourgeois public sphere was defined in contrast to the private or domestic sphere: it was constructed – often unsuccessfully – in order to deny women voices in the civic domain. Habermas neglects to consider how fundamental the exclusion of women was to the construction of a public sphere. 'Public' and 'private' were unstable and elastic categories, but they were always defined in contrast to each other. As Davidoff and Hall argue, men and women were not necessarily confined by these separate spheres, but they did have to reckon with them.¹⁴⁰ I examine the ways in which male bourgeois naturalists sought either to exclude others from their institutions, or to include them on their terms, in their spaces. The working classes were constantly in the minds of the civic reformers, and many educational and cultural schemes were purportedly for their benefit. That artisans and mechanics largely eschewed such activities is testament to the presence of a distinct working-class culture, carried on outside the rubric of middle-class organised rational recreations. These artisanal natural history practices (such as those recovered by Secord) are not studied in detail here, given the scarcity of apposite records in

¹³⁸ Habermas, *The Structural Transformation of the Public Sphere*. Habermas' ideas are discussed in Gunn, 'The Public Sphere, Modernity and Consumption'; Price, *British Society*, 192–233.

¹³⁹ Cannon, *Science in Culture*; Golinski, *Science as Public Culture*; Stewart, *The Rise of Public Science*. Turner sketches a version of 'public science' in my era, but does so on a national political stage, rather than in the civic realm. (Turner, 'Public Science in Britain'.)

¹⁴⁰ Davidoff and Hall, *Family Fortunes*, 416–449.

Yorkshire.¹⁴¹ Rather, this thesis concerns middle-class life science in practice, as carried out in institutions that constituted the public sphere, which carefully constructed by middle-class *men*, in contrast to the private sphere and to working-class culture.

1.5 Overview

Although each of the historical traditions outlined above include many excellent studies, to my knowledge none of them deal in this level of detail with this area, in this era. Even so, by necessity many sites and practices are excluded from the present work: zoological and botanic gardens; microscopical societies; those practices carried on outside the auspices of natural history institutions, especially those of female naturalists; and the activities of working-class natural history groups. Before embarking, it will pay to take stock of the parameters of my study, to lay out explicitly the questions that I will be addressing throughout, and to outline the structure of the thesis as a whole.

1.5.1 Parameters

I have arranged the material below according to institution, rather than biographically, chronologically, or geographically. It is in institutions that disciplines are formed; and their fortunes and fates, their factions and finances, shape the path of science as much as theory change and intellectual debate. From the pages of institutional records and publications the historian can glean a great deal about social relations, status, authority, credibility, consensus and marginalisation. ‘Institution’ is, of course, a broad term, encompassing both an informal group and a massive organisation; or it may simply refer to a building. From the late nineteenth century, it was largely through institutions that professions were formed; practices formalised; and the boundaries between science and pseudo-science erected. The history of the organisation of science, a project followed by Morrell for more than 30 years, has proved to be rich ground for close study.¹⁴² (Like him, I strike a balance between awarding the institution a life of its own – ‘institutional animism’ – and writing only a biography of one or more members.)

Taking the institution as my unit for historical analysis reveals a factor that many students of the spaces of science have ignored: namely, the extent to which institutions encompass a range of sites. New spaces for science hosted a variety of practices; some novel, others not, and different scientific practices flowed between spaces. Ascribing a

¹⁴¹ Secord, ‘Science in the Pub’, ‘Corresponding Artisans’.

¹⁴² Morrell, *Science, Culture and Politics*; Morrell and Thackray, *Gentlemen of Science*. See also for example Geison, *Michael Foster*; MacLeod and Collins, *The Parliament of Science*; James, *The Development of the Laboratory*.

single, distinct set of practices to a specific space is a mistake. And although each chapter corresponds to a site for life science – lecture hall, museum space, laboratory and field respectively – I emphasise throughout the multiplicity of practices carried out under the auspices of each institution. Natural history was not confined to the lecture hall in philosophical societies; museums housed lectures and laboratories; college biology involved field study; and ‘field’ clubs relied heavily on their meetings and classes. Other important spaces for the dissemination, consumption and display of science are included along the way, such as the library, the civic exhibition and the institutions’ publications. Although this thesis is ostensibly about field, lab and museum spaces, in chapter 2 I examine the cultures of life science in yet another site: the lecture hall. The decline in popularity of the scientific lecture, a major point of discussion in that chapter, is the context in which practitioners of laboratory, museum and field made their cases.

I begin in the early 1870s, shortly after Miall began his career. This was the decade in which many of the institutions discussed herein were founded: the Yorkshire College, Weston Park Museum, and many field clubs. I conclude in 1904, as many civic colleges finally gained independent university status, and shortly before Miall retired. The intervening decades were those in which the biological laboratory rose to prominence. It was also, however, a period of massive museum and field club growth, and of the municipalisation of civic amenities. And so, although it is banal to claim one’s period of study as being one of unprecedented change, for my purpose, the three decades I detail are of particular interest. (Nevertheless, historic boundaries such as mine “cut a slice across a wider continuum”;¹⁴³ and further studies of this kind are sorely needed in other eras.) The macro-structure of this thesis is arranged synchronically: each of the chapters cover the entire period. Attention to chronology has not been neglected, however, and throughout I pay close attention to changes and developments over the course of this era.

1.5.2 Themes

Running throughout the chapters that follow are three core arguments, concerning professional and amateur; science and society; field, lab and museum.

Much history of science is concerned with professional men of science; some historians have concentrated on amateurs; a handful have analysed the relationship between these groups. Mine is one of the few accounts to juxtapose the development of both of these communities, and the interactions between them. Although I will be borrowing such historiographical devices as boundary construction and standardisation of

methods, the central historiographic concept that I marshal in this context is novel: an endeavour I term *amateurisation*. I discuss this idea, expanded from Lowe's work, in chapter 5. Coincident with the demarcation of the laboratory as an exclusive space for a professional 'new' biology and with the emergence of a professional, expert body of curators, a number of amateurs sought to re-assert their authority over the field through a rigorous re-organisation of amateur groups and practices. Amateurs were not a passive audience for the laboratory professionals, nor were they a dying breed. I am careful to attribute agency to amateur practitioners and new professionals alike, which approach is especially important when studying science in the provinces, where professional men of science were few and far between. I will explore the construction of identities, of authority, and of boundaries between science and non-science, both between amateur and professional, and between different sites.

In order to pursue these ends, I will begin to untangle the complex net of cultural and educational institutions in which the sites for the practice of life science emerged and existed. Few historians have engaged with all of the institutions at play in the provincial city, and although my study is not comprehensive, it is among the most broad-ranging assessments to date. The extent to which life science overlapped and interacted with other facets of civic culture has not, to my knowledge, been fully explored by historians of life science. I investigate the impact of the maturing provincial middle classes upon science, and a different picture of natural history emerges when it is approached as one of a range of cultural activities within the network of voluntary associations. By studying the history of natural history as a scientific discipline, we are making tacit assumptions that naturalists were driven by the desire to advance or diffuse scientific knowledge. Rather, I approach natural history as a set of cultural practices, some empirical, some leisurely, some entertaining, some sporting. As Jankovic writes of eighteenth-century chorographers, "they were region-centred rather than discipline-bound".¹⁴⁴

Exploring this civic network will lead us through the spaces for the practice of life science. At each institution, I stop to assess the practice, or range of practices, carried out within its walls (or hedges, as the case may be), in order to compare and contrast them. To what extent did new places for science bring with them novel practices, and how far was each site for science associated with distinct practices? Related to these issues is my investigation of the purported 'decline of natural history' in the late nineteenth century. Recently lambasted by historians of life science, the traditional story of fieldwork becoming

¹⁴³ Wahrman, *Imagining the Middle Class*, 14.

subordinate to laboratory biology is in need of further reassessment. I want to chart the shifts in authority, if any, between field, laboratory and museum space. To what extent, I ask, did the rise of laboratory biology affect the status of field and museum research, and the popularity and prevalence of the teaching and display offered therein?

1.5.3 Outline

I begin with those institutions whose activities centred on the lecture hall – literary and philosophical societies and mechanics’ institutes. Although historians have largely studied these groups in the first half of the nineteenth century, I argue that they were still important and active after 1870, although their goals and membership had changed considerably. Both were playgrounds for the civic élite: philosophical societies as the epitome of the cultural voluntary association, and mechanics’ institutes as important sites for the attempted imposition of middle-class education on Yorkshire’s working men. Their grand halls provided the forum for a host of Yorkshire life science lecturers, among the most prolific of whom were the micro-biologist William Dallinger, the ornithologist Henry Seebohm, the metallographer and marine biologist Henry Sorby, and Louis Miall (all of whom appear often throughout this thesis). Their performances, well-rehearsed and lantern-illustrated, were a popular manifestation of life science on display. The approval and respect of civic audiences were important to those lecturers seeking to construct professional identities, just as the society members desired to be seen to be participating in a worthwhile activity. As with all the groups I examine, however, the activities of philosophical societies and mechanics’ institutes were in no way restricted to the lecture hall. Non-lecture activities such as classes became increasingly important to the philosophical societies, as audiences began to dwindle in the late century. The other sites for life science are studied against the backdrop of this gradual decline.

Miall began his career at a philosophical society, and although he was responsible for organising the lecture scheme, his time was largely taken up with the society’s museum. For many philosophical societies, their collections were their *raison d’être*, and these and other civic museums are the subject of chapter 3. Lectures may have attracted audiences in their hundreds, but by the end of the century, hundreds of thousands were visiting Yorkshire’s museums. The exhibits they witnessed within, a considerable proportion of which were devoted to natural history, represented the front end of a bewildering variety of practices relating to cataloguing, labelling and display; and the specimens themselves were there as a result of a vast range of complex acquisition networks that stretched from local

¹⁴⁴ Jankovic, ‘The Place of Nature and the Nature of Place’, 90.

worthies to colonial collectors. Curators in a variety of museums – not only philosophical, but also private, commercial and public – set out these displays for a variety of reasons, although by the end of the century their outlook was predominantly educational. The role of the curators themselves was also changing, as they toiled to transform their position from that of either a janitor or a dabbling honorary post, to that of a civic professional. Their claim to this status rested largely on the centrality of the museum to urban cultural life, and the very buildings in which the collections were housed illustrated this clearly.

In the 1870s and 1880s, however, a new institution was emerging in some Yorkshire towns, the facades of which threatened to overshadow even the grandest of museums. Chapter 4 details the life science teaching and research within this, the civic college. It was in the Yorkshire College of Science that Miall sought to construct a new professional identity in contrast to that of the museum, based on the laboratory. Utilising Congregationalist networks, and appealing to a variety of constituencies including schoolteachers and medical educators, Miall and other Yorkshire biologists set up pedagogical schemes that were based not only in their teaching laboratories, but in college museums and in the field. In their museological teaching and research, the new colleges were home to new variations of established practices, just as in the lecture room Miall applied lantern technology in novel ways. Fieldwork was also crucial to a burgeoning research tradition within the colleges, namely, plant ecology. Biologists such as William Smith in Leeds and Thomas Woodhead in Huddersfield were pioneers in this novel mode of study, and they relied heavily on the continued interaction between college faculty and amateur field club.

These field clubs are the subject of chapter 5, in which I return to plant ecology, this time from the perspective of amateurs rather than academics. (Although we should remember that nearly all of the college biology faculty, including Miall, were active members of these groups.) The long-established tradition of floristic lists, and the more recent practice of biogeographical mapping provided solid bases for this new discipline to flourish. Participants in the detailed technical surveys required for such studies were in a minority in the naturalists' societies, however; the motivations for venturing into the field were various, and many participated in natural history simply as a leisure pursuit. Reacting against this 'picnicking' element of the clubs were those who sought to bring about the 'amateurisation' of natural history. Instead, naturalists such as William Roebuck and George Porritt presented field clubs – and especially the Yorkshire Naturalists' Union, a countywide federation of around 40 such groups – as an efficient, regimented, fact-

gathering force. Through specialisation and extensive collaboration and exchange networks, they reasserted their authority over the field as a site for the production of life science; despite the backbone of their activities lying in their system of meetings and lectures based in the built environment. Field clubs provide the most visible incidence of the middle-class dominance of natural history; the societies I discuss were part of a field club 'boom' that occurred in late-century Britain, as the *bourgeoisie* swarmed out of the cities and into the Dales.

Before drawing out my conclusions, I return to Miall's perplexing attitude towards non-laboratory practitioners in the first part of chapter 6. I argue that his condemnatory rhetoric was part of his project of boundary closure; a method of constructing a distinct professional identity. I also return to Henry Sorby, who in spite of his own amateur status, also contributed to the construction of professional identities in Yorkshire science. The sheer volume and variety of life science practices in Victorian Yorkshire is daunting, and many details and characters have been omitted for the sake of clarity and brevity. As I demonstrate in three survey appendices, Miall and Sorby, major characters in this thesis, were but two members of a vast and vibrant community.

Chapter 2: Natural History in the Lecture Hall

Louis Miall's career provides the narrative thread that runs through this thesis: he began it in Bradford in 1865 at that most venerable of provincial associations, a literary and philosophical society.¹ Although each society organised a range of activities in a number of spaces, as I argue throughout, in this chapter I will be looking closely at the core of their practices: the scientific lecture.

Some considerable historical attention has been paid to the culture of civic lecturing in the eighteenth and early nineteenth centuries: Thackray, Inkster and Hays have examined in detail the forms and functions of the scientific lecture.² I wish to build on this work – which expands the historical focus beyond the lecturers to the societies and their audiences – by extending it to the late century, which has been largely neglected by historians of the lecture hall. By ending their studies mid century, these scholars implicitly subscribe to J.W. Hudson's claim in 1851 that “the Provincial Philosophical Societies of England have completed their career, they are the debris of an age that has passed away”.³ I argue that although early-century bias is in part justified by a decrease in scientific lecturing in some quarters, there was still a strong tradition extant in late nineteenth-century Britain (especially in the industrial North). I focus on natural history lectures and lecturers: I will also be following Forgan's lead by looking at the civic association as a whole, including the spaces these institutions occupied.⁴ Like Inkster, I examine the sites for scientific lectures as an integral part of the institutional civic network.

The attempted communication of science to a wider audience is a theme that runs through all the chapters in this thesis: the current chapter, however, is the only one dedicated solely to the endeavours of dissemination and replication of knowledge. Heeding Cooter and Pumfrey, however, I avoid subscribing to a diffusionist model of the popularisation of science – by which account knowledge is imparted by learned savants to passive readers or listeners – and where possible I pay attention to the audience response to the lectures.⁵ In particular, I treat the relationship between lecturers and audiences as

¹ Referred to throughout as ‘lit and phil’, ‘LPS’ or ‘philosophical society’.

² Hays, ‘The London Lecturing Empire’; Inkster, ‘The Public Lecture’; Thackray, ‘Natural Knowledge in Cultural Context’. See also Johnston, ‘Scientific Improvement’; Kargon, *Science in Victorian Manchester*, 1–85; Lowe, ‘Locals and Cosmopolitans’.

³ Cited in Roderick and Stephens, ‘The Role of 19th-Century Provincial Literary and Philosophical Societies’, 28 (from Hudson's *History of Adult Education* (1851)).

⁴ Forgan, ‘Context, Image and Function’.

⁵ Cooter and Pumfrey, ‘Separate Spheres and Public Places’.

one of 'mutual enrolment': the societies wanted to include grand men of science on their programmes, and the lecturers were seeking legitimating audiences.

The audiences I study were to be found in two administrative settings: philosophical societies and mechanics' institutes. I focus more on the former, for two reasons: lit and phils were the earliest institutional sites for life science lectures, and many of the other groups in this thesis owe their genesis to them; and secondly, Yorkshire philosophical societies have not been studied in as much comparative detail as mechanics' institutes.⁶ Moreover, given the focus on middle-class practices and identities in this thesis, it is appropriate that I concentrate on lit and phils, given that they are often taken as the epitome of the bourgeois cultural association. Mechanics' institutes housed rather fewer life science practices, but they are nonetheless worthy of study in this context, given their enormous membership and the attention hitherto given them by historians of science.

I open this chapter by paying careful attention to the most prolific speakers on life science on the Yorkshire lecture circuit in this era: particularly Louis Compton Miall and Henry Clifton Sorby. The ensuing sections treat the philosophical societies and mechanics' institutes in turn, placing the life science lectures in context by examining the genesis and development of these organisations, and discussing other lecturers and the composition of the audiences. I engage with the physical environment of the lectures: the buildings of the societies, the architecture of their lecture halls and the technologies of display. Lectures were not the only activity at the philosophical societies and mechanics' institutes, and so I discuss the full range of related practices, including classes, libraries and soirées. Many contemporary commentators were concerned by the decline of the philosophical societies in the closing decades of the nineteenth century, and before concluding I discuss the supposed causes for this decay.

I present here lecturers, audiences and the spaces in which the lectures were delivered. Thus the following sections contribute to the core of this thesis, namely, the study of practice and place. I also demonstrate the variety of activities within the philosophical societies, a range that is equally demonstrated in other institutions. This chapter also serves to illustrate the middle-class stranglehold over civic science, and equally the role of science in middle-class urban culture.

⁶ Hemming, 'The Mechanics' Institute Movement'; Popple, 'The Origin and Development of the YUMI'. There are, however, a great many detailed and useful histories of individual societies, including Browne, *Chapters of Whitby History*; Johnston, 'Scientific Improvement'; Kitson Clark, *The Leeds Philosophical and Literary Society*; Porter, *Sheffield Literary and Philosophical Society*; Scruton, 'History of the Society'; YPS, *Annual Report* (1971).

2.1 Regular Lecturers

In ^{the} last decades of the nineteenth century, four names most regularly appear in connection with the life science lecture circuit: Miall, Dallinger, Seebohm and Sorby. Given the extent to which these men featured in Yorkshire science, brief biographical sketches are warranted before I move on to discuss other lecturers and their audiences (see appendix 1 for biographical details of other practitioners). The juxtaposition of their biographies demonstrates both the vitality and the variety of life science expertise in late Victorian Yorkshire.

2.1.1 Louis Compton Miall

In 1865 the newly-reformed Bradford Philosophical Society (BPS) hired Miall as secretary and keeper of their collections. His influential relatives, discussed in chapter 1, were already liberally distributed about the society. J.G. Miall (Louis' father) was one of the founder members; Louis' brother Philip, by now an MD, was a council member, and both of the brothers' wives were associates.⁷ The Salt family, friends of the elder Mialls and later crucial in Louis' career path, were also prominent among the membership. Titus Salt Senior was vice-president in the 1870s; Edward and Titus Junior were life members; and Titus' son George spoke to the society on a number of occasions. There can be little doubt that their presence eased Louis Miall's selection. Miall's family and their connections not only helped him to gain his appointment, but also served as a continued source of assistance throughout his career.

As well as his curatorial duties (which are discussed in the next chapter), Miall was also responsible for organising guest lectures, which allowed him to meet metropolitan grandees such as Richard Owen, George Rolleston and, notably, T.H. Huxley. They first met before Miall presented his first geological paper on a locally unearthed fossil amphibian *Labyrinthodont* (which they examined together), when Huxley responded to Miall's letters offering encouragement and advice.⁸ Huxley supported Miall's application to the post of curator at the Leeds Philosophical and Literary Society, which the young curator took upon leaving the floundering BPS in 1871. Miall wrote to Huxley in 1886 that he and his assistant Alfred Denny "feel as pupils to a master, for whatever we can do in Biology we have learnt from you".⁹ Miall described Huxley as one "who had the true gifts of the teacher", and Huxley in turn admired Miall's work.¹⁰

⁷ BPS, *Reports* (1865–1870).

⁸ Anon., Manuscript Biography of L.C. Miall; Miall, Manuscript Autobiography.

⁹ Miall, Letter to T.H. Huxley, 16th November 1886.

¹⁰ Miall, *Thirty Years of Teaching*, 3.

It may have been Huxley who advised Miall to attend the Leeds School of Medicine in 1867.¹¹ For two years at the medical school Miall learnt anatomy and physiology to supplement his already formidable grasp of geology, but it was for this latter skill that he was offered the chair of geology at the Yorkshire College in 1874, which he passed up in favour of his friend Alexander Green. (What is *not* mentioned in the hagiographic obituaries is that Miall was turned down for a position at Owen's College in Manchester.¹²) The following year, however, he accepted the new Yorkshire College lectureship in biology – and was made a professor in 1876 – a post that he held until his retirement in 1907.

Although he did not stay at the BPS for long, Miall soon began to make regular appearances on the lit and phil circuit in the early 1870s, and would continue to do so for 40 years. He also taught at mechanics' institutes, especially as part of the Gilchrist lecture scheme (detailed below). His subject matter ranged from Darwinism to 'Glaciers and Ice Fields at Home and Abroad', from children's lectures in Halifax to 'Science Lectures for the People' in Hull. In the 1870s he spoke mostly on geology, ornithology and botany: later he concentrated on entomology, reflecting the shift in his research interests (see chapter 4). Thus, during the early 1890s he toured the county delivering a group of lectures on 'Contrivance in Nature', which consisted of four sessions:

- i. Aquatic Insects
- ii. Floating Leaves
- iii. Problems in Animal Mechanics
- iv. Adaptation of Parts to New Functions.

The series was an evolutionist declamation, an apologia for detailed morphological study in which he introduced the themes of Darwinian adaptation. By delivering a series, rather than a single lecture, Miall was able to give his audience a taste of a structured pedagogical syllabus, similar to that at the Yorkshire College Biology Department. Nevertheless, it is important to note that Miall continued to lecture to other groups long after his appointment at the college. Civic audiences were of vital import in his efforts to construct a professional biology in Yorkshire, as I explore further in chapters 4 and 6.

2.1.2 William Henry Dallinger

Dallinger, a Plymouth-born Methodist minister and avid microscopist, became a mainstay on the Yorkshire lecture track after his appointment in 1880 as Principal of Wesley College,

¹¹ Although Wager argues that it was more likely to have been Philip Miall. (Wager, 'Louis Compton Miall'.)

¹² I am grateful to Dr Alison Kraft for this information.

an up-market boys' school in Sheffield.¹³ After eight years at the College, Dallinger was awarded the position of minister-without-charge by the Methodist Conference in order to continue his research. This was in recognition of his microbiological investigations, and most significantly his contribution to the spontaneous generation debate, based on microscopic work he had carried out in Liverpool from 1873 to 1875 with the physician John James Drysdale. By keeping unicellular monads (protozoa) under constant microscopic observation (taking shifts of up to nine hours each), Dallinger and Drysdale were able to record the first life history of a complex Protistan, and to demonstrate that the protozoa spores – only visible with the highest-powered microscopes available – were able to survive increasingly high temperatures. They were able to show, moreover, that the live spores they witnessed in sterilised water were not abiogenetic, but had survived boiling. Phenomena that might be taken to support the occurrence of spontaneous generation, Dallinger and Drysdale argued, were rather part of a series of changes in the life history of an organism. With their results they supported Huxley and John Tyndall against the pro-spontaneous generation camp headed by Henry C. Bastian.¹⁴ In return, these metropolitan grandees supported Dallinger's publishing ventures and his nomination for Fellowship of the Royal Society.

Dallinger delivered his first major public lecture at the London Royal Institution in 1877. From 1879 (the year before he arrived in Yorkshire), and for 30 years until his death, he delivered more than 450 lectures for the Gilchrist Educational Trust around the country. These lectures were mostly concerned with microscopic zoology, including 'The Lowest and Smallest Forms of Life', and 'The Infinitely Little'. His first appearance on the Yorkshire lecture circuit was probably in 1878 in Halifax, and he later lectured periodically in Hull and Bradford. He was of course a regular at the Sheffield Literary and Philosophical Society (SLPS) during the 1880s. By the middle of the decade, however, he was no longer involved in active research (he abandoned his monad studies after an accident terminated a six-year experiment), and his lectures became more pedagogical. By

¹³ 'A.E.S', 'William Henry Dallinger'; Anon., 'Dallinger'; *DNB*; Haas, 'The Reverend William Henry Dallinger'; Mackerness, 'Sheffield's Cultural Life'; Strick, *Sparks of Life*, 119–123. Dallinger's 'Notes on Current Science' were a regular feature of the *Wesleyan Methodist Magazine*, and he edited the 1891 and 1901 editions of William Carpenter's *The Microscope and Its Revelations*. Dallinger was a founder member of both the Christian Evidence Society and the Wesleyan Scientific Society, and was closely involved in the society's journal, the *Wesleyan Naturalist*. He was four times president of the Royal Microscopical Society, and three times president of the Quekett Microscopical Club. I am grateful to Dr Jack Haas for references and biographical information concerning Dallinger.

¹⁴ Rather than flying the agnostic flag, Dallinger used his evidence against abiogenesis to support his brand of theistic evolution. (Haas, 'Dallinger, Early Advocate of Theistic Evolution'.) After airing their arguments at the Liverpool Lit and Phil and Microscopical Societies, Dallinger and Drysdale published their results in the *Monthly Microscopical Journal*, 1873–1876.

the time he left Sheffield for Lewisham, he was concentrating on the technical aspects of microscopy. His obituarist commented,

As a lecturer Dallinger was very successful: he had a vivid and descriptive style and a remarkable ability in illustrating both verbally and by drawings his subject matter. He spared no pains to make his matter attractive and even painted his own slides: in this his remarkable artistic gifts were apparent.¹⁵

Similarly, one of his congregation noted of his preaching style, “in the pulpit he fixes the attention of all his observers more by his singularity than his charm [...]. His choice of words is large, his taste in figure and metaphor is well-formed and well-considered; nothing that he says is likely to offend the taste of the fastidious [...] there is little chance of his outwearing the patience of a congregation by the paucity of his ideas in comparison with the multiplicity of his words.”¹⁶ From these accounts and from the success of his lectures at Firth College (see chapter 4) we can infer that Dallinger was an engaging and popular lecturer.

2.1.3 Henry Seebohm

Another Sheffield resident on the Yorkshire lecture beat was the Quaker ornithologist Henry Seebohm.¹⁷ His father, Benjamin Seebohm, was a German émigré who settled in Bradford. A ministering member of the Society of Friends, Benjamin was a keen gardener and birdwatcher, and he encouraged his sons to keep records of the local avifauna.¹⁸ Henry continued to practice natural history at the Friends’ School in York, and in Sheffield where he later settled as a steel manufacturer.¹⁹ His considerable wealth allowed him to pursue ornithology, his growing passion, in a series of journeys through ever more remote parts of eastern Europe and Asia Minor. His researches on these travels formed the basis of the most famous of his many works, *The Birds of Siberia* (1901).²⁰ His main concern was with the geographical distribution of migrating birds, and with the classification of European avifauna.²¹ He donated large portions of the vast bird skin and oological collections he amassed to the British Museum and to the Weston Park Museum in Sheffield (see chapter 3). On the strength of his interests and publications, he was made a fellow of the

¹⁵ ‘A.E.S’, ‘William Henry Dallinger’, v.

¹⁶ From an article in the Liverpool satirical magazine the *Porcupine*, 12th March 1870, cited in Haas, ‘Dallinger, Early Advocate of Theistic Evolution’, unpag.

¹⁷ DNB; Hobson, Henry Seebohm’s Journal; Odom, *Hallamshire Worthies*, 198.

¹⁸ Seebohm, *Private Memoirs of B. and E. Seebohm*, 1–64.

¹⁹ Accounts of field trips Seebohm made while at school are included in Hobson, Henry Seebohm’s Journal.

²⁰ Published posthumously, *Birds of Siberia* was based on *Siberia in Europe* (1880) and *Siberia in Asia* (1882).

²¹ *The Classification of Birds* (1890); *The Geographical Distribution of British Birds* (1893).

Zoological, Royal Geographical and Linnean societies, and in 1893 he presided over the Yorkshire Naturalists' Union.

The lectures he delivered on the Yorkshire lit and phil circuit – at Hull, York, Halifax and especially Sheffield – were well received, combining as they did three of the most popular elements of Victorian lectures: the romance of natural history, the heroism of the travel narrative and the visual attraction of exotic eggs and skins. He regularly spoke on 'The Migration of Birds', and he mingled his knowledge of exotic birds with an equal level of expertise in local ornithology. This formula was evidently a popular one, and he was in demand as a lecturer to philosophical societies throughout this era.

2.1.4 Henry Clifton Sorby

Sorby, the Anglican philanthropist dubbed the "father of metallography", played a key role in the practice of life science in late Victorian Sheffield.²² Hailing from a dynasty of master cutlers, he inherited a sizeable fortune, and was able to equip a private laboratory for himself. In a prolific career spanning sixty years, he published over 240 papers covering a wide range of disciplines: chemistry, petrography, metallurgy, archaeology, and – of particular concern here – marine zoology and natural history.

Sorby's first line of biological research was on animal and vegetable chemistry, and he later spent several years performing colour analyses of various flora and fauna. The young Henry had learnt German and planned to study under Justus von Liebig, but suspended his plans after the death of his father.²³ He finally travelled to Germany in 1852, meeting amongst others the mineralogist Ferdinand Zirkel, and came home deeply impressed with German analytical approaches to the physical sciences. Accordingly, his later work demonstrated a blend of natural history and natural philosophy more commonly found on the Continent. In 1879 he purchased a 35-ton yacht, *The Glimpse*, equipped it as a floating laboratory, and spent the following 24 summers trawling the east coast, surveying marine biology, biogeography and water temperatures. Although he was a staunch advocate of science in Sheffield – he was instrumental in persuading the BAAS to come to the town in 1879, and resisted advice to move to London – he did not confine himself to Sheffield institutions. Sorby was extremely well-connected in London, utilising a considerable correspondence network.²⁴ (He was on close terms with Huxley, who

²² 'J.O.A.', 'Dr. H.C. Sorby, F.R.S.', 466; Higham, *A Very Scientific Gentleman*, Odom, *Hallamshire Worthies*, 198–203; Sorby, 'Fifty Years'.

²³ Bishop, 'New Biographical Data on Henry Clifton Sorby'.

²⁴ Sorby presided over the Mineralogical (1876), Geological (1878–80) and Royal Microscopical Societies (1877), and the geological section of the BAAS. Elected FRS in 1857 (aged 31), he was awarded the Wollaston, Boerhaave and Royal Society Medals, and an honorary LLD from Cambridge in 1879.

defended him during a well-publicised palaeontological debate in the *Athenaeum* with G.C. Wallich.)

Sorby was most renowned for his pioneering work in microscopy. He studied everything he came across at the microscopic level: blood, carbon, shells, rocks, crystals, sands, meteorites, iron and steel all found themselves under his lens, and his diaries show that while in his laboratory or on board *The Glimpse*, the bulk of his time was devoted to microscopy. Sorby was among the first to use the microscope as a research tool, rather than as display apparatus; and while his contemporaries were applying microscopy to the biomedical fields, Sorby forged into the virgin territory of the geophysical sciences.²⁵ For although Sorby prized discovery and original research as the aims of scientific endeavour, perhaps the bulk of his acknowledged achievements were developments of new techniques. He was most famous in his lifetime for developing a method of preparing highly shaved and polished microscopic sections of rocks, which allowed the identification of their constituent crystalline minerals and their structural relationships.²⁶ His work on colour was facilitated by his development of a spectrum microscope, and he was an early practitioner of micro-photography.

Sorby joined the Sheffield Literary and Philosophical Society in 1846, and was elected a proprietor after a month. Over the course of the next sixty years he was elected president seven times, and spent eighteen years in total as honorary secretary.²⁷ He was hailed as a local hero by the society, and from the brilliance of his early years, Sorby settled back as the grand SLPS patriarch. Along the way, he was active in all aspects of society business, especially at the monthly meetings. In the period 1870 to 1898 he delivered nearly a third of the total lectures on natural history. He was instrumental in introducing the annual conversazione and in the formation of the Natural Science Section in 1872, and donated scores of volumes to the library. He was also president of the Sheffield Mechanics' Institute for several years, and as such was one of the large group who were active in both institutions. Sorby benefited in return from his involvement: these groups provided a convenient sounding wall for his work before he took it south to be published or presented in the hallowed halls of the national societies. As Bishop argues, Sorby used the society to "create his own scientific milieu".²⁸ For although he was dedicated to his

²⁵ Edyvean, 'Henry Clifton Sorby's Role in Establishing a University at Sheffield'.

²⁶ In 1864, Walter White, secretary of the Royal Society, suggested a ballad to Sorby along the lines of "Hard crystals I atomize | And Iron and Steel too | And Stubborn Rocks I shave and grind | And look them through and through." (Cited in Smith, *A History of Metallography*, 174.)

²⁷ President in 1852, 1870 to 1872, 1879, 1897 to 1898. He was honorary secretary 1849 to 1852, 1859 to 1870, 1886 to 1889, 1899 to 1908.

²⁸ Bishop, 'New Biographical Data on Henry Clifton Sorby', 80.

home society, Sorby, like Miall, toured the county in the later century with lectures on archaeology, metallography, and most commonly, new techniques in studying marine mammals.

Local speakers like Miall, Dallinger, Seebohm and Sorby continued a tradition implemented earlier in the century by prominent local-boys-made-good such as the polar explorer William Scoresby. They were familiar, popular, and cheap (or even free). But as we shall see, this quartet did not dominate the lecture circuit entirely.

2.2 Lectures at the Philosophical Societies

The philosophical societies at which these four men lectured were already well-established by the late century. After outlining their genesis and development, I discuss the range of other lecturers and their motivations for lecturing. I go on to examine briefly the content of their lectures and what can be gleaned about the composition of their audiences.

2.2.1 Literary and Philosophical Societies in Yorkshire

Although the Manchester Literary and Philosophical Society had aroused envy across the Pennines from its establishment in 1781, and despite various late eighteenth-century attempts to emulate it, it was not until the 1820s that the 'philosophical movement' became established in Yorkshire. It then began in earnest: following Leeds' example in 1818, wealthy manufacturers, clergymen and physicians quickly formed societies in York, Sheffield, Hull, Whitby and Halifax.²⁹ They were advocated by the same self-appointed *cognoscenti* who had supported similar ventures throughout the century: Athenaeums; promotion societies; YMCAs; church educational institutes; and halls of science such as Isaac Ironside's in Sheffield (1839 to 1848). The organising committees utilised a fund-raising formula that had already proven successful for subscription libraries, cloth halls and assembly rooms. The establishment and growth of the lit and phils also owed a great deal to the tradition of itinerant lecturing in the provinces: in some cases the local philosophical society was basically an institutionalisation of this practice. As they had in the 1800s in a less formal capacity, so in the 1820s and 30s, men of science such as John Murray and Robert Goodacre toured the county lecturing to interested and informed civic audiences.³⁰

²⁹ The Leeds Phil and Lit, for example, counted among its founder members William Hey Senior and Junior, and the indefatigable Edward Baines. They chose to christen their society 'Philosophical and Literary' rather than the more common 'Literary and Philosophical' because of what they considered to be an unusually high level of interest in natural philosophy among the members. (Kitson Clark, *The Leeds Philosophical and Literary Society*.)

³⁰ Inkster, 'The Public Lecture'.

Tapping the rich vein of civic pride, philosophical societies advocated progress, utility and advancement of science, while banning the potentially volatile topics of politics and religion, thus uniting the otherwise divided urban middling ranks.³¹ Their purported objective was to instil an appreciation of all things scientific into the civic population. The Halifax Lit and Phil's manifesto was typically ambitious: the council expressed a desire "to diffuse among [the] members, and through them among the community at large [...] a taste for scientific and other liberal pursuits, which may serve to elevate the intellectual and moral character, and thus to promote [...] the best interests of mankind".³² The Hull Society echoed this aim, anticipating that their lectures "must eventually bear good fruit by infusing a love of knowledge, and a habit of scientific investigation and thought into the minds of many"; and the Bradford Philosophical Society was "established for the purpose of promoting the pursuit of Science, Literature and Art".³³ The societies sought to achieve these goals through lecture programmes (perhaps following Jeremy Bentham's argument that the lecture was the best mode of education), classes, exhibitions and, as discussed in the following chapter, museums.

The composition of these groups was almost exclusively middle class, and in this way the demographic make-up of the societies was similar to that which would later constitute colleges and field clubs. (After all, there was always a considerable overlap in membership between these groups.) Professionals dominated the philosophical societies, including prominent local medical men, lawyers, teachers, pressmen and clergy. The councils and committees tended to be governed for long periods by a select few from the upper and upper-middle echelons of society (sometimes to the chagrin of other members).³⁴

Although the philosophical societies exhibited a greater degree of denominational heterogeneity than other civic groups, chapel was more prevalent than church.³⁵ Indeed this was to be expected, given the prevalence of dissent in Victorian Yorkshire. The Congregationalist Crossleys (of carpet fame) dominated the Halifax Lit and Phil, and the Salts and Mialls likewise in Bradford. For although "a member should be moved by feelings of public spirit rather than by those of personal gain", it is clear that industrial

³¹ The Leeds Phil and Lit decreed, "subjects shall be discussed, that include all branches of Natural Knowledge and Literature [...] but excluding all topics of Religion, politics and ethics". (From a record of the first meeting, cited in Kitson Clark, *The Leeds Philosophical and Literary Society*, 11.)

³² Halifax LPS, *A Centenary Handbook*, 20.

³³ HRI, *Annual Report* (1865–6), 12; BPS, *Report* 19 (1893–4), 3.

³⁴ Smith, *Satires and Comments*.

³⁵ Binfield, 'In Search of Mrs. A.'

dynasties used these cultural institutions as power bases.³⁶ Throughout the century the strict regulation codes, high subscriptions and election by ballot that ensured exclusivity also contributed to the persistent atmosphere of a gentleman's club that permeated the societies. Although women were sometimes admitted as full members (as in Halifax) and more often as 'associates' (as in York and Bradford) or 'subscribers' (as in Sheffield after 1869) it is clear that the membership and the governing bodies were predominantly male. Furthermore those women involved were often daughters and wives of the male members.³⁷ The soirées and outings were family occasions, whereas the meetings tended to be serious, sombre and single-sex. The gender composition of the lecture audience, however, varied greatly between institutions and lecture topics.

These, then, were the institutional environments in which the lecturers plied their trade: cultural voluntary associations, dominated by the middle classes in general and by local dynasties in particular, with the ostensible aim of elevating the citizens of the town through scientific and liberal pursuits.

Table 2.1: Some of the Philosophical Societies in Yorkshire³⁸

| Society | Established | Accommodation | Museum | Library |
|--|---|---|-------------------|---------|
| Bradford Philosophical | [1808; 1826; 1839; 1843] 1865 | Unknown | Yes | Yes |
| Cleveland Literary & Philosophical | 1863 (as the Middlesbrough Athenaeum: changed name 1868) | A hall on Corporation Row, Middlesbrough | Unknown | Yes |
| Halifax Literary & Philosophical | 1830 | Assembly Rooms, then new premises 1837: Philosophical Hall, Harrison Road | Yes | Yes |
| Huddersfield Literary & Scientific ³⁹ | c. 1857. Merged into Huddersfield Technical College (HTC), 1886 | Rooms in Queen Street; 1883, Technical College | Yes; later at HTC | Yes |
| Hull Literary & Philosophical | 1822 | Hull Royal Institution from 1855 | Yes | Yes |
| Keighley Scientific & Literary | 1881 | Museum | Yes | Yes |

³⁶ YPS, *Annual Report* (1903), 6.

³⁷ A notable exception is the case of the BPS in the 1890s, when the (female) associates outnumbered the (male) members. (BPS, *Reports* (1893–1897).)

³⁸ Also extant were the Barnsley Philosophical (est. 1828; re-formed in 1837); Harrogate Literary (*fl.* 1870s); Hebden Bridge Literary & Scientific (*fl.* 1907); Pocklington Literary & Philosophical (*fl.* 1888); Rotherham Literary & Scientific (1862–1880); and a Spen Valley Literary & Scientific (*fl.* 1906).

³⁹ There had previously been a short-lived Huddersfield Philosophical Society in the 1830s.

| Society | Established | Accommodation | Museum | Library |
|--|---|----------------------|---------|---------|
| Leeds Philosophical & Literary | 1818 | Philosophical Hall | Yes | Yes |
| Scarborough Philosophical | 1827. From 1853, Scarborough Philosophical & Archaeological | Rotunda | Yes | Yes |
| Sheffield Literary & Philosophical | 1822 | Various | To town | Yes |
| Wakefield Naturalists' and Philosophical | 1852 | Met at the Town Hall | To town | Yes |
| Whitby Literary & Philosophical | 1823 | The Pier | Yes | Unknown |
| Yorkshire Philosophical, York | 1822 | Yorkshire Museum | Yes | Yes |

2.2.2 The Lecture Circuit

Sharing the podia with Miall, Seebohm, Dallinger and Sorby were a host of other lecturers from around Yorkshire and the rest of the country. The larger philosophical societies – at York, Leeds and Sheffield – successfully attracted some of the most famous (and infamous) scientific speakers of late Victorian Britain. The same names appear repeatedly across the county delivering life science lectures: Thomas Huxley; William Crawford Williamson and William Boyd Dawkins, professors of natural history and geology at Owen's College; E. Ray Lankester, professor of zoology at UCL; George Rolleston, Oxford University's Linacre Professor of anatomy and physiology; the Catholic St George Mivart, by this time a pro-evolutionist but anti-Darwinian; Alfred Russel Wallace, spiritualist zoogeographer; and Francis Darwin, then teaching botany at Cambridge University. Their addresses were a mixture of well-rehearsed popular commentaries – such as Huxley's 'Lump of Coal' – and the results of their recent researches, such as Wallace's biogeographical lectures. Many of these naturalists and biologists were academics in relatively new posts, and their prolific lecturing activities may have been fuelled as much by their efforts to assert the authority of academic biology as by a desire to educate the provincial public.

Some of the poorer societies had trouble securing the services of these high-status speakers: the Bradford society, only extant in its latest form since 1865, experienced this difficulty during the early 1870s, and for a spell in the early 1880s gave up their lecture series altogether. "There was none of the prestige which attributes to old and successful Institutions," their council explained, "to induce men of science to visit Bradford at their

personal inconvenience.”⁴⁰ Even the more prosperous societies were occasionally snubbed, as the Sheffield LPS had been by Ruskin (twice) in the 1850s.⁴¹ This did not trouble most societies unduly, however, for there was a plentiful supply of local speakers from which to choose, notably the four I introduced earlier. Some were local physicians, lawyers and clergymen, but as the century wore on, more full-time salaried men of science became mainstays of the circuit. Driven by the need or desire to establish their status in civic culture, lecturers at the local colleges were commonplace on the programmes. Miall’s activities have been examined above: he was accompanied by other Yorkshire College faculty such as Percy Fry Kendall, professor of geology and Arthur Rücker, professor of physics. Thomas Hick was also a frequent lecturer at Halifax, Sheffield and Leeds.⁴² Originally a mill worker, Hick turned to teaching in Leeds after injuring his hand, later going on to study at Huxley’s South Kensington summer course in the early 1870s. In 1886 he was appointed assistant lecturer in botany at Owen’s College, but continued to lecture in his home county. Edward Birks, banker, botanist and botany instructor at the Sheffield School of Medicine was a regular feature on the SLPS programme; he was also honorary secretary for much of the 1880s and 1890s.

College lecturers were not the only group striving to use the philosophical society platforms to propagate their researches and, arguably, to establish themselves as experts. Museum curators, keen to elevate the status of their post – at this point little more than a skilled janitor – also lectured widely. Walter Keeping of the Yorkshire Museum was very active in this respect, and his successor, Henry Platnauer, delivered a large proportion of the evening lectures during his time in York, (as did his successor, Tempest Anderson).⁴³ Henry Crowther of the Leeds Museum (and previously on the staff at the YCS) was also a regular on the circuit. William Henry Flower, the doyen of late Victorian curators, was even known to make an appearance.

As Inkster notes, the role of these individuals in the establishment and reproduction of polite civic science should not be underestimated.⁴⁴ Cooter and Pumfrey have eloquently deemed this relationship one of mutual enrolment.⁴⁵ The lecturers used the societies as platforms to promulgate their views on research, where it should be performed, and by whom. They also used their audiences as sounding boards for their

⁴⁰ BPS, *Report 1* (1865), 5.

⁴¹ Porter, *Sheffield Literary and Philosophical Society*, 59–60.

⁴² Lees, ‘Thomas Hick’; Cash, ‘Thomas Hick’. I am grateful to Dr Bernard Thomason for biographical information and references concerning Hick.

⁴³ YPS, *Annual Reports* (1883–1904).

⁴⁴ Inkster, ‘Aspects of the History of Science and Science Culture’.

⁴⁵ Cooter and Pumfrey, ‘Separate Spheres and Public Places’.

unpublished researches. William Bunting Crump, for example, aired an early version of his ecological research (see chapters 4 and 5) at the Halifax Lit and Phil in 1901.⁴⁶ Thomas Allis, the prominent York ornithologist, shared his many findings with the Yorkshire Philosophical Society (YPS). Others – including Dallinger and Sorby – tested their ideas on a provincial audience before taking them south. In a reciprocal relationship, the lecturers lent the societies their gravitas and the societies provided these savants with status and an audience. This reciprocity, usually implicit, was most evident when the informal system broke down, as at Bradford: the BPS, increasingly unable to attract reputable lecturers, lost audiences, so that such speakers were even less likely to grace them with their presence.⁴⁷

2.2.3 Content and Audience

A healthy lit and phil programme (which would usually run from October to May) consisted of ten to twelve lectures, of which one or two were usually devoted to natural history. I can find no evidence of any structure to the disciplinary distribution of lectures, which probably depended more on the availability of lecturers than a balanced syllabus. Literature, art and history were the most popular topics: of the sciences, chemistry was the most common. More popular later in this era were archaeology, photography and sumptuously illustrated travel narratives. Almost all lectures spanned a range of subjects – folklore and myth, for example, were often to be found in natural history lectures – and lecturers generally spoke on a variety of subjects over the course of their careers.

There is evidence of a great range of topics within life science lectures, and it would be impossible (and in any case unnecessary) to list them all here. Suffice to note that they ranged from Frank Buckland's 'Cultivation of Salmon' to Boyd Dawkins' 'Discoveries in Caves' to George Romanes' 'Nerves'. Metropolitan lecturers' topics contrasted with those of Yorkshire-based speakers, in that the latter were able to deliver lectures on Yorkshire flora, fauna and geology, subject matter to which the naturalists in the audience were able to relate. Nevertheless, the local figures did not dwell on proximate matters entirely: exotic subject matter – we need think only of Seebohm's Siberian birds – was also popular. Perhaps the most ubiquitous^{ousl} recurring theme was evolution. It is important to note that despite the omnipresence of Huxley and other Darwinian apologists, St George Mivart was also disseminating an alternative, anti-Darwinian message – often within the same lecture

⁴⁶ Halifax LPS, *List of Lectures*.

⁴⁷ BPS, *Reports* (1865–1905).

series as his opponents in the debate. ‘Darwinism’ was also the chosen topic of many local lecturers, including Miall and Thomas Whiteside Hime, a frequent lecturer in Sheffield and a close friend of Sorby’s.

There are precious few first-hand accounts as to how these lectures were received: attempts to analyse the audiences’ use of the material presented, to award them agency within the ‘communication circuit’ (as book historians have done for readers) are hindered by chronic lack of documentary evidence.⁴⁸ Cooter and Pumfrey may demand an approach that treats science as “a multifaceted and highly flexible symbolic resource of multiple meanings”, but accounts of these heterodox interpretations are difficult to recover.⁴⁹ Similar problems arise, as I discuss in further chapters, when the historian attempts to recover the experiences of visitors to museums and students in colleges. To my knowledge, only the belligerent ‘Smith of Halifax’ left a record of responses to the lectures: and then his only comment on the natural history content of the Halifax Lit and Phil programme was that he was left nonplussed by Boyd Dawkins’ geological arguments.⁵⁰ Smith also complained about the lack of opportunity for debate and discussion after the lectures.

It is possible, however, to piece together the composition, if not the attitude, of the audiences. Society members were generally allowed to introduce to the lectures one or two friends, possibly as well as their families. Literary and travel-related topics always attracted the largest audiences, and were increasingly common in the lecture series as the century wore on. Figures for lecture attendance in society records reveal that in general, around one third to one half of the size of the society might attend any given lecture (see figure 2.1), which would have filled most lit and phil theatres. The majority of the audience of the lectures, however, were the members themselves, and so the composition of the societies gives a good idea of those in the auditoria. Given the status of such an audience, and the presence of many professionals, it is clear that in many cases the lecturer would have been addressing an audience of his (and occasionally her) peers. This was crucial for the lecturers, as I discussed earlier, given, as Cooter and Pumfrey note, “the vital, transformative role of emerging middle-class audiences”.⁵¹ This apparently did not suit those few non-élite present: “are not the greater part of the lectures”, demanded

⁴⁸ Darnton, *The Kiss of Lamourette*, 107–187; Topham, ‘Beyond the Common Context’.

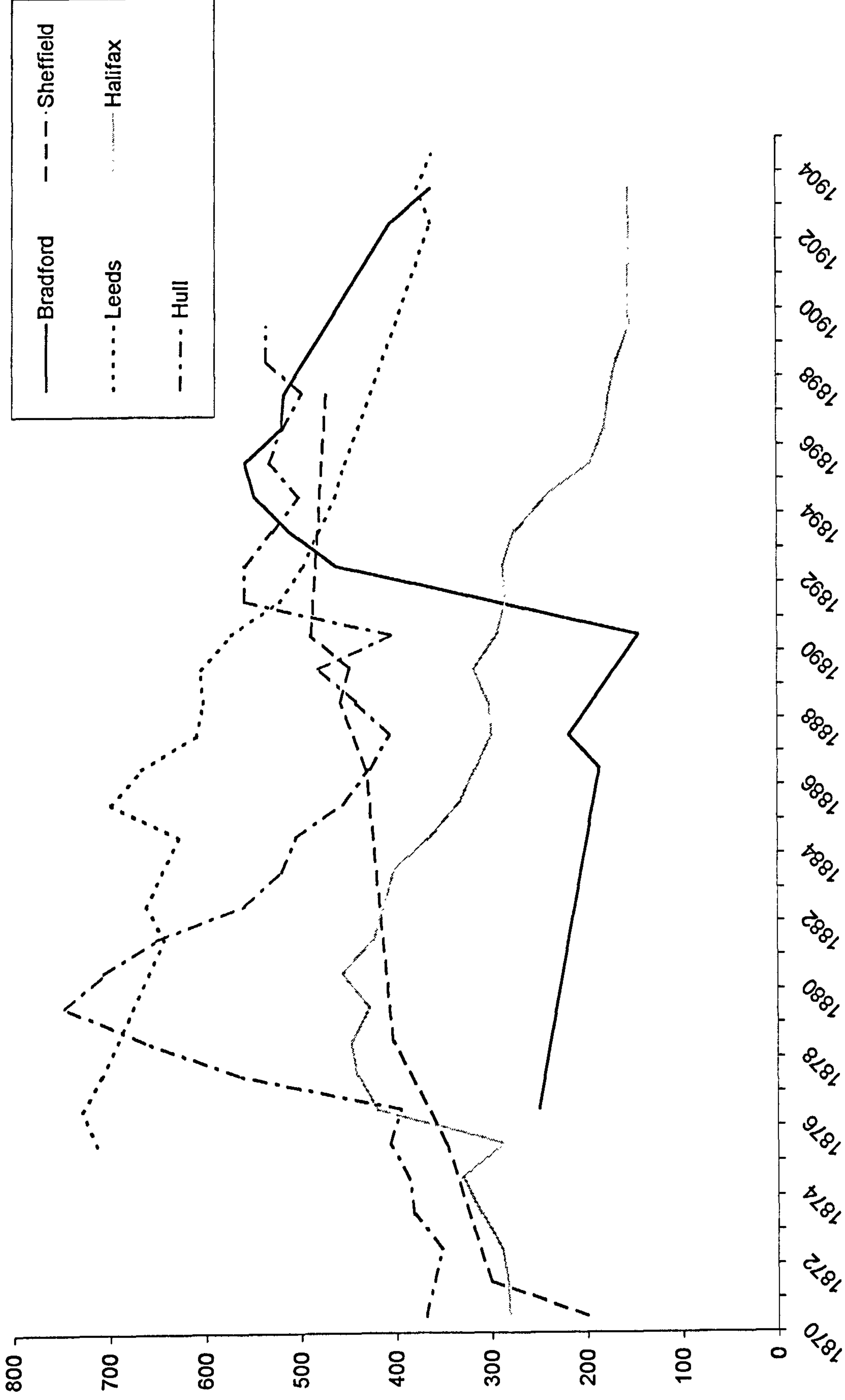
⁴⁹ Cooter and Pumfrey, ‘Separate Spheres and Public Places’, 245. The exemplary treatment of science in this way is Desmond, *The Politics of Evolution*.

⁵⁰ Smith, *Satires and Comments*.

⁵¹ Cooter and Pumfrey, ‘Separate Spheres and Public Places’, 245.

Figure 2.1: Membership of Philosophical Societies in Yorkshire, 1870–1900

[Sources: BPS, *Reports*; Halifax LPS, *Annual Reports*; HRI, *Annual Reports*; LPLS, *Annual Reports*; SLPS, *Annual Reports*]



Smith of Halifax, “characterised by crotchet-preachings to suit the idiosyncrasies of a god-favoured few[?]”.⁵²

Although the lit and phil councils made occasional attempts to educate the labourers of the town, they were rarely successful (and certainly never attracted the audiences, say, that Huxley had for his lectures for workingmen in London). In 1866, the Bradford Philosophical Society council noted “with much regret that advantage has been but very slightly taken by the working classes of the opportunity thus afforded them [by penny lectures] of obtaining scientific instruction of a high order at a low charge”.⁵³ Only the Hull society had any luck in this respect, noting in particular the satisfactory demeanour of the workingmen audience.⁵⁴ In general, lectures for the working classes were left to the mechanics’ institutes. Some lectures and meetings were thrown open to the public, as the struggling BPS did in the 1860s and the Hull Society in the 1870s: for example the children’s lecture, a popular tradition from the 1880s (at Halifax). It is clear, however, that most seats most of the time were taken up by male, middle-aged, middle-class society members.

2.3 Life Science and the Mechanics’ Institutes

Despite the hopes of their founders, mechanics’ institutes by this period were also largely populated by the middle classes. After describing how this came to be in the national arena, I turn to the development of the institutes in Yorkshire in particular. Finally, I engage with the limited life science content of institutes’ pedagogical schemes.

2.3.1 Mechanics’ Institutes in the Early Nineteenth Century

There has been considerable historical scholarship dedicated to mechanics’ institutes – of which Hemming and Popple focus on this region and this period in most detail.⁵⁵ Most historians of the institutes doggedly focus on the issue of class: specifically, whether the institutes were vehicles of didactic improvement for working men and women (Laurent, Inkster) or an instrument of social control wielded by the middle class (Shapin and Barnes).⁵⁶ Inkster encapsulates this debate succinctly: “the institutes may be seen as associational offshoots of a radical urban scientific culture or as a focus for cultural

⁵² Smith, *Satires and Comments*, 13.

⁵³ BPS, *Report 2* (1866), 6.

⁵⁴ “The council observed with satisfaction that a great number of Working Men availed themselves of the privilege accorded, and by their attention and general demeanour greatly gratified the Lecturer [Rev. W.S. Symonds], and did credit to their own intelligence.” (HRI, *Annual Report* (1869), 9.)

⁵⁵ Hemming, ‘The Mechanics’ Institute Movement’; Popple, ‘The Origin and Development of the YUMI’.

⁵⁶ Inkster, ‘Science and the Mechanics’ Institutes’, ‘The Social Context of an Educational Movement’; Laurent, ‘Science, Society and Politics’; Shapin and Barnes, ‘Science, Nature and Control’.

domination of one maturing class over another".⁵⁷ I will begin this section with a brief discussion of these arguments before setting out the early history and development of mechanics' institutes in England.

The mechanics' institute movement blossomed in the 1820s, fuelled by Broughamite sentiments and drawing on the tradition of the voluntary association and the provincial itinerant lecture. Civic luminaries founded institutes across urban England, which were fostered by the young lit and phils and by Henry Brougham's Society for the Diffusion of Useful Knowledge – both thoroughly middle-class enterprises. In Yorkshire, as elsewhere, the mechanics' institutes had a wide variety of supporters, objectives and memberships. The Leeds Mechanics' Institute, founded in 1824, was dominated by the Baineses: Edward Senior, instrumental in its foundation and early years, had seen Henry Brougham and George Birkbeck (who was born in Settle) lecture in London. The Sheffield institute was fronted from its establishment in 1832 by the physician George Holland, who also set up institutes in Worksop and Halifax. The mechanics' institute in Rotherham (est. 1838) had roots in the local temperance movement. The Huddersfield Mechanics' Institute – among the largest and most enduring in the county – was founded in 1841 as a Young Men's Improvement Society by Frederic Schwann, a German merchant settled in the town, who at first intended the group to be for the benefit of his employees. Of the 600 institutes nationwide in 1850, one quarter were in Yorkshire: 30 institutes were founded over the century in the Huddersfield area alone.⁵⁸

If there is a consensus regarding the class composition of institutes it must surely be that the middling sort dominated them, first as agitators, then founders and finally as the majority of the membership. The rhetoric of their working-class origins, often employed at the time, was largely unsubstantiated. Dissenting ministers, physicians and civic-minded manufacturers, mostly Whigs with some radicals for good measure – often, as at Leeds and Whitby, the core members of the local lit and phil – were largely responsible for setting up the institutes. Whether they were motivated by genuine concern for their ill-educated fellow citizens or by a paranoid urge to pacify the potentially riotous workers in the insecure 1820s remains open to debate. Either way, the messages failed to reach their target audience, for the institutes were largely composed of skilled tradesmen, clerks and young teachers or professionals. Illiteracy and lack of funds deterred many others from attending. Although we should not ignore the variety of composition at different institutes,

⁵⁷ Inkster, 'Aspects of the History of Science and Science Culture', 12.

⁵⁸ O'Connell, 'From Mechanics' Institute to Polytechnic'.

Figure 2.2: Number of Affiliated Institutes of the Yorkshire Union of Mechanics' Institutes, 1837-1895

[Source: Popple, *The Origin and Development of the YUMI* (from YUMI, *Reports*.)]



only 5% of their membership in Yorkshire in 1840 were mechanics, a proportion that did not change significantly over the following decades.⁵⁹

2.3.2 The Yorkshire Union of Mechanics' Institutes

Commentators then and now have pointed to the failure of the institutes in the 1850s to live up to their early goals: a failure to offer advanced education because of the lack of rude literacy and numeracy skills, a failure to retain as members the class for which they had been formed and the subsequent invasion of the petty bourgeoisie.⁶⁰ Armed with this keener and wealthier clientele, however, the institutes continued to thrive into the late century, especially in the northern counties: a stamina that has been ignored by many scholars. Nowhere was this more emphatically illustrated than in Yorkshire, which along with Lancashire housed the thriving institutes of the textile districts. These groups provided the backbone of the Yorkshire Union of Mechanics' Institutes (YUMI), a brainchild of Edward Baines, which in 1841 succeeded a West Riding Union established four years earlier.⁶¹

The YUMI purported to offer its constituent groups a portfolio of benefits, including cheap, centralised lecturing resources, didactic guidelines, a parliamentary lobby and a means of exchange of information through their reports and annual meetings. By 1851 the union was already the largest educational organisation in the country – the Leeds Institute, for example, increased its membership nearly tenfold in the 1840s – and it continued to thrive and grow throughout the late nineteenth century, despite a conspicuous lack of state support. By 1890 the YUMI claimed a combined membership of over 60,000 in almost 300 affiliated institutes (see figure 2.2). Many of these groups were housed in grand civic buildings, raised mostly by private subscription, which were dominated by lecture theatres usually much larger than those of the lit and phils. (The Leeds Institute held the Yorkshire Exhibition of Arts and Crafts in 1875 in order to pay off their building debt: 430,000 attended.) New institutes were still joining the union at the turn of the century, and the West Riding still boasted the highest concentration of them.

The institutes continued to be patronised by the upper-middle-class élite. Anglican support, withheld at first, became more apparent in the later century, for example in the

⁵⁹ Cited in Hemming, 'The Mechanics' Institute Movement' and Shapin and Barnes, 'Science, Nature and Control'. In Yorkshire, some of the Pennine village institutes claimed a large proportion of working-class members, whereas some of the larger establishments – especially the Wakefield Institute – were undeniably upper-middle-class. (Hemming, 'The Mechanics' Institute Movement'.)

⁶⁰ See for example Cardwell, *The Organisation of Science in England*, 71–75.

⁶¹ Popple, 'The Origin and Development of the YUMI'.

efforts of the formidable Reverend Hook in Leeds and Theodore Drury in Keighley.⁶² Sorby's omnipresence in Sheffield scientific culture certainly extended to the Sheffield Institute, over which he presided for several years. Titus Salt poured money into the institutes and day schools at Saltaire, and Edward Baines Junior presided over the Yorkshire Union of Mechanics Institutes for over fifty years. Meanwhile, the mean age of the predominantly upper-working- and middle-class membership became younger, and more women joined the institutes, or affiliated groups connected with the YUMI, such as the 'Female Institutes' in Keighley, Huddersfield and Bradford.⁶³ (In 1865, 15% of the YUMI membership were women, although this fell to under 10% in the 1870s; around half of the members were under 21.⁶⁴) Of these young, middle-class clientele, however, how many chose to study life sciences?

2.3.3 Life Science Classes and Lectures

Most historians of the institutes have treated science as an homogeneous enterprise: I attempt here to differentiate between physiology and natural history and the other sciences – principally chemistry – within the institutes' remit.⁶⁵ There was a wide variety and a great number of science classes at the mechanics' institutes: only a few of them were devoted to life science.

Much of the education offered by mechanics' institutes was designed for the examinations of the Department of Science and Art. Set up in 1857 as a direct result of the 1851 Great Exhibition, the department, under the aegis of the Education Department of the Privy council, implemented an examination system that was to last for four decades. It set up science schools by offering grants to mechanics' institutes and other educational groups. By 1871, the Royal Commission on Scientific Instruction reported that there were 97 such schools in Yorkshire, teaching 2650 students.⁶⁶ Huxley and Hooker designed many of the exams, which accordingly included various life science options: physiology, botany, and later biology. None of these options were particularly popular, however. Between 1870 and 1884, across the county only 72 pupils registered for mineralogy classes, and 270 for biology, whereas geometry and mechanical engineering attracted nearly 10,000 each.⁶⁷

⁶² Hemming, 'The Mechanics' Institute Movement'; Shuttleworth, *Charlotte Brontë and Victorian Psychology*, 19–33; YUMI, *Report* (1887).

⁶³ The Huddersfield Female Institute, established in 1847, soon listed hundreds of members; it amalgamated with the MI in 1883.

⁶⁴ Hemming, 'The Mechanics' Institute Movement'; Popple, 'The Origin and Development of the YUMI'.

⁶⁵ Laurent does focus on the implementation of evolution in his discussion of the roots of socialism in the late-century institutes. (Laurent, 'Science, Society and Politics'.)

⁶⁶ Royal Commission on Scientific Instruction, *First, Supplementary, and Second Reports*, 391–400.

⁶⁷ Hemming, 'The Mechanics' Institute Movement'.

By the 1870s, the institutes could – although many chose not to – offer geology, mineralogy, animal physiology, zoology and botany (later combined as biology), but the only class of this type to attract students in any number was animal physiology. Even this was only ranked the eighth most popular science (geology and botany were among the least popular).

It is very difficult, as historians have noted, to determine the manner in which classes were taught at the institutes, or their exact syllabus.⁶⁸ It seems probable, however, that the ill-attended botany classes largely consisted of taxonomy. Hemming judges that most classes were taught by rote, and this is not unlikely, given that both of the physiology instructors at the Sheffield Institute, Edward Russell and later Cornelius Bennett, were schoolmasters.⁶⁹ A total of 37 students, mostly teachers and clerks, sat the class in Sheffield in its first three years; of the few who sat the Science and Art exam in the subject in the 1880s, around 70% passed.⁷⁰ (Among the students was Charles Bradshaw, later assistant curator at the Sheffield Public Museum.) A similar class thrived in a modest way at York, and the subject continued to attract a small number of students into the twentieth century. In Huddersfield, Alfred Sheard, who was responsible for the pure science classes at the MI, taught animal physiology and vegetable anatomy and physiology classes in 1871, 1872, and from 1876 until 1883, when the enrolments failed to justify the formation of classes. During 1882 and 1883, Mr Gardiner taught animal physiology and B.B. Joll taught botany. No more than nine students sat exams in any one year, although the class sizes ranged from twelve to thirty.⁷¹

The Department of Science and Art was not the only educational scheme to which the institutes subscribed. The problem, experienced by many institutes, of finding qualified lecturers willing to speak without charge was partly alleviated by the Gilchrist Trust Scheme and later the University Extension Lectures, which included occasional physiology and geology courses.⁷² The Gilchrist lecturers, funded by the endowment of Dr John Gilchrist in 1841, included W.C. Williamson of Owen's College, William Dallinger and Louis Miall.⁷³ These three, and Alexander Green of the YCS, provided the majority of the life science

⁶⁸ Shapin and Barnes, 'Science, Nature and Control'.

⁶⁹ Hemming, 'The Mechanics' Institute Movement'; White, *White's General and Commercial Directory*.

⁷⁰ SMI, *General Register*. By 1884 the class "had dwindled almost away". (SMI, *Minute Book* (1884), unpag.)

⁷¹ Huddersfield MI, *Annual Reports* (1870–1884).

⁷² Stuart, 'University Extension and Local Higher Education'; Welch, *The Peripatetic University*, 13–102.

⁷³ Vincent, *Haydn's Dictionary of Dates*, 624. They "were delivered to crowded and delighted audiences" in 1886 and Curzon felt they would "no doubt be productive of much good hereafter". (YUMI, *Report* (1886), 37.) The eight 'Gilchrist Science Lectures for the People' at the Leeds MI also included Norman Lockyer, and the equivalent scheme in Huddersfield included William Boyd Dawkins and William B. Carpenter. (Huddersfield MI, *Annual Report* 38 (1879).)

related lectures in Yorkshire from 1870 to 1900, which were few and far between. Miall delivered lectures from the stock of topics with which he toured many educational institutions in the county, including old favourites such as ‘On the Surface of the Water’; Dallinger delivered on a range of natural history topics, including ‘Spiders – Their Work and Wisdom’; Green’s mainstay was physical geography.⁷⁴ That these lectures were as far as we can tell sensibly identical to those delivered at the lit and phils and naturalists’ meetings demonstrates the extent to which the institutes were part of middle-class civic culture, and suggests that the composition of these audiences, regarding class and education, might not have been dissimilar.

As well as the Science and Art Department classes, the Gilchrist Lectures, technical courses run by the City and Guilds of London and languages by the Society of Arts, the YUMI itself also ran courses. A minority of pupils took pure science classes (around one quarter of YUMI class entries in 1884), and only a few of them studied biological subjects. It is difficult to gauge where the few life science classes there were fitted into the educational scheme of the YUMI: certainly this varied from institute to institute.⁷⁵ Some undoubtedly offered zoology and botany as specifically non-technical, whereas at Sheffield physiology (introduced in 1872) and geology were presented as useful:

In the framing of the Class List [...] it has been the aim of the Committee to introduce, as far as possible, such secondary subjects as seemed most likely to furnish the students with knowledge which they might turn to practical account in their every-day life. Chemistry, Physiology, Geology, Machine Construction, &c., have for this reason been included in our programme; and though numbers attending these classes cannot be said to be large, the students in them manifest an earnest desire to become acquainted with the various branches of Science.⁷⁶

Whichever educational slant the life sciences were given, it does not seem to have had an impact on class sizes. Physiology and biology would always be overshadowed by other subjects at the mechanics’ institutes.

2.4 The Lecturing Environment: Space and Display

I outlined in the previous chapter the merits of examining the spaces in which life science was practised: accordingly, I now turn from the lecturers, their topics and their audiences

⁷⁴ YUMI, *Reports*.

⁷⁵ The Sheffield MI arranged lectures for working men on “Mechanics, Chemistry, and other branches of Natural or Moral Philosophy, and the Useful Arts; but more especially, those which are immediately applicable to or connected with the different processes, of Manufactures in this town”. (Cited in Mackerness, ‘Sheffield’s Cultural Life’, 433.)

⁷⁶ SMI, *Annual Report* (1876), 3–4.

to the physical environment of the lectures. Forgan's pioneering enquiry, 'Context, Image and Function' (1986), remains the only work in the history of science that seriously tackles this issue, and yet the space in which a lecture was delivered – and moreover the illustrative aids employed by the lecturer – must have affected the audience's experience. The best way to approach this issue is to examine the premises of the philosophical societies. Given that the buildings of the mechanics' institutes have been discussed in detail elsewhere, the following section therefore focuses on the philosophical halls. However, a great deal of what follows can also be applied to the mechanics' grand premises (of which the towering Leeds Institute and the Huddersfield Technical School are enduring examples).⁷⁷

2.4.1 Philosophical Premises

Of those wealthy enough, most societies had erected their buildings in the 1820s and 1830s, and many were extended in the 1860s and 1870s.⁷⁸ The museum of the Yorkshire Philosophical Society in York, built in 1823, was perhaps the biggest and the boldest. Those societies with the luxury of choice considered the sites of their buildings carefully. Too close to the centre of a town and the premises might be enveloped by the soot-ridden industrial inner-city blocks; too far out and access would become difficult. Generally, councils deemed the edge of the town centre to be preferable, if possible close to a civic garden. And yet the social geography of urban Yorkshire changed massively over the course of the century, and many town centre societies lost members in droves as the middle classes withdrew to the suburbs.⁷⁹

Their grand buildings did not come cheap – ranging from Scarborough's £1840 bill to York's huge £9800 outlay (three times the original estimate). These initial sums were commonly raised by subscription shares, usually one or two guineas. The societies were effectively joint stock-companies: the shareholder-members, or proprietors, then had special privileges (the power to invite guests to the lectures, and so forth). Even with the relief from local rates brought about by the Acts of Parliament of 1843 and 1854, however, the outstanding debt and subsequent maintenance costs of these buildings were millstones around lit and phil necks for decades.⁸⁰ Nearly all of the societies in Yorkshire were in debt in the 1870s (York being the notable exception, having cleared its massive deficit by this

⁷⁷ Hemming, 'The Mechanics' Institute Movement'. Photographs of mechanics' institute buildings can be found illustrating the later YUMI *Reports*.

⁷⁸ Brears, 'Temples of the Muses'.

⁷⁹ Dennis, 'The Social Geography of Victorian Huddersfield'; Inkster, 'Aspects of the History of Science and Science Culture'; Taylor, 'Victorian Leeds'.

⁸⁰ The 1843 Act exempted societies devoted to literature, science or fine art from rates; the 1854 Literary and Scientific Institutions Act allowed such groups to be given sites of up to an acre.

time). For Sheffield, Ilkley, Halifax and Hull, the only solution was to transfer their museum to the corporation (see chapter 3).⁸¹ Like museums, lectures programmes often cost the society more than they generated, owing to the expenses of non-local lecturers.⁸²

The massive drain on society finances induced by a building project was too much for some societies, who chose rather to rent rooms in civic buildings, or to share premises (see table 2.1: we can assume that some of those societies not presented in detail, such as the Pocklington Lit and Phil, were even poorer). Nowhere is the extent to which science was embedded in civic culture more graphically demonstrated than in joint tenancy. There were a number of civic institutions with which a lit and phil might co-habit: the Whitby Society originally erected a building in 1827 jointly with the subscription library and the civic baths: the Hull Royal Institution was built for the library and Hull LPS, and eventually also housed an art gallery.⁸³ Lack of a building, however, denied a society civic kudos relative to those groups who were able to stake out their territory in a more visible fashion.⁸⁴ This problem hit the Sheffield LPS hard: housed in various accommodation, the society rented rooms at the School of Art in 1868, and finally moved to rooms in Leopold Street (over the Assay Office) in 1895. No plan to build their own premises came to fruition. It was almost farcical: each time a major educational establishment was built in the town (the medical school, the mechanics' institution, Firth College), the SLPS lobbied for joint accommodation, but in vain. They were, however, allowed use of the Cutler's Hall, Firth College and the music hall for their popular public lectures. In this way, they ensured that they always had access to that most critical space: the lecture theatre.

2.4.2 Lecture Theatres

A room suitable for the delivery of lectures, then, along with a museum, was an essential feature of philosophical society accommodation. The Victorian scientific lecture hall drew from the anatomical theatre architectural tradition rather than that of the playhouse.⁸⁵ (This was particularly fitting, given the number of medical men involved in the lit and phils.) These classical amphitheatres matched well the Grecian exteriors of the buildings. They tended to be hemispherical or rectangular, with the lecturer and his apparatus in the centre of a long side, and raked banks of seats for the audience. Many architects followed the lead of the London Royal Institution in including a further raised gallery. Grand arches and pillars instilled a sense of dignity to the occasion, and instilled decorum and respect in

⁸¹ Brears, 'Temples of the Muses'; Halifax LPS, *Annual Report* 65 (1895); HRI, *Annual Report* (1898).

⁸² YPS, *Annual Report* (1889).

⁸³ Browne, *Chapters of Whitby History*, 11–17. The Whitby Lit and Phil purchased the whole building in 1856.

⁸⁴ Forgan, 'Context, Image and Function', 91.

the audience, especially at the YPS, where parallel raked seats (facilitated by a sunken floor) nestled between Ionic columns.⁸⁶ Portraits and busts of local dignitaries gazed down on the occupants, reminding them of the great achievements of their town.⁸⁷

Acoustics, ventilation and lighting were the prime concerns of the societies when erecting or adapting their lecture rooms. Replacing their original room (which also had parallel raked seats), the Leeds Society equipped a new lecture theatre in 1862, which had:

semi-circular seating built in tiers and seated about 400 people; its acoustics were perfect, there was resonance without echo, and without doubt it was the finest room in the city for a speaker to be heard. [...] It was a friendly room [c.f. the York theatre] and a delight to speak or sing in. The architects were Messrs Dobson & Chorley and they designed a room of one span and in the centre of the ceiling a top light.⁸⁸

Electric lights were installed in lecture theatres from the 1890s, replacing large, gas-fuelled brass lanterns.⁸⁹ “The Society’s new rooms” announced the Sheffield LPS *Annual Report* in 1897, “are spacious, light, and well warmed and ventilated”; the Halifax lecture theatre was also “conveniently situated, well warmed, and well lighted”.⁹⁰ The comfort of the *cognoscenti* was clearly of prime concern.

One reason for the common shape of the lecture theatre was to allow as large an audience as possible. The size of the Leeds hall seems to have been a desirable capacity; the Halifax LPS wanted a lecture theatre of this size, but had to settle for 250; the YPS room barely fitted 200; and most other societies constantly chafed for larger auditoria. The Halifax lectures were subsequently rather crowded – their attendance ranged from 170 to 320 – and they had to install hinged seats at the back of the upper gallery. This proving insufficient, they transferred the most popular lecturers to the New Assembly Rooms and later the Mechanics’ Hall and the Victoria Hall.⁹¹ (Mechanics’ theatres were for the most part considerably larger than those of the philosophical halls.) In York, supplementary lectures were held in the Festival Concert Room.⁹² In Bradford, the Council felt moved to limit the number of subscribers through want of space.⁹³ Clearly, the civic lecture was still a popular pastime in the late century.

⁸⁵ Forgan, ‘Context, Image and Function’; Markus, *Buildings and Power*, 169–244.

⁸⁶ Taylor, ‘Recollections’; Markus, *Buildings and Power*, 169–244.

⁸⁷ YPS, *Annual Report* (1872).

⁸⁸ Sprittles, *Links with Bygone Leeds*, 72.

⁸⁹ Taylor, ‘Recollections’.

⁹⁰ SLPS *Annual Report* (1897), 7; Halifax LPS, *Annual Report* 58 (1889), 11.

⁹¹ Halifax LPS, *Annual Report* 44 (1874), 46 (1876), 64 (1894), *List of Lectures*.

⁹² YPS, *Annual Report* (1888).

⁹³ BPS, *Report* 19 (1893–4).

2.4.3 Technologies of Display

Contributing to the endurance of this popularity were the ever-more elaborate methods employed to illustrate the lectures. Lecturers needed to generate and maintain large audiences, and illustrations were crucial in entertaining them, ensuring their attention and their repeated attendance. As Inkster has detailed, early nineteenth-century public lecturers utilised a great deal more equipment and effects than private educators, so much so that the life of an itinerant lecturer was plagued with the problem of transporting vast arrays of equipment.⁹⁴ By the late century, the lecturer's lot was a happier one, as technologies of display such as the magic lantern became smaller and cheaper.

The popularity of traditional modes of illustration, however, endured. Although not as common in life science as in chemical and physical lectures, experiments were always a reliable crowd pleaser. Physiology lectures, such as Dr Dresser's in Halifax in 1867 and W. Stirling's (of Owen's College) at Hull in 1893 – 'How We Breathe' – lent themselves most obviously to experiment, but many other life science lecturers also advertised experiments and demonstrations as part of their repertoire.⁹⁵ Demonstrations in the museums were also common, although these would probably have been little more than lectures in front of the exhibition cases – but perhaps the audience were permitted to handle certain specimens.⁹⁶ Many lecturers brought the specimens to the audience rather than *vice versa* – Seebohm, for example, always demonstrated his talks with examples of eggs and plumes, and his popularity partly stemmed from this practice. Those who did not have specimens often illustrated their lectures with large prepared illustrations, or by drawing freehand on a chalkboard.

Few of these display methods, however, could compete with the magic lantern. Developed from the tradition of the camera obscura, the bull's eye lantern and elaborate mirrors, the magic lantern was essentially a luminous source shone through a painted glass slide onto a screen. This simplicity facilitated the endurance of the magic lantern despite many competitors over the centuries: phantasmagoria; zoetropes (or 'Wheels of Life'); stroboscopes (or iconoscopes); stereoscopes and countless others.⁹⁷ First developed in the

⁹⁴ Inkster, 'The Public Lecture'. The arduous travelling prompted Martin Simpson to give up lecturing and seek employment as a curator. He was eventually appointed as such by the Whitby Museum. (Hemmingway, 'Martin Simpson'.)

⁹⁵ Halifax LPS, *Annual Report* 37 (1867); HRI, *Annual Report* (1893), 7.

⁹⁶ Walter Keeping, for example, gave demonstrations to the YPS members in the Yorkshire Museum. (YPS, *Annual Report* (1882).)

⁹⁷ Zoetropes and stroboscopes were devices that simulated moving images using multiple pictures; stereoscopes combined two images to give a three-dimensional effect. Although various devices for simulating motion with magic lanterns were developed very early on, most of the displays at lectures were stationary. Stereoscopes had been commonplace in mid-Victorian parlours, but had fallen from grace by the

seventeenth century, the era of the professional magic lantern display had been ushered in by the showman Etienne Gaspard Robertson in revolutionary Paris, others subsequently following his lead all over Europe.⁹⁸ In Britain, the educational potential of lanterns was reinforced in the 1820s and 1830s by the optician Philip Carpenter, who developed a process for accurate reproduction of multiple slides, which had previously been mostly hand-painted.⁹⁹ New developments in illumination – especially the oxy-hydrogen limelight – allowed a much greater distance between projector and screen, facilitating much larger images.¹⁰⁰ This also meant that the lantern could be positioned behind the audience, rather than on the other side of the screen, which to some extent de-mystified the process. Throughout the rest of the century, as lanterns became much cheaper, they were commonplace at temperance societies, voluntary associations, mechanics institutes and many other educational groups.¹⁰¹

Many lit and phil lecturers advertised their talks as ‘illustrated by the oxy-hydrogen lantern’, the quasi-scientific synonym for the magic lantern. They thereby lent their lectures scientific credibility, placing them firmly in the camp of John Tyndall and other renowned, respectable, scientific lanternists. Although lanterns were already in widespread use in Yorkshire lecture halls by mid century, they became more prevalent in the 1880s as the slides and lanterns were made cheaper, more portable and more sophisticated. On a lecture programme of the 1890s, non-illustrated scientific talks were the exception, lantern demonstrations the rule. Prosperous societies such as those at York and Hull installed permanent, powerful lanterns in their halls (Hull’s Mr Pybus provided in-house operation).¹⁰² As well as in the regular lecture series, lantern illustrations were used for classes, penny lectures, and during *conversazioni*. When photographic sections were formed in some societies in the 1880s and 1890s, they expanded the use and display of lantern technology even further. Like his erstwhile assistant and successor at the Leeds Museum, Henry Crowther, Miall made ample use of slides in his ‘Contrivances in Nature’

late century, as they were most commonly used to display nude images. Nineteenth-century lanterns were part of the same culture of display that embraced the panorama and the diorama, most popular in the regency period but enjoying a renaissance in the 1880s. (Hyde, *Panoromania!*; Altick, *The Shows of London*, 117–127.)

⁹⁸ Robinson, ‘Shows and Slides’.

⁹⁹ Secord, ‘Botany on a Plate’.

¹⁰⁰ Hays, ‘The London Lecturing Empire’.

¹⁰¹ J.E. Flower of the Recreative Evening Schools Association reported in 1890, “we have now a fairly large stock [of slides: with them] we teach astronomy, botany, electricity, geology, heat, light, magnetism, mechanics [...], natural history, physiology, physiography and sound”. ([Stead], ‘The Magic Lantern Mission’, 565. I am grateful to Dr Gowan Dawson for this reference.)

¹⁰² HRI, *Annual Report* (1896). The York lantern was donated by Tempest Anderson, later to be their curator. (YPS, *Annual Report* (1889).)

series: he also pioneered the use of lantern displays in daylight at the Yorkshire College (see chapter 4).

One attraction of lantern technology was the capacity to render the minuscule massive – giving the audience, the lecturers claimed, direct access to the microscopic world. Given the scarcity of documented accounts of natural history lantern shows, Henry Mayhew’s interview with a magic lantern manufacturer and showman in London is especially valuable:

I now introduce insects and butterflies’ wings in my lanterns – real insects and real wings of insects on the slides. I make such as fleas, bugs, pig-lice (an extraordinary thing, with claws like a crab, sir), and so up to butterflies – all between the glasses, and air-tight [...]. Here’s the sting, tongue and wing of a bee. Here you see flowers. Those leaves of the ferns are really beautiful [...]. You can magnify them up to any size, and it’s still nature – no disproportion and no distortion.¹⁰³

This technique of projecting natural objects themselves – rather than images thereof – was one of Sorby’s specialities. He painstakingly developed a novel set of techniques whereby marine zoological and algal specimens could be mounted directly onto 3¼-inch lantern slides and then displayed.¹⁰⁴ By drying them on glass, staining them when necessary and mounting them in a variety of solvents, Sorby was able to render the specimens (collected during his summers on *The Glimpse*) flat but undistorted, and to retain their brilliant coloration.¹⁰⁵ Many of his lit and phil lectures revolved around these slides, and they were hugely popular. At the Liverpool Biological Society in 1891, “everyone [was] much surprised, and praised them very much indeed”, and at the Royal Society in 1898 the slides “were repeatedly applauded and it was said that no one in the world could produce [anything similar]”.¹⁰⁶ The lantern slide, and illustrations in general, were clearly instrumental in the impression a lecture made upon the audience: although, as I discuss below, some felt that this impression detracted from and trivialised the content of the lecture. Before turning to the lantern’s purported role in the demise of the philosophical society, however, I will outline the plethora of non-lecturing practices carried out by the societies and the institutes.

¹⁰³ From a letter to the *Morning Chronicle*, 28th February 1850, cited in Thompson and Yeo, *The Unknown Mayhew*, 358. I am grateful to Dr Richard Noakes for this reference.

¹⁰⁴ Edyvean, ‘Henry Clifton Sorby [...] the Algal Lantern Slides’. Many of his slides – still perfectly preserved – are currently on display in the lobby of the Alfred Denny biology building at the University of Sheffield.

¹⁰⁵ Different species required different pressing times and stains (including port); and marine fauna proved more difficult than flora. Sorby wrote, “nearly every animal requires special treatment, and what is desirable in one case would be ruinous in another”. (Sorby, ‘On the Preservation of Marine Animals’, 438.)

¹⁰⁶ Excerpts from Sorby’s diary, cited in Edyvean, ‘Henry Clifton Sorby [...] the Algal Lantern Slides’, 43.

2.5 Other Sites and Activities

Historical scholarship on philosophical societies and mechanics' institutes has focussed on their lectures, pedagogical activities or their museums, ignoring the other practices that took place within the physical and administrative limits of these groups. And although the ostensible theme in the current chapter is the life science lecture, I will briefly discuss these other practises insofar as they involved natural history, given that they illustrate one central argument of this thesis, concerning the multiplicity of sites and practices within all the groups I study. Besides which, an account which only treated the lectures within the philosophical societies and mechanics' institutes would present only part of the institutional biographies of these groups.

Lit and phil buildings fulfilled a number of functions aside from their use as museological and lecture spaces: they often also included reading rooms and classrooms, and although they did not contribute to the practice or teaching of life science, many also housed laboratories (usually chemical) and observatories.¹⁰⁷ They also used their halls to hold more exclusive meetings, to house specialist sections of the societies and to stage grand conversaciones and exhibitions. Similarly, the mechanics' institutes also included reading (or 'newspaper') rooms, conversation rooms, and chemical, metallurgical and physical laboratories on their premises: some even had garden allotments. Neither were their activities restricted to the built environment (some groups organised excursions). Common to nearly all of the societies and institutes, however, was a space set aside for a library.

2.5.1 Libraries

Several of the philosophical societies, for example in Halifax, had no need of their own library, as they already shared premises with subscription libraries. Other societies expected their curators to carry out a librarian's duties and the more museum-focussed societies, such as the Yorkshire Philosophical, treated their library as another department of the museum. The lit and phil libraries ranged from comprehensive and extensive (as at the YPS) to haphazard and limited (as at Bradford). A thriving society might own 20,000 volumes, of which most were factual. (This proportion, however, did not reflect lending patterns, for the vast majority of issues were for novels.) Their shelves groaned under the

¹⁰⁷ Forgan, 'Context, Image and Function'; Brears, 'Temples of the Muses'; Markus, *Buildings and Power*, 169–244.

weight of learned tomes. As the bellicose ‘Smith of Halifax’ complained of the lit and phil library, “you will see shelves crowded with geology, astronomy and archæology, to suit the caprice of a few”.¹⁰⁸ The library in question was typical in its inclusion of a range of natural history and biology volumes: works by Louis Agassiz, William Buckland, Comte de Buffon, Charles Darwin (six), Philip Gosse, Huxley (four), Linnaeus, Herbert Spencer, Charles Waterton and Gilbert White.¹⁰⁹ These holdings, for many societies, were bolstered by items loaned from Mudie’s and other circulating libraries. By the 1890s, however, the annual number of book issues were decreasing across the county, as the lit and phil libraries succumbed to competition from free public libraries and falling book prices.¹¹⁰ In 1894 a committee appointed by the council of the Leeds Phil and Lit reported that their library was “not kept up to modern requirements. It is very little used.”¹¹¹

The mechanics’ institutes libraries, meanwhile, were enjoying a modest prosperity.¹¹² By mid century, their content had moved away from what was generally Spartan self-improvement literature to include a wide variety of material. Although the inclusion of fiction remained a bone of contention throughout the century, it was by far the most popular reading matter, as it was at the lit and phils. Natural science books comprised a tiny minority of issues (2%, for example, in Leeds), and Thomas Lister noted in 1871 that natural history volumes were “seldom consulted”.¹¹³ Should the members have chosen to read them, however, very often a wide variety of biology and natural history tomes were on the shelves at their local institute. Laurent has discussed the wide variety of literature concerning Darwinism at the Bradford and Halifax Institutes, and the Leeds and Huddersfield libraries by 1888 similarly included numerous works by Darwin, the Hookers, Charles Lyell, Huxley and even Spencer (and in Leeds of course the complete works of Louis Compton Miall).¹¹⁴

Nearly all the societies were part of an extensive periodical network that included many of the clubs and groups detailed herein: journals such as the *Annals of Natural History* and the *Journal of Microscopical Science* arrived in the same post bag as the transactions of

¹⁰⁸ Smith, *Satires and Comments*, 4.

¹⁰⁹ Halifax LPS, *Catalogue of Books in the Library*. Similarly the SLPS collection included the works of Darwin, Lyell and Kirby and Spence. (SLPS, *Minutes of the Council Meetings* (1871); Spalding, ‘Natural History in the Early Years of the Sheffield Literary and Philosophical Society’.)

¹¹⁰ Altick, *The English Common Reader*, 213–239, 294–317; Halifax LPS, *Annual Report* 69 (1899); Roderick and Stephens, ‘The Role of 19th-Century Provincial Literary and Philosophical Societies’.

¹¹¹ LPLS, *Catalogue of the Library, Report of [...] a Committee*, 2.

¹¹² The mechanics’ libraries in Yorkshire had on average 1,000 volumes each (Leeds and Bradford, among the largest, had nearly 20,000 volumes each in the 1880s), and the smaller institutes were provided for by the itinerant Yorkshire Village Library.

¹¹³ Lister, ‘Brief Suggestions’, 55.

various European and international societies.¹¹⁵ As well as a number of commercial natural history publications,¹¹⁶ the Yorkshire Philosophical received *gratis*, in exchange for their publications, the BAAS *Reports*; the Missouri Botanical Garden's *Annual Reports*; the Tyneside Naturalists' *Transactions*; the Geological Survey of India's *Memoirs*; the Royal Institution's *Proceedings*; the Russian Mineralogical Society's *Memoirs*; the Smithsonian's *Reports*; the Perthshire Society of Natural Science's *Transactions*; the Australian AAS *Reports*; the National Museum of Montevideo's *Annals*; the Institute of Geology of Mexico's *Proceedings*; the reports of the Hull, Leeds, Leicester and Manchester lit and phils, and the journals of a host of metropolitan societies.¹¹⁷ Although the YPS was unusually rich and prestigious – and only the more affluent and successful societies consistently published transactions or proceedings (such as the YPS *Communications*) – this does give a taste of the extensive character of the journal exchange scheme. There does not, however, appear to have been any overlap between the exchange scheme in which the philosophical societies participated and that of the mechanics' institutes, who also sent their institute magazines to Europe and the colonies.¹¹⁸

2.5.2 Classes at the Philosophical Societies

Formal classes organised at the mechanics' institutes have already been discussed; few historians, however, have acknowledged that the philosophical societies also hosted similar schemes. Some, like the Hull Royal Institution, had classrooms within their buildings: those without used their lecture halls or other civic rooms for this purpose. It was a small step from individual lecture to short course – for example, Miall's 'Contrivance in Nature' series, which was almost indistinguishable from an organised class. The principal difference was the sign-up procedure: we can infer that the audience for a lecture series could pick and choose, whereas students in the classes enrolled for an entire course (whether or not they then attended). Some instituted lectures for the working class, to greater or lesser degrees of success (the Hull Museum lectures, detailed in the following chapter, were perhaps the best attended). Generally, when artisans attended middle-class arranged classes – rarely – they preferred to do so at the mechanics' institutes or technical

¹¹⁴ HTS, *Catalogue of Books in the Library*; Laurent, 'Science, Society and Politics'; Leeds Institute, *Catalogue of the Library*.

¹¹⁵ Halifax LPS, *Catalogue of Books in the Library*.

¹¹⁶ Including John Gould's serialised *Birds of Asia*; *Proceedings of the Geological Society*; publications of the Palaeontographical and Ray Societies; the *Zoological Record*, *Annals of Natural History*, *Magazine of Natural History*, and the *Geological Magazine*. (YPS, *Annual Report* (1874), 27.)

¹¹⁷ YPS, *Annual Report* (1874), 24–6; (1904), 28–30.

¹¹⁸ Hemming, 'The Mechanics' Institute Movement'.

schools. Thus when Miall taught a course of physical geography at Bradford, ostensibly a joint venture of the lit and phil and the mechanics' institute, no mechanics were present.¹¹⁹

It is difficult to determine the syllabuses or content of these courses. Huxley's *Lessons in Elementary Physiology* (1866), famously criticised by Michael Foster for being too dense,¹²⁰ was certainly among the textbooks recommended: Miall would have referred to it in the physiology and zoology classes he taught at Bradford in the late 1860s. By his last year there, Louis Miall was teaching zoology, human osteology and geology classes: Phillip Miall was instructing the physiology class and T.C. Sands offered 'Use of the Microscope'. (By this time, however, average attendance at these classes had fallen from between 10 and 20 to between 4 and 8 – and the classes were abandoned altogether in 1872.¹²¹) Chemistry always attracted the largest science class enrolment: of the life sciences, physiology was the most common and popular.¹²² The younger Miall was not the only teacher to include practical demonstrations – including dissections – in his classes. The BPS reported, “the society has [...] many facilities for science-teaching, such as a large and valuable collection of diagrams [no classes offered lantern illustrations], specimens of fossils and minerals, dissected preparations and microscopic slides”.¹²³ The museum collections were undoubtedly a valuable resource for teaching, and the burden of teaching seems to have fallen largely on the curators such as Miall and his successor Charles Callaway.

Despite the decline in the Bradford classes, courses elsewhere were popular: upon embarking on an educationalist track in the mid-1870s – in 1873 they had taken it upon themselves “to appoint at least one permanent teacher of science in the town” – the Hull society's membership soared (see figure 2.1).¹²⁴ In 1878 they built more classrooms, and two years later they proudly announced,

Until within the last few years the chief interest of the Society consisted in its sessional lectures and valuable museum. Now, however, it may be considered to be an important educational centre, and has so spread out its wings as to embrace the Science and Art Classes in Connection with South Kensington and the Cambridge University Extension System.¹²⁵

¹¹⁹ BPS, *Report 5* (1869).

¹²⁰ Desmond, *Huxley: The Devil's Disciple*, 339–341.

¹²¹ BPS, *Reports* (1870–1872).

¹²² At the BPS, for example, 12 enrolled in Geology, 21 in physiology and 29 in chemistry. When Miall introduced zoology, it attracted an average of 13. (BPS, *Reports* (1867–1868).)

¹²³ BPS, *Report 6* (1870), 7.

¹²⁴ HRI, *Annual Report* (1873), 15.

¹²⁵ HRI, *Annual Report* (1880), 1.

The Hull society, like others across the county, played host to two educational schemes founded in the 1870s: the Science Schools of the Department of Science and Art, discussed above, and the University Extension Lectures. The former were more common at mechanics' institutes than at the philosophical societies – only the Hull LPS and the Whitby hosted science schools as far as I am aware, and the former shifted responsibility for them to the Corporation's technical education committee. At Whitby, they achieved a mixed measure of success: although the Science and Art Department drawing course was the most popular of all their classes, by 1890 the physiology class attracted only three students.¹²⁶

The University Extension Lectures were the brainchild of James Stuart of Trinity College, Cambridge, in the wake of university reform and the repeal of the Test Acts.¹²⁷ Stuart and other reformers established these lecture schemes in order to spread university-style liberal education in the industrial provinces. Mostly delivered by Oxbridge Dons imported for the occasion, and including physiology and biology, they were held at philosophical societies, mechanics' institutes and custom-founded university extension societies across Yorkshire from the early 1870s.¹²⁸ They were immensely popular – in Halifax, 110 lectures were delivered in the 1875 session – but attracted almost exclusively middle-class audiences. The relationship between the philosophical societies and the new colleges, which I outline below, partly hinged on this scheme.

2.5.3 Meetings and Sections

Some societies, as well as organising formal lecture courses, held internal meetings at which active members of the society presented their ideas and research. These were often based on the Royal Society model, and where possible they were held in a private chamber rather than the 'public' lecture theatre.¹²⁹ They often took the form of a short paper followed by a chaired discussion, with the express purpose of the "interchange of ideas on abstruse subjects, and the enunciation of new discoveries in Science and Literature".¹³⁰ Those meetings concerning natural history tended to be led by a core group of local naturalists, which in Sheffield included Henry Sorby and Henry Seebohm; Alfred Denny, lecturer at the nearby Firth College; the society's curator Thomas Whiteside Hime; the prominent

¹²⁶ Browne, *Chapters of Whitby History*, 170–179.

¹²⁷ Cardwell, *The Organisation of Science*, 136–141; Welch, *The Peripatetic University*, 13–44.

¹²⁸ Physiology lecturers included W.B. Richardson and E.A. Parkin; Edward Bagnall Poulton (soon to be Hope Professor of Zoology at Oxford) taught a zoology course on 'Heredity and Evolution'; and Halford John MacKinder (first Oxford Reader of geography) offered physical geography. (BPS, *Reports* (1890–1892); *DNB*.)

¹²⁹ Forgan, 'Context, Image and Function'.

¹³⁰ SLPS, *Annual Report* (1889), 7.

Sheffield naturalist George Vine; and Edward Birks, botany lecturer at the medical school. The well-attended monthly meetings of the Yorkshire Philosophical Society were reserved for serious scientific papers, at which archaeology and geology dominated. Equivalents at other societies – for example the ‘sessional papers’ at the Hull Royal Institution and the ‘Society Papers’ of the BPS – did not form such a core part of society activities, as councils expended more effort on external lecture programmes.¹³¹

The format of these meetings was echoed by distinct groups within the societies when, during the 1860s, they formed specialist sections. Specialisation, often painted by historians as a contributing factor in the downfall of natural history and amateur science, was as widespread among amateur groups as it was among the new professionals. Although the BPS formed sections in order to encourage wider membership opportunities, most other Yorkshire Societies formed them to promote a more exclusive, serious ‘scientific’ element in their membership, as exemplified by the ‘Natural Science’ section of the SLPS (formed in 1872). Thus the Halifax Lit and Phil included a microscopical section from the 1860s, as did Hull, which also boasted distinct geological and natural history groups. These sections held fortnightly meetings which often took the form of classes run by the honorary curators.

Although the formation of sections did not have a great impact on the practice of life science at the lit and phils, they did have an impact on the *place* of science by organising excursions, thus liberating their members from the built environment. Antiquarian, architectural or seaside excursions were well established, usually as annual social events. The genesis of the specialist sections, however, facilitated geological and natural historical excursions in the 1860s and 70s, just as a new breed of field clubs began to swarm over the Yorkshire Dales and moors (without which the lit and phil excursions may well have been better attended). The Hull botanical and geological sections, the BPS geological section, and Walter Keeping at the Yorkshire Museum all implemented gathering and observing expeditions and sometimes field lectures as part of their activities. Attempts to initiate field-based natural history clubs within the mechanics’ institutes, however, met with little success beyond a handful of junior naturalists’ groups.¹³² At Heckmondwike, the unlikely nerve centre of natural history in the West Riding, the institute members formed such a juvenile naturalist society, which was suitably didactic in character, run by J.M. Barber, who had been involved in the West Riding Consolidated Naturalists’ Society. Even this, which

¹³¹ In Hull natural history featured very little at the sessional meetings, probably because by this time such matters were dealt with by the separate sections detailed below. The BPS society papers were almost all devoted to literary topics.

was “almost unique”, seems to have been swallowed up or replaced by the local field club.¹³³ Neither did any of the institutes house museum collections by this time: Henry Sales told the Devonshire Commission that the mechanics’ institutes had no “natural history museums, geological museums and zoological collections of any extent”.¹³⁴

2.5.4 Conversazione

More common as an annual social event than the antiquarian excursion was that most visible demonstration of the public’s fascination with science, the *conversazione*. The societies and institutes used these public exhibition-cum-festivals – a defining feature of almost all the forms of the Victorian voluntary association – as a way of demonstrating their scientific prowess and displaying their civic pride. The *Cornhill Magazine* gives a flavour of such a gathering:

[A] traveller is expounding, with the aid of a plan of bones, and a full-length portrait of the creature in a complete state, the manners, customs, and personal appearance of the very latest discovery in natural history. Portraits of the last thing out in the way of pre-Adamite monsters are also to be seen, being a portion of one toe, in a fossil state, of a new species of megatherium—very rare. There are busts of celebrated philosophers, statesmen, and poets, portraits on the walls of the most distinguished civil engineers, chemists, geologists, arctic explorers, and Eastern travellers. [...] Also there are microscopes through which you may gaze at the wondrous beauties to be seen in the foot of a frog, and telescopes through which you may gaze at the stars.¹³⁵

Alongside archaeology and industrial art, scientific apparatus – especially microscopes – formed the central element of these annual events, which were almost always a great success. At Bradford’s turn-of-the-century *conversazione*,

Mr. ERNEST DENNY and Madame BERTHA MOORE occupied the posts of entertainers, and Mr. RICHARD KEARTON gave a running commentary on a selection of the photographs [probably displayed by magic lantern] of bird life for which he and his brother [Cherry Kearton] have become famous.¹³⁶

Musicians serenaded the visitors as they gazed at the panoply of natural and artificial wonders, and the exhibitions often stayed on display for some time after the

¹³² Lister, ‘Brief Suggestions’.

¹³³ YUMI, *Report* (1878), 122.

¹³⁴ Royal Commission on Scientific Instruction, *First, Supplementary, and Second Reports*, 399.

¹³⁵ [Doyle], ‘Conversazione’, 269. I am grateful to Dr Gowan Dawson for this reference.

¹³⁶ BPS, *Report* 27 (1901–2), 6. Richard Kearton of Swaledale, naturalist, photographer, writer and lecturer, had that year published, with his brother Cherry, *With Nature and a Camera, Being the Adventures and Observations of a Field Naturalist and an Animal Photographer* (1902). (*Who Was Who*.)

conversazione. Magic lanterns undoubtedly played a crucial role in attracting the masses of visitors: certainly Hull's in-house operator Mr Pybus was kept busy on these occasions.¹³⁷

The members of the Sheffield LPS were particularly committed to their soirées, which were instituted by Sorby in 1860 and largely fuelled by his enthusiasm (and capital, as the soirées were usually financed out of the presidents' pockets, although other civic grandees lent much of the apparatus).¹³⁸ Once a year the Society held an exhibition of scientific apparatus, archaeology and objects of local interest. Given Sorby's interests, it is not surprising that microscopy featured highly, although there was not a great deal of natural history otherwise, save the occasional display of stuffed birds.¹³⁹ Held at the Cutler's Hall, the conversaciones at their busiest in the late 1880s attracted over 1,000 visitors.¹⁴⁰ (Society members were also closely involved with that grandest of all soirées, the BAAS, at its meeting in Sheffield in 1879.¹⁴¹) The conversaciones and the hefty attendance at the public lectures represented a shift towards the popular by the society, which while not resented, was commented on by the more 'scientific' members of the society. This popularity, however, was not to last.

2.6 The Decline of the Lit and Phils?

It is clear, then, that the philosophical societies had maintained their initial vitality and their popularity as sites for the dissemination of science beyond the middle of the century. By the 1890s, however, their lecture audiences were dwindling, soirée attendance was decreasing, library issues were falling, and membership was steadily diminishing. This latter development, closely related to the others, is illustrated by figure 2.1, and the diminishment would be further exaggerated if the increasing populations of the towns were taken into account: as a fraction of civic population, their deterioration was even more pronounced. It will pay here to examine two factors presented as responsible for this decline: competition from other civic groups (especially the new colleges), and the 'popularisation' of the lecture syllabuses. (To the Victorian civic worthy, of course, 'popularising' was often a pejorative term, as we shall see in the case of Thomas Sheppard below.) These issues are apposite to the current study, the former because of my dedication throughout this thesis to examining civic science as an interactive organism, and both factors because they

¹³⁷ HRI, *Annual Report* (1896).

¹³⁸ The Crossleys lent the Halifax LPS meteorological instruments, for example. (Halifax LPS, *Annual Report* 35 (1865).)

¹³⁹ SLPS, *Annual Report* (1875).

¹⁴⁰ The Sheffield conversaciones were discontinued in 1903.

¹⁴¹ BAAS, *Report* (1879).

contribute to the examination of the popularity and significance of different sites for life science.

2.6.1 Relationships with other Groups

It appears that in some towns, far from being suffocated by the indefatigable growth of many other voluntary associations and scientific clubs in the late century, the lit and phils thrived in this new atmosphere of solidarity. At Hull and Bradford, the philosophical societies formed 'associations', loose alliances with other groups such as the local naturalists' clubs and antiquarian societies. The lit and phils, as the elder statesmen of civic science, felt it their duty to guide and foster the more recently established groups, and the resulting associations demonstrate well the interconnected organism of civic science, most visibly by sharing premises and at the conversazione, where all the societies were represented.¹⁴² In York, the YPS went further by aggressively attempting to assert their position as the key group in the town:

All the above societies [the York Medical Society, the York and District Field Naturalists' Society and so on] aim at the pursuit of objects cognate with those of the Philosophical Society and the Council has had pleasure in assisting them by the use of its premises, but it must not be forgotten that union is strength, and the Council is of the opinion that some of the Societies would more fittingly be worked as sections of this Society.¹⁴³

This tack had worked, if briefly, for the Bradford Philosophical, who in 1866 had absorbed the original local field naturalists' society into their natural history section; and for the Sheffield LPS, who absorbed the Archaeological Society as a section after many years of collaboration in 1876.¹⁴⁴

Aside from formal associations, there were many connections between the philosophical societies and other groups in urban Yorkshire. Most obviously, there was a significant overlap in membership between the lit and phil and other scientific institutions in a town.¹⁴⁵ Shared premises have already been mentioned: the Sheffield LPS, for example, let their Leopold Street rooms to various 'kindred societies', and the museum

¹⁴² In Bradford, for example, the scientific association, the natural history society and the microscopical society were "affiliated to the Philosophical society on terms of mutual benefit, and rooms [were] provided for the common use of the societies". (BPS, *Report 11* (1885–6), 3.)

¹⁴³ YPS, *Annual Report* (1897), x.

¹⁴⁴ BPS, *Report 2* (1866); SLPS, *Minutes of the General Meetings* (1876).

¹⁴⁵ In Sheffield, Vine, Hime, Allen, Sorby, Denny and Birks were all either naturalists' club or microscopical society members, or both: William White, the curator of the Ruskin Museum was an active member, and after its formation, the curators of the Sheffield Public Museum were all very visibly among the ranks of members and lecturers.

room was opened for the School of Art and for the Sheffield Naturalists.¹⁴⁶ Club and society may have co-existed with more ease, however, had their meetings not clashed.¹⁴⁷ Many societies shared space as well as membership in this way: the Hull Royal Institution, the Leeds Philosophical Hall and the Halifax LPS lecture theatre were used by various other societies.¹⁴⁸ The philosophical societies nourished the young field clubs in the early 1870s, and all of the curators were active members of their local naturalists' club.

Relationships with other institutions had not always been so harmonious. In Sheffield, the mechanics' institute and the literary and philosophical society had originally been rivals: as James Montgomery, poet and editor of the *Sheffield Iris*, wrote to Arnold Knight, founder of the medical school, in 1840, "if [the SLPS] had half the spirit which the Mechanics have, we should present a very different aspect to the public than we have yet been able to do. They take by storm while we are only sapping."¹⁴⁹ Even for the cases in which the institutes owed their genesis to the philosophical societies, by mid century, like vast cuckoos, their membership dwarfed that of their 'parent' society. Their committees and membership overlapped considerably in the period in question, however, and society generally co-existed with institute as peacefully as they did with most other civic associations.

The mechanics' institutes, meanwhile, enjoyed congenial relations with many other groups within the civic science organism. Part of the secret of the YUMI's late-century success was the inclusion of working men's clubs and other similar establishments. In this era, boundaries were increasingly blurred between mechanics' institutes, mutual improvements societies, working men's colleges, trade and technical schools, lyceums, athenaeums, halls of science, workers' educational institutes and lit and phils. Towards the end of the century, the union included a variety of these institutions. Many of the more grandly housed institutes let their rooms to other civic societies for meetings.¹⁵⁰ In Leeds, the mechanics amalgamated in 1842 with the Leeds Literary Institute, and later with the local school of art. By 1897 they operated under the cumbersome title of the Leeds

¹⁴⁶ SLPS, *Annual Report* (1899), *Minutes of the Council Meetings* (1871–1873).

¹⁴⁷ Hime, Letter to H.C. Sorby, 6th May 1875.

¹⁴⁸ In Halifax, the lecture theatre was used by the scientific society; the teachers' guild; the Yorkshire Geological and Polytechnic society; the Yorkshire Archaeological society; and the topographical society. In 1890, the lecture theatre was used on 135 occasions. In 1893, they further extended the range of groups using the hall by abolishing their original ruling that no religious group would be allowed this privilege. (Halifax LPS, *Annual Reports* (1888–1893).)

¹⁴⁹ Cited in Porter, *Sheffield Literary and Philosophical Society*, 33.

¹⁵⁰ For example, the Heckmondwike Naturalists' Society met in their local institute's rooms. (YUMI, *Report* (1883).)

Institute of Science, Art and Literature.¹⁵¹ By the early years of the twentieth century, organisations such as the Workers' Educational Association began to take over the mantle of working-class education: but in the late Victorian era, mechanics' institutes were still going strong: and like all the other institutions detailed in this thesis, they continued to do so as part of a civic network.

2.6.2 The Impact of Civic Colleges

The establishment of civic colleges in the late nineteenth century, however, was to have a more significant impact on the role of existing sites for science lectures: again, however, it was generally beneficial. There was a particularly close relationship between the mechanics' institutes and both the civic colleges and medical schools, whose staff regularly lectured on the YUMI circuit. Across the county, scholarships were arranged for artisans and mechanics to attend the university colleges.¹⁵² Baines endowed these in the case of the Yorkshire College, and his dual involvement was continued by his successor the Marquis of Ripon, who was president of both the union and the college.

Despite historians' claims that the philosophical societies dried up with the onset of civic colleges,¹⁵³ the lit and phils played crucial roles in the founding of the colleges, and the new institutions continued to interact with the older groups throughout their early years and beyond. In Leeds, there was significant overlap between lit and phil members and Yorkshire College staff, and – I suspect – students. The presence of a college in a town provided the local philosophical society with a steady flow of educated members and lecturers from both the staff and students. College and society also continued to interact on an institutional level, often to the benefit of the lit and phil. For example, the new university was the Leeds Phil and Lit Council's first choice as a recipient for the society's collection upon their decision to disband their museum.

In Sheffield, however, despite the level of commitment to the lit and phil shown by Firth College staff, the relationship was not quite so fraternal.¹⁵⁴ As they did every time a new institution was planned, the SLPS council delighted at the prospect of a chance for new housing when the college was planned. Allen wrote to Sorby in 1876, "there was some talk at the Lit & Phil Council meetings the other day about attempting to get the Society accommodation in the new Firth College. I think the idea is a very good one, and I

¹⁵¹ Leeds Institute, *An Historical Sketch*.

¹⁵² YUMI, *Reports* (1874–1904); SMI, *Annual Reports* (1876–1897).

¹⁵³ See for example Higham, *A Very Scientific Gentleman*, 123–140.

¹⁵⁴ Vir Jones served as a secretary and demonstrated at the conversaciones; the Principal, William Hicks, frequently lectured and was president in 1903; Dallinger was vice-president in 1885; and Denny and Birks were also involved.

hope it will bear fruit.”¹⁵⁵ A sub-committee was appointed to see how they might “make arrangements [...] for the mutual benefit of the two Institutions”.¹⁵⁶ The society’s application, however, was ignominiously rejected. They were granted the use of the college hall for public lectures, however, so long as they did not interfere with college business: and although audiences often spilled out of the room, the society kept using it because of the facilities for practical demonstrations and illustrations.¹⁵⁷ After the college was up and running, there appears to have been a change of heart: for although the SLPS council contemplated housing their library at the college, their conclusion was that “the status of the Society might be imperilled if it ceased to have an independent existence”.¹⁵⁸

Societies in a town without their own university college were also affected. At Bradford, shortly after the birth of the Yorkshire College in 1874, Miall gave a course of lectures at the philosophical society as a member of college staff, and “they were a great success”.¹⁵⁹ Their average attendance was ten times what the BPS classes had been. The staff at the new colleges were regular speakers at lit and phils across the county, as discussed above.¹⁶⁰ The exact nature of the relationship between the educational facilities of the lit and phils and the new civic colleges varied from town to town, but it seems to have been the case that although the society classes lost customers to college courses in the 1880s, they were certainly not crushed. Those societies in towns that boasted a higher educational establishment generally fared better than those without (in terms of membership and lecture programmes), but it would be hasty to attribute this to the presence of the college alone.

2.6.3 Lecture Content Changes

I have established that for the most part the emergence of other groups in the civic science organism was not detrimental to the philosophical societies. Nevertheless, by the 1890s many philosophical societies were struggling. As the Halifax LPS council bemoaned, “for some years past what may be described as a wave of depression has passed over the fortunes not only of this Society, but of similar Societies in other towns, and the result has

¹⁵⁵ Allen, Letter to H.C. Sorby, 8th May 1876.

¹⁵⁶ SLPS, *Minutes of the Council Meetings* (1879), 84.

¹⁵⁷ FCS, *Minutes of Council* (1879); SLPS, *Annual Report* (1893). The society later complained about the seats in the college hall. (FCS, *Minutes of Council* (1886).)

¹⁵⁸ SLPS, *Annual Report* (1881), 5.

¹⁵⁹ BPS, *Report 9* (1874–6), 5.

¹⁶⁰ Indeed, George Salt in endowing Miall’s chair was keen to ensure that Leeds did not dominate Miall’s time entirely: “a further condition [of the endowment] is that Mr Miall shall deliver in Bradford each session a course of not less than twelve lectures upon some subject belonging to his chair”. (YCS, *Minute Book* (1874–8), 180.)

been a continual and steady decrease in the number of subscribers”.¹⁶¹ They had isolated the causes for their ‘decline’: the sloth of many of their remaining members in matters relating to the society; the lack of original research; and the energy expended on their library at the expense of their museum.¹⁶²

Thomas Sheppard, Curator of the Hull Museum and editor of *The Naturalist*, offered his own explanation for the undeniable decline in popularity of the scientific lecture.

Photography and the magic lantern are in part responsible [...]. The reading and discussion of strictly scientific papers is now [1903] almost a thing of the past. The ‘popular lantern lecture’ is far more acceptable, and if the membership of the societies is to be kept up, the demands of the members in this respect must be catered for. [The Hull LPS is] a *Literary and Philosophical Society* by name only [...]. Its very existence to-day is due to the fact that its officers have decided to alter the nature of its proceedings to meet the times.¹⁶³

He later complained of the lectures, “so ‘popular’ have these become that their titles only are mentioned in the Society’s reports; and at the meetings themselves there is a frantic rush for the door immediately the lecture is over”.¹⁶⁴ Citing lantern technology as a cause of the decline of the scientific lecture is problematic, however, given how instrumental scientific lecturers were in its development and use, so we must look elsewhere.

The most common cause cited for any decline was the perceived decrease in the intellectual content of the lecture programmes. By the 1890s the culmination of a gradual change is visible in many lit and phil programmes. The lecture organising committees introduced more travel narratives and more illustrations. (Perhaps to compensate, the Yorkshire Philosophical Society ensured that monthly meetings became visibly more sombre and scientific.) The changes in content were introduced in order to compete with other attractions appearing in the late century. Philosophical society members in Halifax bemoaned “counter attractions which have militated against the enthusiasm it would be desirable to see evinced”, and similarly in Hull in 1866: “in 1856 the Society stood alone. It now has to encounter powerful rivals”.¹⁶⁵ I have established that these rivals were not other scientific groups: we can infer, therefore, that the reports refer to entertainment venues such as music halls – instituted in the 1850s but enjoying a renaissance – and

¹⁶¹ Halifax LPS, *Annual Report* 57 (1888), 7.

¹⁶² Halifax LPS, *Annual Report* 50 (1881).

¹⁶³ Sheppard, ‘Hull’s Contribution to Science’, 218. Original emphasis.

¹⁶⁴ Sheppard, *Yorkshire’s Contribution to Science*, 9.

¹⁶⁵ Halifax LPS, *Annual Report* 58 (1889), 10; HRI, *Annual Report* (1866–7), 7.

organised sporting events.¹⁶⁶ Leisure activities such as these, and the novel ‘consumer culture’ were gathering momentum in the 1890s.¹⁶⁷

Not all societies could feel so confident in the late nineteenth century as the flourishing Yorkshire Philosophical Society, whose situation in 1873 inspired “the strongest ground of confidence in the permanent prosperity of our society”.¹⁶⁸ Many other lit and phils failed to continue thriving, or to survive at all. The Halifax Society abandoned its lecture series altogether by the turn of the century; the Bradford Philosophical collapsed in 1905, and the Sheffield LPS suddenly disbanded in 1932 – developments that were related, I would contend, to their lack of permanent premises. Another contributing factor may have been that the lit and phils, unlike the field clubs and museums, did not co-operate in county- or national-scale unions. The general demise of the science lecture at the lit and phil, while varying from town to town, was quite clearly evident overall. Only a handful survived to flourish once more in the twentieth century. The era of the popular scientific lecture was over, and, as I show in chapter 4, civic colleges shouldered the mantle of lecture-based science pedagogy.

The mechanics’ institutes, meanwhile, continued to enjoy rude health and large memberships. Although their activities diversified in the late century, lectures and classes continued to be their mainstays. Part of the reason for the continued success of the institutes (and the source of much criticism in the mid-century) was the diversification of their lecture content from rigid science-based didacticism to include more entertaining topics such as music and literature. This development mirrored the changes in the lit and phil lecture subjects, and similarly, fewer lectures overall were being delivered by the end of the century, and fewer of those remaining were on science. In Leeds, an average of 19 lectures were delivered per session in the 1890s, compared with over 40 in the 1850s. Of these, only four were in scientific subjects.¹⁶⁹ Elsewhere in the county, the Wakefield Institute gained a reputation for excellence in lecturing, whereas the Halifax and Huddersfield institutes all but abandoned their lecture programmes. The YUMI struggled to maintain interest in the lectures by encouraging more illustrations and demonstrations and circulating a list of lecturers with the subjects they offered. (Frank Curzon of Leeds, the Union’s salaried agent from 1871 to 1902, offered a great range of lectures, including a

¹⁶⁶ Best, *Mid-Victorian Britain*, 218–249.

¹⁶⁷ Golby and Purdue, *The Civilisation of the Crowd*, 164–182; Gunn, ‘The Public Sphere, Modernity and Consumption’; Meller, *Leisure and the Changing City*, 1–18; Walvin, *Leisure and Society*, 60–125.

¹⁶⁸ Kenrick, ‘A Retrospect’, 44.

¹⁶⁹ In 1855, 781 lectures were delivered under the auspices of the YUMI; a decade later this number had halved, and by 1881 only 110 lectures were delivered. (Hemming, ‘The Mechanics’ Institute Movement’.)

course of physiognomy.¹⁷⁰) Lecture audiences notwithstanding, however, the YUMI was flourishing by the turn of the century.

2.7 Conclusion

And so we have watched Miall embark on a career that runs through this thesis. In doing so, a detailed picture of the culture of scientific lecturing has emerged. The scene for the following chapters has thereby been set, and the existing forums for education, entertainment and display have been established. I will use this as a point of comparison for other, younger groups that I study in the following chapters. The present chapter is also pertinent to the present study in its own right and to a number of debates concerning Victorian society: the dominance of the middle classes in provincial civic culture; the construction of professional identities in both metropolis and province; the endurance of the scientific lecture in the later nineteenth century; and the debates over what constituted education and what entertainment.

That the middle classes dominated the philosophical societies is unquestioned; I have also re-iterated that by the late century they also controlled and largely comprised the membership of the mechanics' institutes. Attending scientific lectures and conversaciones was an acceptable leisure pursuit for a middle-class adult: it was morally rewarding, intellectually expanding, and best of all, as a member of the audience one was visibly participating in such an activity. Moreover, membership and patronage of philosophical societies and mechanics' institutes were crucial for any budding civic grandee, as the presence of the Salts and the Baineses confirms. I demonstrate in later chapters the extent to which persons of the middling sort set about conquering all the other sites for life science in late Victorian Yorkshire. Like these other groups, as Inkster argues, philosophical society and mechanics' institute were firmly embedded in the matrix of civic culture.¹⁷¹ Following Inkster, I have demonstrated here and I will reinforce later the value of studying the sites for scientific lectures alongside the other institutions in the Victorian town.

In this chapter I have also planted the seed of a tale that will grow throughout the following chapters: the story of the construction of professional identities in late Victorian biology. This endeavour had already begun in earnest in London and Cambridge, and we have seen the extent to which the metropolitan men of science patronised those in

¹⁷⁰ YUMI, *Reports* (1871–1902).

¹⁷¹ Inkster, 'Science and the Mechanics' Institutes'.

Yorkshire who wished to do the same. It has also become clear that Yorkshire lecture audiences were vital for those professionalising men of science in metropolis and province, museum and laboratory alike, through their commitment to lit and phil lecturing. Provincial Mialls and metropolitan Huxleys alike needed to get their names into middle-class parlours, their books onto middle-class shelves. I have shown how the society members used the lectures; the lecturers likewise used the audiences, in this case to establish themselves as experts. It was not only professionals who were constructing new identities in the philosophical halls, however: through the specialisation within the societies and the formation of the Yorkshire Union of Mechanics' Institutes, we see early signs of the re-constitution of amateur identities.

The eagerness of the budding professionals and the enthusiasm of the civic-minded middle-classes combined to keep the philosophical societies thriving throughout much of the late century. The mechanics' institutes also survived well past the mid-century demise attributed them by contemporary and historian alike. As Laurent argues, there are good reasons for extending the study of mechanics' institutes into the late century, especially in the textile districts.¹⁷² (The Bradford, Leeds, Huddersfield and Keighley Institutes all averaged over 1,000 members each in the second half of the century.) That the lecture programmes became more eclectic and populist did not signal their demise. Contrary to Sheppard's complaints, the magic lantern was not a contributing factor to the decline of the scientific lecture – rather, such technologies of display kept the attention and the attendance of the audiences for decades, even if, as he claimed, the medium obscured the message. The significance of the visual is even more visible in the following chapter, in which I move from the lecture theatre to the museum.

Nevertheless, by the 1890s lecture audiences *were* dwindling. We cannot pinpoint just what *did* prevent the audiences from attending later in the century, or to judge whether the councils were justified in decreasing the science content of the programmes. For although critics condemned the philosophical societies for devoting more space to entertainment and less to education, as Inkster has pointed out, the distinction between lecturing for instruction and for entertainment was always hazy.¹⁷³ The modest endurance of the mechanics' institutes thereby contrasts with the faltering fate of many of the philosophical societies. It is difficult to explain the difference in their fates: why would they have fared differently in the face of competition within the commercialised leisure

¹⁷² Laurent, 'Science, Society and Politics'.

¹⁷³ Inkster, 'The Public Lecture'.

market? The efforts of the YUMI certainly bolstered the mechanics' institutes, but they did not have the power to generate audiences.

Against the backdrop of the life science lectures and their eventual decline, in further chapters I trace the emergence of new sites and groups for the practice of life science. The collections of the philosophical societies formed the core of many of the civic museums that emerged in the later century, and in the following chapter I trace the 'municipalisation' of these institutions, the transition from elite society to (purportedly) public museum. As Meller argues, however, the transfer of cultural institutions to corporations did little to diminish the extent to which they operated under bourgeois control.¹⁷⁴ The philosophical societies played a crucial role in the formation and early years of civic colleges in Leeds and Sheffield, although, as I outlined above, the Sheffield LPS was not rewarded for its efforts. In my penultimate chapter, I show that while the lecture hall may have decreased in popularity as a site for life science, we should not infer from this a decline in the following of natural history as a pursuit, given the massive growth in middle-class field clubs.

¹⁷⁴ Meller, *Leisure and the Changing City*, 65–71.

Chapter 3: Museums and Natural History

Louis Miall left the struggling Bradford Philosophical in 1871, to take up the position of curator (and later secretary) of the Leeds Philosophical and Literary Society, whose museum was housed in the grand Philosophical Hall on Park Row. In this chapter, I discuss the collections, arrangement and display of life science there and in other Yorkshire museums. The transition from élite philosophical society collections to public municipal museums is a central theme of this chapter. It provides a bridge between exclusive society (Miall's first post – see chapter 2), and civic college (his final place of employment – see chapter 4). The institutions that feature most prominently in this chapter – in Hull, Leeds, York and especially Sheffield – exhibit different stages of this transition, and together they present a broad spectrum of objectives and practices in the last decades of the nineteenth century. Studying a variety of museums thereby provides a powerful tool for the comparison of 'philosophical' and 'municipal' life science. Both were dominated by the middle classes, but, as I shall argue, in different ways and for different reasons.

Philosophical and municipal museums coexisted and competed with other sites of exhibition, including private and commercial museums, which I discuss in the first section. I then examine the duties of the curator and other museum staff, in which, as throughout, I focus on Elijah Howarth and the Sheffield Public Museum (SPM). Next I transfer attention from the social realm to the physical, looking briefly at museum buildings, fittings and the 'architecture of display', before introducing the collections themselves, their acquisition, cataloguing, labelling and display. Finally, I will piece together what I can about museum visitors and their experiences, and it will become clear how important museums were as a site for the public at large to experience natural history.

My aim is to combine macro- and micro-level history, from debates on the role of museums in Victorian society to intimate details of collection and display. Like many historians, I study in detail the *place* of natural history in museums, from building to cabinet. Unlike many scholars, however, I also pay attention to the *practice* of museum curators, their day-to-day activities, and their efforts to construct a professional community. Historians of science have largely ignored these issues, given that many of these practices fall outside even an expansive definition of scientific research.¹ Curators, however, comprised only one section of a varied community who were involved with civic museums.

¹ A notable recent exception is MacGregor, and Headon, 'Re-Inventing the Ashmolean'.

It was the same public-minded middle class who flocked to the halls of the philosophical societies and went on excursions with the naturalists' clubs, who supported provincial museums. The same generous citizens who endowed libraries and colleges also donated specimens to the museum, leaving their busts to watch over the collections. It makes sense, therefore, to pay careful attention to the organic relationship between general civic life and the philosophical society, museum and other institutions. I want to situate natural history collections within a dense network of civic institutions and individuals through acquisition routes and the control of public museums. Natural history, like other areas of the civic museum, comprised a cultural and symbolic resource for the maturing middle classes, used in different ways in different towns. Pointon has noted the "marked paucity of detailed published research which links the often wide-ranging theoretical concerns of 'museology' with historically specific situations".² Hill's recent thesis has begun to fill this gap: and the present study aims to continue this trend.³

3.1 Museums Bright and Beautiful

The forty-or-so museums in late nineteenth-century Yorkshire (see appendix 2) fulfilled a wide variety of functions in civic life. I discuss their ostensible purposes roughly in order of their emergence, from private and commercial to philosophical, and then to public and educational. The later traditions supplemented, but did not entirely eclipse, the earlier types, and rarely did one museum subscribe exclusively to any single ethic: but by the end of the period in question, most prominent museums were predominantly educational.

3.1.1 Private and Commercial

Private cabinets were among the manifold precedents of museums discussed in chapter 1. The private museums of Ralph Thoresby of Leeds in the seventeenth century and George Wallis of Hull in the 1780s were among the earliest recorded collections of natural history in Yorkshire.⁴ These collections were gathered by the individual and generally kept for the viewing of only more prestigious visitors: as Henry Flower, curator of the British Museum Natural History collections, wrote, "they were maintained mainly for the gratification of the possessor or his personal friends".⁵ Charles Waterton of Wakefield continued the private tradition in the Victorian era. Waterton, the Catholic 'squire of Walton Hall' and author of

² Pointon, 'Introduction [to *Art Apart*]', 2–3.

³ Hill, 'Municipal Museums in the North-West'.

⁴ Brears and Davis, *Treasures for the People*, 2–5, 10–11.

⁵ Flower, 'Address', 5.

Wanderings in South America (1825), gathered around him an eclectic collection of bizarre taxidermic specimens and turned his grounds into one of England's first nature reserves.⁶ By the later century, however, the remaining private museums, like the Ruskin Museum in Sheffield, were “not a collection of curiosities, [nor] a taxidermic lumber-room of stuffed objects, of beetles and butterflies and uncomfortable creeping things impaled with pins on cardboard, an assemblage of monstrosities that are fabulous like the phoenix, or extinct like the dodo”.⁷ Instead, the Guild of St George, who ran the museum on Ruskin's behalf, designed it for the public at large, and subscribed to a more pedagogical ethic. (The Ruskin Museum has been examined in detail elsewhere, and so I do not dwell upon it here.⁸)

While private collectors kept museums for their own pleasure, other collections were amassed as business investments. The first museums to admit casual visitors had been those institutions that sought to generate an income from them: the commercial museums. Where private collections ensured exclusivity by selection, commercial ventures were open to any who could afford the entrance fee. Proprietors of curiosity shows such as the peripatetic ‘Liverpool Museum of Natural and Foreign Curiosities, Antiquities and Various Productions of the Fine Arts’ funded themselves either through large admission fees or by offering their specimens for sale. There was no clear distinction between taxidermist's shop and museum: the animal preserver Robert Dunn's ‘museum’ in early nineteenth-century Hull was “little more than a showroom for his own products” and John Calvert founded his Commercial Street museum in 1795 (the Leeds ‘Old Museum’) as a base for his trade as a birds dealer and gun-maker.⁹ Robert Cundall also made a living from his Victoria Museum on Beckett Street, Leeds, from 1865 to 1880. A variety of natural curiosities and a large library attracted admissions, and Cundall supplemented his income by selling mounted birds and insects.¹⁰ Despite surviving fierce competition throughout the nineteenth century from fairgrounds, menageries and other shows, by the 1890s commercial museums were all but extinct. Among the last in Yorkshire was that of Seth Lister Mosley in Beaumont Park, Huddersfield. Mosley (1848–1929), who had been inspired by Waterton's *Wanderings*, was a painter-decorator who had set up as a professional

⁶ Barber, *The Heyday of Natural History*, 99–110; Edginton, *Charles Waterton*, 177–211.

⁷ Bradbury, ‘The Ruskin Museum’, 13. Emphasis added.

⁸ Barnes, *Ruskin in Sheffield*; Brears and Davis, *Treasures for the People*, 44–45; Greenwood, *Museums and Art Galleries*, 145–149; Hewison, *Art and Society*; Hunt, *The Wider Sea*, 329–405.

⁹ Brears and Davis, *Treasures for the People*, 11. The Old Museum fell into decline in the 1850s; Mr Linsey bought the entire stock in 1872, opened it to the public again for two years, then auctioned off the entire contents.

¹⁰ Cundall, *Victoria Museum Annual*.

natural history artist, taxidermist and as a curator of a series of commercial museums.¹¹ Upon his appointment as curator of the Huddersfield Technical College museum (see chapter 4), however, Mosley “cease[d] to ‘deal’ in natural history specimens”.¹²

This typology of museums mirrored the development of libraries during this period. Yorkshire, like the nation at large, had a strong tradition of private subscription libraries, including the oldest surviving specimen of its type, on Commercial Street in Leeds (on whose committee Miall served in 1873).¹³ After the foundation of the Leeds and Halifax Libraries in 1768, Bradford, Sheffield, York, Scarborough and Whitby followed suit.¹⁴ By the mid nineteenth century, commercial circulating libraries were big business, and Charles Mudie’s enterprises in this area were especially successful.¹⁵ Many of these, however, were absorbed or replaced by Free Libraries in the later century, just as private and commercial museum collections were taken over by the corporations. Between private and municipal, however, there was another breed of museum and library: those run by philosophical societies.

3.1.2 Philosophical Museums

From the 1820s, a new rationale for museums – neither private nor commercial – had been especially strong in Yorkshire. The philosophical societies detailed in the previous chapter included museums from the outset, and societies such as Whitby and York owed their very existence to their collections.¹⁶ Such a society, recorded the Hull LPS, “is not simply an institution, the only business of which it is to provide first-class lectures on literary and scientific subjects, but it has also to give the [natural] sciences a permanent home, where they may be illustrated by a continually increasing number of appropriate specimens”.¹⁷ These museums, which provided “a guarantee for the prosperity and usefulness of the society” were founded in Leeds in 1822, and following its success, in Whitby, York and Hull in 1823; Scarborough in 1829 and Halifax in 1831.¹⁸ (Those societies founded much later than the Regency, such as the Bradford and Wakefield Societies, generally failed to support a museum.) Although the public were provisionally admitted, the collections were

¹¹ Davies, ‘The Making of a Municipal Museum’; Mosley, ‘Autobiography’, ‘Reminiscences’.

¹² *Naturalists’ Journal* 9 (1900), 143.

¹³ [Beckwith], *The Leeds Library*, 59–83.

¹⁴ The ‘Gentleman’s Library’ opened in Sheffield in 1771, and other private libraries followed in Bradford in 1774, in Hull and Whitby a year later and in York in 1798. Hull had circulating libraries from as early as the 1740s and a subscription library from 1775, which was housed alongside the museum in the Royal Institution from 1855. (Nattriss, ‘Libraries’.)

¹⁵ Altick, *The English Common Reader*, 294–317.

¹⁶ Brears, ‘Temples of the Muses’; Browne, *Chapters of Whitby History*; Forgan, ‘Context, Image and Function’.

¹⁷ HRI, *Annual Report* (1866–7), 10.

¹⁸ HRI, *Annual Report* (1871), 11.

mostly for the benefit of the members of the parent society. The fate and fortune of Yorkshire Philosophical Society was especially tied up with its museum and grounds, the access to which was the most popular reason for joining the society. Occasionally, a museum might be thrown open to all on a weekend or holiday, perhaps genuinely to educate all classes, but more likely as an effort to increase membership by giving a brief taster of its benefits.

Of all the collections in Yorkshire, the philosophical museums were most often geared towards research. Miall was particularly active in this respect at the Leeds Museum, and his research retained this museological bent long after he took up his post at the Yorkshire College. Most famously, he spent three years dissecting an elephant, which he heralded as the most detailed anatomical study of its kind. He later explored the properties of glycerine jelly as a mounting fluid, which he published in *Nature*, and used in practice at the museum. In 1874 the Geological Society of London awarded Miall a research grant, probably on the strength of his research at the museum. He continued his palaeontological work in 1883, when an almost-complete *Megalichthys hibberti* was brought to the museum from a local pit (by a pit manager trained in coal-mining at the Yorkshire College).¹⁹ The Yorkshire Museum in York, like the national museums, was an active centre for comparative anatomy; a branch of science best carried out at a site containing such a vast variety of specimens. Researches into life histories, a subject of interest in lab, field and museum alike, were best performed, argued museum practitioners, with access to a massive, well-ordered collection. Curators repeatedly insisted on the importance of museums as storehouses for taxonomic identification and comparison.²⁰

The impact of the 'new museum' idea discussed in chapter 1 can clearly be seen in Miall's organisation of the Leeds Phil and Lit museum. Soon after his appointment, Miall was arguing that "it would be in all respects beneficial to separate more typical and easily understood examples from the obscurer and minuter objects, valuable only to the close observer".²¹ The bulk of the entomological and conchological collections were reserved for detailed study. Unlike the stuffed avifauna intended for display, Miall's assistant William Eagle Clarke donated a collection of bird skins for the express purpose of detailed research. Later, Miall became even more explicit in his support for the new museum idea, writing, "it may be thought practicable to divide the objects in a great public museum into two sets, one arranged to suit the convenience of experts, and the other adapted for

¹⁹ Kitson Clark, *The Leeds Philosophical and Literary Society*, 145–150; Miall, *Description of the Remains of Megalichthys*.

²⁰ Flower, 'Address'; Pyrah, *The History of the Yorkshire Museum*, 81–119.

²¹ LPLS, *Annual Reports* (1876–7), 10; LPLS, *Annual Reports* (1884–5); Miall, *Guide to the Museum*.

popular instruction”.²² Although Miall was seeking thereby to re-establish the museum as a site of research expertise, by the turn of the century it is clear that both curators and visitors were spending less time on research. During his successor’s curatorship “very few applications to study the collections [were] made”.²³ By this time, however, Miall was focussing his efforts on the construction of a laboratory élite, and most museums were arranged with the public audience in mind rather than the researcher.

3.1.3 Public Museums

Over the last quarter of the nineteenth century, most philosophical museums in Britain gradually evolved into *public* museums (a process that occurred later in Yorkshire than much of the rest of the country). There was a fourfold increase in public museums between 1850 and 1900.²⁴ The fruits of the Victorian ‘museum movement’ from the 1870s to the 1910s were corporation-owned, layperson-orientated and usually free to enter, allegedly motivated neither by profit nor the elevation of the status of a society and its members. By 1911, 225 towns in Britain had at least one museum, and the majority of these were public (see appendix 2). The general populace had been permitted access to some museums in Yorkshire since the eighteenth century, and nationally since 1753, when the British Museum was founded with the collections of Sir Hans Sloane, but not until the late nineteenth century were museums ostensibly designed for public at large rather than for the benefit of the proprietors and other savants.²⁵ Parliament had given local authorities the power to levy a penny tax to maintain museums and free libraries in the Museum Acts of 1845 and 1850; boroughs such as Ipswich took advantage of this from the early 1850s.²⁶ That champion of civic pride, Joseph Chamberlain, backed by Sheffield’s own A.J. Mundella, barracked the Commons for nationwide provision for local museums, to be run by municipal committee rather than an individual or society.²⁷ Unlike other parts of the country, however, Yorkshire towns were slow to take advantage of the Acts, largely because of the strength of the philosophical museums in the county. It was not until the struggling societies handed their collections to the corporations in the late century that public museums became commonplace.

²² Miall, *House, Garden and Field*, 289.

²³ LPLS, *Report of [...] A Committee*, 2.

²⁴ Bennett, *The Birth of the Museum*, 69–75; Lewis, *For Instruction and Recreation*, 1–17; Pearce, *Museums, Objects and Collections*, 98–109.

²⁵ Ralph Thoresby’s museum in Leeds thrived from the late seventeenth century until 1726. The Kirkleatham Museum was open from 1738 to 1948. (Brears and Davis, *Treasures for the People*, 2–7.)

²⁶ The Ipswich Museum went to the town in 1853. (Markham, *A Rhino in High Street*.)

²⁷ Anon., ‘Local Museums’.

Sheffield witnessed this transfer first. The lit and phil relinquished their collections in 1875, ostensibly because they felt “the Museum might be made of Greater general use to the town at large”, but the decision probably owed more to their chronic accommodation problems.²⁸ Thomas Hime, the society’s honorary curator, ensured that the proposed accommodation was suitable and although the SLPS continued to donate, they held no sway over museum practice.²⁹ Twenty years later, the Halifax Lit and Phil were desperately trying to liquidate their debt, and they observed that their museum “has for many years been the least used of the Society’s departments, and keeping it in order for the small number of visitors who have paid [1d] for admission has entailed considerable expense”. As a solution, they “wished to see the valuable collections made more useful and placed in safe keeping, and at the same time to relieve the Society of the expense of maintaining the Museum”, so they transferred the collections to the corporation’s Belle Vue Museum in 1896.³⁰ The Hull Corporation, rich from the town’s shipping industry, had first proposed to add a storey to the Royal Institution for an art gallery, then agreed in 1900 to shoulder responsibility for the badly-attended and poorly-arranged museum as well. This was at the suggestion of the financially strapped Hull LPS, who were far more concerned with its lecture series by this stage anyway, and had always tried to make their amenities accessible to the public. In other parts of the county, the Ilkley Museum and Antiquarian Society submitted their collection to the town in 1891; the Brighouse Library museum went to the town in 1898; the Keighley Scientific and Literary’s in 1899; and the Huddersfield Literary and Scientific Society, along with their collections, was absorbed into the technical college at the turn of the century. The corporations in Leeds and in Scarborough, by contrast, were to wait until 1921 and 1937 respectively. The York Museum, possibly the most successful philosophical museum in the country, finally went to the town in 1961. The reluctance of these institutions to relinquish their collections was roundly criticised around the turn of the century by zealous public-minded museum practitioners such as Sheppard and Elijah Howarth of Sheffield.³¹

Appendix 2 shows that literary and philosophical societies were not the only such groups to plant seed museums: many naturalists’ clubs followed suit later in the century, and like the lit and phils, their museums often grew to be the *raison d’être* of the society (notwithstanding the expense incurred). In the late century, a number of working men’s natural history groups in the West Riding, as in Lancashire, continued to set up small

²⁸ SLPS, *Annual Report* (1871), 4, *Minutes of the Council Meetings* (1870).

²⁹ SLPS, *Annual Report* (1876); SPM, *Museum Sub-Committee Minutes*.

³⁰ Halifax LPS, *Annual Report* 65 (1895), 8.

collections in public houses – giving rise to ‘Inn-Parlour Museums’.³² Many municipal museums were established with the collections of the local field club as the backbone of the natural history collection (which was particularly the case in Huddersfield, largely through the efforts of the energetic Seth Mosley). Many different groups within the network of voluntary associations contributed to museums, and natural history collections were utilised by a wide variety of civic groups. Nineteenth-century public museums were founded on the same wave of civic pride that produced free libraries, assembly rooms, town halls and city gardens. (Sheffield, Hull and York all had lavish gardens, run variously by society and corporation.³³) As Thomas Greenwood, editor and free library campaigner (who had worked in a Sheffield branch library) wrote in 1888, “a Museum and Free Library are as necessary for the mental and moral health of the citizens as good sanitary arrangements, water supply and street lighting are for their physical health and comfort”.³⁴ Corporations took control of museums as they did many other civic amenities during the late-century municipalisation.³⁵

3.1.4 Museums and Civic Life

In the hands of the corporation, the museum became an even more integral part of the organism of urban provincial life. In 1887, Frederick Mappin proudly announced at the opening of the gallery endowed by his uncle John Newton Mappin:

Every child in Sheffield will have schools that are almost now and will be entirely free; free libraries; free parks; a free museum, and a free picture gallery, [...] and with Firth College [...], I believe that we may say that we have in Sheffield everything which is calculated to supply intellectual food and intellectual enjoyment, and to elevate and refine the pleasures of this vast population.³⁶

Museums, as Forgan and Gooday argue, were but one facet of an inter-related system of civic education and improvement, acting in tandem with other institutions.³⁷

Civic museums continued to enjoy a vital relationship with other scientific groups and institutions aside from their parent society, largely due to the extensive personal connections with local clubs cultivated by curators. The Museums Association

³¹ Museums Association, *Report 8* (1896); *Museums Journal* 1 (1901–2).

³² Mosley, ‘Inn-Parlour ‘Museums’’.

³³ Sheffield Town Trust, *Botanical Gardens Minute Book* (1899), *Botanical Gardens Ledger* (1899), *Bye Laws [...] of the Sheffield Botanic Gardens*, Markham, *The Book of Hull*, 75–92; Hingston, ‘The First Fifty Years of Museum Gardens’.

³⁴ Greenwood, *Museums and Art Galleries*, 389; DNB.

³⁵ Hill, ‘Municipal Museums in the North-West’.

³⁶ Cited in Brears and Davis, *Treasures for the People*, 49.

recommended that curators enlist the help of members of the various learned societies and colleges in the town. This strategy was effectively employed by Thomas Sheppard of the Hull Museum, who, as President of the Hull Scientific and Field Naturalists' Club, fostered close relations between the two organisations. "I think we can claim in Hull", he told the club in 1906, "that the greatest harmony exists between local scientific societies and the museum, to the advantage of both."³⁸ Similarly in Leeds, Sheffield and York, curators lectured extensively to clubs and societies in the towns and surroundings areas. Clubs donated regularly to the museums, and in return were able to use the museum buildings for their meetings and exhibitions. Museums provided an architectural focus for the cultural life of the town, and aside from the naturalists' clubs, non-scientific civic societies and associations also used the buildings – often one of the grandest in the town – for various functions and meetings.

The exact administrative location of the public museum in the civic establishment varied from town to town. In Hull, the Property and Bridges Sub-Committee ran the museum, whereas in Sheffield it was organised alongside the free libraries. Prominent local dissenters with fingers in many pies and interests in science such as Robert Leader and (Mayor) John Pye Smith sat on the Sheffield Museum Committee, which was spearheaded by Alderman W.H. Brittain (later president of the Museums Association). Hill has demonstrated how far these committees were dominated by the urban middle-class élite.³⁹ The committee members usually concurred with the curator's suggestions regarding the details of museum practice: their most important function was to control the municipal purse strings. The sum available rarely exceeded £1000 per annum in Sheffield; and the further expense incurred by branch museums rapidly absorbed the additional funds generated after the corporation added half a penny to the Libraries and Museums Levy (as the 1891 Museums and Gymnasiums Bill allowed them to do).⁴⁰ No museum was well off: Sheppard's expenditure was consistently over-budget, and the philosophical museums – even the Yorkshire Museum with its subscriptions and garden gate income – were riddled with debt. The early 1880s were particularly fallow years, during those years when the middle classes felt they were in the depths of the 'Great Depression'; the only way to

³⁷ Forgan and Gooday, 'A Fungoid Assemblage of Buildings', 'Constructing South Kensington'; Forgan, 'But Indifferently Lodged...'

³⁸ Sheppard, 'The Relationship between Provincial Museums and Local Scientific Societies', 2, 'Round the Hull Museum'; *Museums Journal* 2 (1902–3); *Hull Museum Publications* 10 (1902).

³⁹ Hill, 'Municipal Museums in the North-West'.

⁴⁰ Borough of Sheffield, *Annual Report of the CFPLM* (1875–1905).

extend the buildings or purchase large collections was to lobby persistently the same deep-pocketed civic élite.

Howarth's £1000 per year, then, was among the largest in the county. This considerable sum was justified because Weston Park was providing a vital service to the city in educating its citizenry. At the opening of the extension of the Leicester Museum, John Burns, the president of the Board of Trade, proclaimed, "museums were absolutely essential if they were to provide for the great mass of people a nobler method of spending their leisure time than the public house".⁴¹ Museums were the ideal site for rational recreation, where the improvement and edification of the public could be carefully managed. The museum, although like the library and the city garden potentially a place of entertainment, was contrasted with less worthy – but perhaps more entertaining – sites such as the sports field, or even worse, pubs and gin palaces. Indeed, Henry Crowther of Leeds wrote in 1905 of "these dark days when the manhood of this country is bent on watching sport".⁴² Within philosophical and public museum alike, however, disputes raged regarding the form this rational recreation should take.

3.2 Pedagogy and Universality

Augustus Pitt-Rivers in Oxford and other liberal reformers such as Edward Forbes at the Museum of Economic Geology in London hoped their respective museums might generate a population of self-directing, self-managing citizens. Museum scholars argue that working men were to be imbued with reliability and orderliness by their experience in these institutions.⁴³ The very attendance of the working classes at the municipal museum, however, is as uncertain as their resultant transformation into super-citizens. Here I agree with Forgan and Yanni that Foucault's emphasis on power when analysing spaces such as museums obscures the multiple meanings of buildings.⁴⁴ Even when curators set out their museums for educational purposes, there was a variety of pedagogical modes their displays could take, for a range of audiences.

⁴¹ Cited in Howarth, 'Presidential Address', 34.

⁴² Crowther, 'The Museum as a Teacher of Nature-Study', 9.

⁴³ Bennett, *The Birth of the Museum*, 17–108; Pearce, *Museums, Objects and Collections*, 1–15; van Keuren, 'Museums and Ideology'.

⁴⁴ Forgan, 'But Indifferently Lodged...'; Yanni, *Nature's Museums*, 8–11. Neither does a Foucauldian approach to the history of museums take sufficient account of the evolution of collections and spaces subsequent to their establishment.

3.2.1 Museums and Education

Whether they were opportunities for working-class enlightenment or tools of the bourgeoisie, museums were universally heralded as “the educational stock in trade of the nation”.⁴⁵ Ruskin’s museum in Walkley, near Sheffield (later transferred to Meersbrook Hall under the corporation), was certainly intended as such.⁴⁶ Sir Jonathan Hutchinson (1828–1913), president of the Royal College of Surgeons, advocated educational museums in every town and to set an example he founded them himself in Selby and (famously) in Haslemere.⁴⁷ The museums at Halifax and Hull were also geared towards education: in the former, William Bunting Crump saw the curator’s role as that of a teacher; and Sheppard similarly argued “that a museum is essentially of value from a purely educational standpoint”.⁴⁸ Howarth set out “to develop the museum on lines in accordance with the educational, scientific, and public requirements of the time”.⁴⁹ By 1891 he was satisfied with the “valuable and instructive collections that have been brought together for [the public’s] benefit”.⁵⁰

The Leeds Museum, by contrast, was slower to respond to this trend, and remained largely research-oriented under Miall. Despite his ostensible new museum commitment to both research *and* display, he admitted “the nearer [museums] approach to scientific completeness, the less fitted will they become for popular instruction”.⁵¹ After leaving the society Miall set about constructing a laboratory-based professional identity *in contrast* to that of (other) museum practitioners, prompting him to criticise fiercely the effectiveness of the museum as a pedagogical site, as discussed in chapter 6. Although he did teach in the museum, this was largely for the benefit of students at the Yorkshire College.⁵² The geological collection, especially, was aimed at mining students, and it is clear that the various specialist guides to the museum written by Miall were largely aimed at more advanced scholars.⁵³

The only concession Miall made to elementary education was to implement a series of Christmas lectures for schoolchildren. Reverend Henry H. Higgins, first president of

⁴⁵ Anon., ‘Local Museums’.

⁴⁶ Ruskin Museum, *Reports*; Ruskin, Letters to E. Tozer; White, *A Popular Handbook to the Ruskin Museum, A Descriptive Catalogue of the Library*, ‘The Function of Museums’.

⁴⁷ Museums Association, *Report* (1893); Smythe, ‘The Educational Role of Museums’.

⁴⁸ Crump, ‘Belle Vue Museum’; Sheppard, ‘Educational Advantages of a Museum’, 8.

⁴⁹ Howarth, ‘Notes on the Sheffield Public Museum’, 114.

⁵⁰ Borough of Sheffield, *Annual Report of the CFPLM 35* (1891), 6; Howarth et al., *Report on Suggested Extension of Sheffield Public Museum*.

⁵¹ Miall, *House, Garden and Field*, 289.

⁵² LPLS, *Annual Reports*.

⁵³ Miall, *Descriptive Guide to the Mineral Collection, Descriptive Guide to the Fossil Collection, Descriptive Guide to the Collection of British Birds*.

the Museums Association, was the earliest (or if not, the loudest) advocate of schoolchildren's use of museums, implementing a scheme of loans to local schools from the Liverpool Free Museum in 1884.⁵⁴ This extramural approach to 'nature study', favoured particularly by Howarth, was supplemented or substituted in different museums with an intramural lecture scheme.⁵⁵ Crowther continued Miall's efforts in this respect, expanding the Christmas lectures into a year-round 'Leeds Schools' Museum Scheme'. Implemented in 1901, the scheme involved around 15,000 children,

from the upper standards of the Elementary Schools [who] visit the Museum in batches of about 340 [...] and hear a lecture delivered by [Crowther]. The lecture [...] is illustrated by appropriate lantern slides specially prepared by the Curator for the purpose. Afterwards the children [...] proceed to inspect various rooms of the Museum. In each room four or five specimens or cases of specimens, to which attention has been drawn in the lecture, are placed in conspicuous positions, and round these the children are gathered whilst the teacher in charge points out their most important features.⁵⁶

The lectures and displays were designed to instil powers of observation into the children. The route they were intended to follow is illustrated by figure 3.1. At the Hull Museum, too, "the children teem in literally by the hundred".⁵⁷ Sheppard's school system was modelled on Crowther's, and probably attracted even more pupil visitors. He gave hundreds of lectures to local schools at the museum.⁵⁸ At York, Platnauer quietly implemented a smaller-scale system in the early 1900s.⁵⁹

Crowther hoped that nature study might serve to elevate the status of the museum in general; he wrote in 1905, "I long for the time when there shall be a revival in museum work, a honest recognition of its value to the nation; hence my pleasure that nature study is now recognised as a branch of elementary education."⁶⁰ Through nature study curators reasserted the significance of the museum, and provided a site for the continued interaction between amateurs and professionals.⁶¹

⁵⁴ Smythe, 'The Educational Role of Museums'.

⁵⁵ Allen, *The Naturalist in Britain*, 181–184; Crowther, 'The Museum as a Teacher of Nature Study'; Howarth, 'The School Museum System at Sheffield'; Jenkins, 'Science, Sentimentalism or Social Control?'; Jenkins and Swinnerton, 'The School Nature Study Union'; Smythe, 'The Educational Role of Museums'.

⁵⁶ LPLS, *The Leeds Schools' Museum Scheme*, 1.

⁵⁷ Sheppard, 'Educational Advantages of a Museum', 12.

⁵⁸ In 1916, however, he lamented that nature study in schools "has not, as yet, made the slightest difference to the work of our natural history societies. There is no increase in their membership directly due to this cause". (Sheppard, *Yorkshire's Contribution to Science*, 10.)

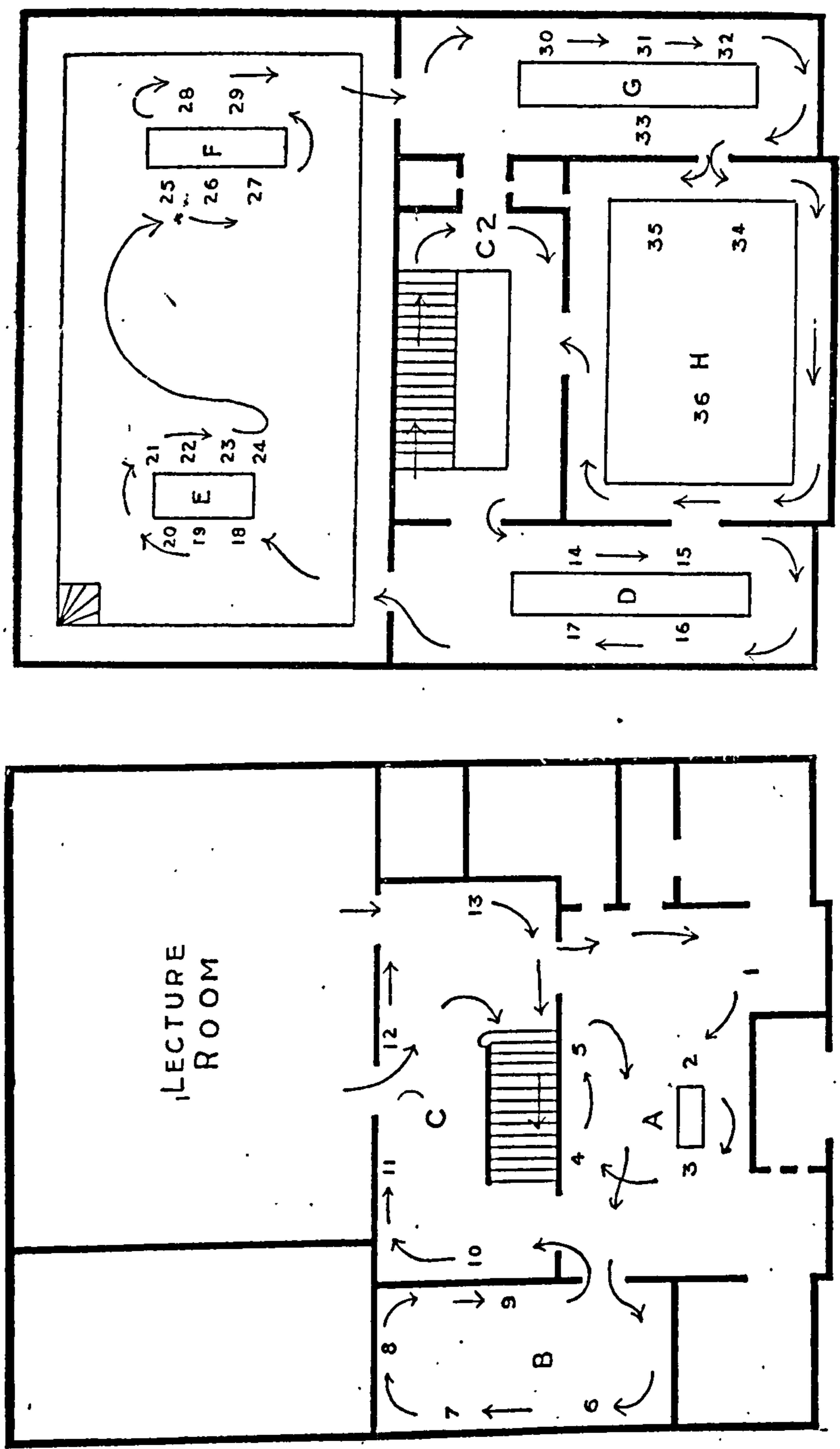
⁵⁹ YPS, *Annual Report* (1901).

⁶⁰ Crowther, 'The Museum as a Teacher of Nature Study', 9.

⁶¹ Allen, 'The Survival of the Amateur Tradition', 'On Parallel Lines'.

Figure 3.1: Scheme for Schoolchildren Visiting the Leeds Museum (1902)

[Source: L.P.L.S. Annual Report (1902-3)]



LECTURE ROOM

ROOMS.

- A.—Outer Vestibule.
- B.—Creek and Roman Room.
- C.—Inner Vestibule.
- C2.—Landings, &c.
- D.—South Geological Room.
- E and F.—Large Zoological Room.
- G.—North Geological Room.
- H.—Bird Room.

In passing round the Rooms and up and down the Staircase please Keep to the LEFT.

Note Specially the Cases as numbered according to Plan.

3.2.2 Universal versus Local

The use of museums in an educational capacity had long prompted a tension in their collecting policies. In order to fulfil a didactic role, some argued the museum should be a storehouse of *universal* information. Sheets-Pyenson contends that the drive for universal museums gave way to an emphasis on local collections towards the end of the nineteenth century.⁶² I would argue, in Yorkshire at least, that the two objectives coexisted, however uneasily, during this time. Howarth certainly attempted to accumulate a complete collection, aggressively acquiring foreign specimens and those that would “fill the gaps”.⁶³ Similarly, Miall felt “we have to consider the wants of residents as well as passing strangers, and what the residents interested in natural history require is a general collection of typical specimens which will teach them something of the elements of their science”, and the Leeds Museum was noted for the completeness of its collections.⁶⁴ Curators wielded these ‘universal’ collections both as the source of their superiority over field naturalists (whose knowledge was usually local), and to tantalise a public curious to view exotic specimens.⁶⁵

By the 1910s, however, Howarth conceded, “we cannot put the universe into a museum, [and] yet that fact is not always adequately realised by some curators, or those who come to museums, if we are to judge by their contents”.⁶⁶ Instead of capturing the entire natural world, Howarth decided that a provincial museum would serve best by accumulating a local collection. The volume of donations from the local area meant that the Sheffield Public Museum could indeed satisfy this objective, which was eminently more achievable for a struggling provincial institution than the garnering of a universal collection. Sheppard, on the other hand, had always believed that a local collection “is the only manner in which a provincial museum can properly accomplish good work, it being obviously absolutely useless to attempt to illustrate the various countries all the world over”.⁶⁷ The Yorkshire Museum had always been dominated by the geology of the area (although as I discuss below, they defined ‘local’ in somewhat broader terms).⁶⁸ “To form the Collection of a nature as local as possible is a right commendation;” agreed the Whitby LPS, “as the smaller museums are not able to vie with the larger in a general sense, they

⁶² Sheets-Pyenson, *Cathedrals of Science*, 3–23.

⁶³ Borough of Sheffield, *Annual Report of the CFPLM* 35 (1891), 5.

⁶⁴ Miall, ‘Museums’, 360.

⁶⁵ Crowther, ‘The Museum as a Teacher of Nature-Study’; Pearce, *Museums, Objects and Collections*, 75–103; Thomas, *Entangled Objects*, 126–151. I am grateful to Mr Sujit Sivasundaram for the latter reference.

⁶⁶ Howarth, ‘Presidential Address’, 34.

⁶⁷ *Hull Museum Publications* 10 (1902), 15.

⁶⁸ Keeping, *A Popular Handbook*, 33.

should excel them in those matters of interest for which their respective neighbourhoods are quoted”.⁶⁹

Gathering local specimens, the curators knew, was not always easy. As Sheppard noted, “they may not be quite so numerous, nor so easily acquired, as curios from abroad,” and as a result, “these represent only a small proportion of the whole”.⁷⁰ A particularly acute problem at York, as elsewhere, was their donors’ fascination for all things curious, which meant that their collections lacked basic, *common* specimens: the YPS Council noted in 1876 that their collection was “somewhat deficient in some of the ordinary forms, which no one has thought fit to supply, because they were within everyone’s reach”.⁷¹ In the following years, the situation was partially rectified thanks to the donation of a cow, a bulldog and the racehorse ‘Blink Bonny’.

The acquisition of local specimens was part of the move to engineer museums as treasuries of the past rather than showcases of the present. In this way, local museums would serve to assert civic identity and trumpet the natural and cultural heritage of the region. Joseph Chamberlain and other advocates of local museums saw this as the collections’ *raison d’être*, and from it arose the notion of museums as provincial palaces of preservation, keepsafing local history, archaeology and flora and fauna.⁷² Flower certainly stressed the preservative role of museums, and Sheppard advocated “the purely historical side [of museum practice]—how necessary it is that even the most common objects should be preserved”.⁷³ He later continued, “examples of local wild animals are so exceedingly rare, and so quickly becoming extinct, that it is necessary to preserve as far as possible any examples that may be met with”.⁷⁴ In this way, museums were a powerful tool for the implementation of the preservationist ethic in late Victorian natural history (see chapter 5).

I have outlined the arguments concerning the objectives of provincial museums, whether private or public, educational or entertaining, local or universal. Common to all this rhetoric, however, was a steadfast confidence that the museum and its practitioners were uniquely qualified to fulfil these roles, as museum professionals sought to maintain the kudos of the museum as a site. While museums declined as sites for active research, the didactic drive provided them with a crucial role in the propagation of science. There is no doubt, however, that by the opening decades of the twentieth century, museums were

⁶⁹ From the Whitby LPS *Annual Report* 1871, cited in Browne, *Chapters of Whitby History*, 171.

⁷⁰ Sheppard, ‘Round the Hull Museum’, 3, 4.

⁷¹ YPS, *Annual Report* (1876), 12.

⁷² Anon., ‘Local Museums’.

⁷³ Flower, ‘Address’; Sheppard, ‘Educational Advantages of a Museum’, 9.

⁷⁴ *Hull Museum Publications* 20 (1904), 33.

no longer hegemonic sites for British life science. In the rest of this chapter I will discuss the museum staff and buildings, examine their collections, and speculate on their visitors.

3.3 Museum Staff

The personality and expertise of the Victorian Curator often had a considerable impact upon his museum. Many stayed at their respective institutions for their entire working lives, moulding the museums to their character and interests. As William Flower wrote, “what a museum really depends on for its success and usefulness is not its building, not its cases, not even its specimens, but its curator. He and his staff are the life and soul of the institution”.⁷⁵ Elijah Howarth of the Sheffield Public Museum in Weston Park – whose staffing arrangements I discuss below in detail to illustrate the general case – later echoed Flower, arguing from decades of experience that “the position of the museum and that of the curator are unseperable. [...] They are linked by a living bond that vitalises them both. Be the collections never so good, they can only derive their museum value from their curator, for the curator is the museum, and the two components are so intertwined in amity that the museum never resents his absorbent domination.”⁷⁶ Similarly, Thomas Teale wrote of Henry Denny, Miall’s predecessor at the Leeds Phil and Lit museum, “he was virtually the Philosophical Hall Museum”.⁷⁷

3.3.1 Personnel and their Responsibilities

The individual curator’s impact on the museum was especially evident in the provinces, for unlike the metropolitan behemoths in London, Edinburgh and Dublin, provincial museums rarely employed more than one salaried curator. Their collections were unavoidably eclectic, and so the post required exceptional breadth and versatility. Howarth wrote of his duties,

Besides all-round knowledge, there is administrative ability, skill in mechanical device, a mathematical disposition towards system and order that brings each museum factor into its proper relation, and a natural gift for imparting knowledge through all the channels which a museum so amply affords. He is not only the collector, but much more, he is the interpreter of the collector, and essentially the

⁷⁵ Cited in Sheets-Pyenson, *Cathedrals of Science*, 26.

⁷⁶ Howarth, ‘Presidential Address’, 43.

⁷⁷ Teale writing in Kitson Clark, *The Leeds Philosophical and Literary Society*, 130.

teacher.⁷⁸

Henry Crowther, Miall's successor at the Leeds Museum, also commented on this breadth of expertise – “in curators of public museums are combined practical and theoretical nature knowledge, the experience of the field naturalist blended with the research of the student. [...] Curators love their museums with zealous tenacity”.⁷⁹ Whereas the field naturalist saw only a fraction of nature's bounty, the curator commanded a collection from many lands and eras.

There could be no denying the scope of their responsibility. Even in 1901, when the Sheffield Museum had a large staff, Howarth's duties at the Sheffield Public Museum were still onerous, including keeping in touch with various organisations outside the museum; inspecting and reporting on possible acquisitions; classification; arranging, labelling, cleaning, preserving and mounting new specimens; general administration and clerical duties; repairs; preparing catalogues and guides for publication and lecturing and attending to visitors.⁸⁰ (Daily records reveal that the most time-consuming of these tasks was the laborious sorting and labelling of new acquisitions.⁸¹) For over 50 years, Howarth “practically lived in [the] museum”.⁸² Born in 1854 on the Wirral, Elijah Howarth was hired by the Liverpool Public Museum in 1869, and within five years was appointed assistant curator. At the tender age of twenty-one he moved to Sheffield to take up the sole curatorship of the new museum in Weston Park, where he remained until 1927. He accrued expertise in a number of areas, including meteorology, archaeology, astronomy, and – foremost – zoology. Howarth kept up his connection with the Liverpool Museum, fostering an active exchange system across the Pennines and often travelling over in order to assist in identification and arrangement. During the course of his long involvement with the Museums Association (MA), of which he was a founder member, he edited their publications, sat on most of their committees, acted as secretary from 1892 to 1909 and president in 1913.

⁷⁸ Howarth, ‘Presidential Address’, 44.

⁷⁹ Crowther, ‘The Museum as a Teacher of Nature-Study’, 6.

⁸⁰ Detailed in Sheffield Free Libraries and Museum Committee, *Minutes* (1901).

⁸¹ SPM, *Daily Report* (1881–1885).

⁸² Howarth, ‘Presidential Address’, 35. Although the architects suggested attaching a curator's house to the museum, it was never built: Howarth lived at Holly Bank, Northumberland Road. (Gibbs, *Sketch for Museum*; BAAS, *Report* 57 (1887).) There does not appear to be a comprehensive biographical source on Howarth (1854–1939) – the following details were gleaned from Borough of Sheffield, *Annual Report of the CFPLM*; Museums Association, *Report*; SPM, *Daily Report* (1881–1885); Riley et al., ‘Sheffield City Museums’; Brears and Davis, *Treasures for the People*, 107–109; and from conversations and correspondence with Mrs Doris Parkin. Mrs Parkin worked in the SPM from 1926, the year before Howarth retired, until 1942. Towards the end of Howarth's time at the museum he became increasingly irascible, and eventually was asked to retire. (Parkin, ‘Reminiscences of a Museum Assistant’.) He was made Fellow of the Royal Astronomical Society in 1881; Fellow of the Zoological Society of London (nominated by Henry Flower) in 1896.

Contrary to Brears and Davis' account, however, Howarth was not the first curator at Weston Park.⁸³ Late in 1874, the museum committee had appointed Charles Callaway, previously of the Bradford Philosophical Society museum, to the post. He held it only for a few months before engaging in a public feud with Councillor Bragge, a prominent member of the committee, the bearer of the last word on the architects' plans for the museum, and an important donor.⁸⁴ Callaway complained that the honourable member was plotting against him: Bragge in turn claimed the curator "had removed the labels from the Literary and Philosophical Collection, and those labels had been lost".⁸⁵ Callaway defended himself, arguing that the fossils in question had been inadequately described. Sorby was called in to adjudicate, but to no avail: in 1876, Callaway resigned, citing ill health.⁸⁶ (He does not appear to have harboured any ill will to the museum itself, however: later that year he exchanged forty fossils with Howarth.⁸⁷)

The Callaway affair was not the last scandal to disgrace the records of the SPM. Assistant Kathleen Dearden was given her notice in 1897 after 13 years at the museum "for insubordination & neglect of duties".⁸⁸ It appears that Dearden was unwilling to undertake sufficient training to satisfy Howarth: he complained "that she had showed no disposition to qualify herself for scientific work in the Museum".⁸⁹ Charles Bradshaw, by contrast, Howarth's assistant from 1876, attended courses of the Science and Art Department in South Kensington and at the Sheffield Mechanics' Institute, and went on to be promoted to chief assistant curator.⁹⁰ Howarth was gathering an expert, male (he did not approve of female curators), professional core of staff at the SPM. These were skilled not only in the sciences but in trades that would enable the museum to be self-sufficient.⁹¹ The museum keepers, Joseph Ellison and later George Elliot, doubled up as joiners and fitters.⁹² They in turn were supported by an invisible army of attendants, cleaners and charwomen. As far as possible, Howarth hired attendants with useful skills such as plumbing or printing;

⁸³ Brears and Davis, *Treasures for the People*, 107–109.

⁸⁴ Callaway (MA B.Sc.) does not appear to have had much luck as a curator. Succeeding Miall in Bradford, he resigned his post after only a year, probably because the society was rapidly going bankrupt. They did not replace him. (BPS, *Report* 7 (1871), 8 (1872).) Riley does not note Callaway's employment at the BPS. (Riley, 'Callaway, Charles'.)

⁸⁵ Anon., 'The Resignation of the Curator'.

⁸⁶ Allen, Letter to H.C. Sorby, 9th October 1875. Callaway's entry in the staff log book reads simply, "Appointed. Resigned." (SPM, *Particulars of Staff*, unpag.)

⁸⁷ Borough of Sheffield, *Annual Report of the CFPLM* (1876); Riley, 'Callaway, Charles'.

⁸⁸ SPM, *Particulars of Staff*.

⁸⁹ SPM, *Museum Sub-committee Minutes*, 15th December 1896.

⁹⁰ SPM, *Museum Sub-committee Minutes* (1881); SMI, *General Register*. Bradshaw, a chemist and mineralogist, was chief assistant curator until his death in 1917. (Riley et al., 'Sheffield City Museums'.)

⁹¹ Personal communication with Mrs Doris Parkin.

⁹² SPM, *Daily Report* (1881–1885).

otherwise, they were largely a security measure (although they also acted as umbrella takers) and their numbers grew apace after policemen were withdrawn from the museum early in the new century.⁹³ By 1904, Howarth had two assistants (one of whom was J.W. Baggaley, trained at Firth College, later to be Howarth's successor), one superintendent and four attendants at the museum.

3.3.2 Building a Professional Museum Community

The only institution to experience a curatorial zeal to rival Howarth's was the Hull Municipal Museum, under the curatorship of Thomas Sheppard.⁹⁴ Like Howarth, Sheppard was hired young – 24 – and spent his entire career at the same museum. The son of a schoolteacher, he was already an accomplished field geologist (Fellow of the Geological Society of London in 1900), and he became increasingly involved in the Yorkshire Naturalists' Union, later editing *The Naturalist* for nearly 40 years.⁹⁵ He took over a dilapidated Hull Lit and Phil collection in 1901, closed the museum for 18 months and re-opened with two attendants and a joiner to run what was to become an small empire of museums in the town.

Other museums in Yorkshire survived with fewer salaried staff. In Leeds, Miall's predecessor Henry Denny had been alone at the museum since 1825.⁹⁶ An "ardent researcher and an insatiable collector" according to T.P. Teale, Miall considered Denny "a respected naturalist of the old school".⁹⁷ Miall in turn employed Denny's son Alfred (later professor of biology at Firth College, Sheffield) as one of a series of assistants. When Miall retired from his post in 1891, he was replaced by Edgar Waite, an ornithologist trained in biology at Owen's College who had also been Miall's assistant since 1888. Waite moved to Sydney in 1893, to be replaced by another of Miall's past lieutenants, Henry Crowther. Miall's approach was thereby indelibly stamped on the practice and collections of the Leeds Museum well beyond his curatorship.

Miall wielded considerable power at the Leeds Museum, as he had at Bradford: in this respect he was among the first of a new breed of qualified, career-oriented curators, despite his subsequent criticism of the museum as a site for education. Upon hiring Miall, the BPS council congratulated themselves on "the engagement of one so well qualified for

⁹³ Parkin, 'Reminiscences of a Museum Assistant'; SPM, *Museum Sub-committee Minutes* (1901). For a brief discussion of police in Victorian museums, see Forgan, 'Bricks and Bones'.

⁹⁴ Schadla-Hall, *Tom Sheppard*.

⁹⁵ Sheppard also edited the *Hull Museum Publications*, the *Transactions of the Hull Geological Society* and the *Transactions of the Hull Scientific and Field Naturalists' Club*.

⁹⁶ For biographical details of Denny and other curators, see appendix 1.

⁹⁷ Cited in Brears, *Of Curiosities and Rare Things*, 6; cited in Kitson Clark, *The Leeds Philosophical and Literary Society*, 149.

the appointment'.⁹⁸ At other philosophical society museums, the salaried curator, or 'keeper' (if they had one at all), was merely an assistant to a gaggle of honorary curators, each ostensibly responsible for a branch of the collection. These honoraries (of which York had eight and Halifax seven) included some committed and expert museum practitioners. William Reed was perhaps their most visible presence at the York Museum in this period, spending years cataloguing and labelling, and donating a massive palaeontological collection. Like other friends of the museum such as the geologist John Phillips, the honorary curators thereby provided the museum with the very content of the collections as well as kudos and expertise. The Whitby LPS was curated with great zeal and commitment by the eccentric Martin Simpson (an honorary curator because the society could not afford to pay him).⁹⁹ It was a respected position in the societies: Thomas Whiteside Hime, who had been honorary curator at the Sheffield LPS before the collections were transferred, was later elected president. At Bradford and Hull, however, the honoraries did very little. Indeed, at both of these towns, when they were between keepers, it was an honorary *secretary* who volunteered to carry on the curating duties. Even at York, their commitment varied enormously, as many of them resided elsewhere.

The honorary curators at York were assisted by a small salaried staff. By the end of the century the YPS employed two attendants and one or two general assistants. Previously they had paid a sub-curator to be responsible for the Gardens (and in part for natural history), a post held for much of the century by Henry Baines, author of *Flora of Yorkshire* (1840). The mainstay of the museum, however, was the keeper: John Phillips had been the first incumbent, and his interest in geology was a common thread running through his successors. During the 1870s a number of keepers passed through in rapid succession, and William Reed undertook a great deal of the day-to-day curating.¹⁰⁰ Then, in 1883, they hired Henry Maurice Platnauer, previously at the British Museum mineralogy department, who was to become a vital figure in the national organisation of museums.

From his cathedral of science in South Kensington, William Flower denounced the efforts of the volunteers, insisting on the employment of new, professional, curators.¹⁰¹ As the staffs of Victorian museums increased and more museums were founded, curators began to seek ways to establish a collective identity and a professional voice. From the

⁹⁸ BPS, *Report 1* (1865), 9.

⁹⁹ Hemmingway, 'Martin Simpson'.

¹⁰⁰ The keepers were Charles Wakefield of Elmfield College ('temporary') 1869–1878; John-Clay Purves of the Geological Survey of Scotland, 1878–1880; and Walter Keeping of University College Wales, 1880–1883. (Pyrah, *The History of the Yorkshire Museum*, 81–119.)

¹⁰¹ Flower, 'Address'.

1880s the York keepers had been demanding from the YPS council more money and status. Platnauer, although grateful to the honoraries for their work, was still conscious of his lowly status as a *keeper*, and so he was especially energetic in the construction of a professional museum community.¹⁰² In 1888, Platnauer, Howarth and eight other British curators met to form a group that became known as the Museums Association (MA), partly in response to a debate in *Nature* in the 1870s involving Flower, William Boyd Dawkins and James Paton.¹⁰³ They established a series of peripatetic annual meetings, and in order to facilitate communication and exchange of specimens and ideas, the association (thanks to Howarth) published its *Report of Proceedings* and later the *Museums Journal*.

Most of those involved in this network were from scientific, corporation-run museums. The MA was largely composed of public practitioners: it grew from the mid-century free public libraries and museums movement, and was partly modelled on the Libraries Association (established a decade earlier). The members, mostly from municipal or soon-to-be public museums, soon included Butler Wood from Bradford, Howarth and Brittain from the SPM, and representatives from Hull and Scarborough. The Leeds Museum was not a member during this period: it was maintained by the society, and still largely controlled by Miall, who (as we shall see) sought to establish a professional identity through other channels. Nevertheless, the rise of the Museums Association marked the beginning of the end of the reign of the honorary curator, and the spawning of a new breed of museum professionals.

3.4 Museum Spaces

As I outlined in chapter 1, Forgan and other historians have explored how the architecture of the buildings of science affected the experiences of visitors and students, and shaped the very disciplines therein.¹⁰⁴ Whereas these techniques have most commonly been used to study metropolitan institutions, I want to apply them to the provincial museum. I thereby continue the spatial discourse I embarked upon in the previous chapter, which I will further investigate in the following chapter with regard to civic colleges.

¹⁰² Wilmot, 'The Yorkshire Museum'.

¹⁰³ Lewis, *For Instruction and Recreation*, 1–17; Museums Association *Reports* (1890–1900). Sorby, Denny and William Hicks (president of Firth College) were all vice-presidents in 1899, when the association met in Sheffield. Sorby had earlier written to Howarth of his sympathy with the objects of the MA. (Sorby, Letter to E. Howarth, 28th June 1899.)

¹⁰⁴ Forgan, 'The Architecture of Display', 'But Indifferently Lodged...', 'Bricks and Bones'; Markus, *Buildings and Power*, 169–244.

3.4.1 Accommodation

At its best, the Victorian museum was a grand affair, replete with pillars and Grecian fronts, emblematic of the present as heir to a classical past.¹⁰⁵ Grand Yorkshire monuments such as the Hull Royal Institution, the Scarborough Rotunda and the Leeds Philosophical Hall proudly proclaimed the vital role in civic life of the museums housed therein. They compared favourably with national glories such as the Ashmolean, the Manchester Art Gallery and even Waterhouse's Gothic masterpiece for the natural history collections of the British Museum. Unparalleled by any laboratory buildings except perhaps the Cavendish in Cambridge, these 'Cathedrals of Science' mediated authority, emphasising the status of their collections and their architects alike with their awe-inspiring pseudo-ceremonial architecture.¹⁰⁶

The Yorkshire Museum was (and remains) the most spectacular of all these Yorkshire buildings, housed among the ruins of St Mary's Abbey on a large plot of land bordered by the city walls. The YPS opened the single-storey top-lit building with two-storey façade in 1830, extending it in 1857 with three galleries at the back in order to accommodate some of the larger specimens. The Leeds Philosophical Hall, completed in 1821 for a mere £6,000, was one of the first of its kind in the country. Cellars and a curator's residence were housed in the basement, a laboratory and grand lecture-hall filled the ground floor, while the library and the museum itself originally nestled in the first floor.¹⁰⁷ Within four years the collections outgrew their accommodation, and the museum was slowly extended over the following decades. The largest of these alterations was in the early 1860s, when the Park Row frontage was doubled and the building extended to include a new lecture hall (see chapter 2), a new library, and a large zoological gallery. The spectacular Scarborough Rotunda, completed in 1838, was also extended in the late century.

Many museums, however, were not wealthy enough to build their own premises. Instead they were housed in rented rooms within assembly halls and municipal headquarters. Over the course of the century the Whitby Museum had shared a building with the library and baths, and the SLPS with the music hall. The Hull LPS had been incumbent on the ground floor of the Hull Royal Institution since its erection in 1854, together with the subscription library. Except for the addition of a balcony in 1869 – a

¹⁰⁵ Forgan, 'Context, Image and Function'; Hill, 'Municipal Museums in the North-West', 'Thoroughly Embued with the Spirit of Ancient Greece'; Pearce, *Museums, Objects and Collections*, 98–109.

¹⁰⁶ Forgan, 'Bricks and Bones'; Sheets-Pyenson, *Cathedrals of Science*.

¹⁰⁷ Sprittles, *Links with Bygone Leeds*, 72–73.

popular architectural method of capturing as much top-light as possible – the museum space there had changed little until the corporation unceremoniously deposited an art gallery on top of it. During the construction work a builders' strike left the museum exposed to the elements, damaging many specimens.

Still others were housed in converted buildings like Weston House in Sheffield. Its original occupants, the Miss Harrisons, were keen to educate their fellow citizens, and left the mansion in Weston Park to the corporation for this purpose.¹⁰⁸ The newly-formed committee made considerable alterations to the house to render it suitable for a museum, most noticeably by adding two large galleries in the stable yard to the rear of the house, linking it to the old school room, which in turn became the curator's office (see figure 3.2). One of the large new galleries was devoted to natural history: a small room bridging the galleries and the old perimeter wall may have been used as a fernery. The museum was opened to the public in 1875, and in 1887 the corporation housed the endowment of John Newton Mappin, a prominent local brewer, in a grand art gallery adjoining the Museum. The Mappin Art Gallery, a vast neo-Grecian parasite under the jurisdiction of the SPM staff, overshadows its humbler parent institution to this day. The museum was further extended at the turn of the century with the opening of the branch museum at High Hazels House.

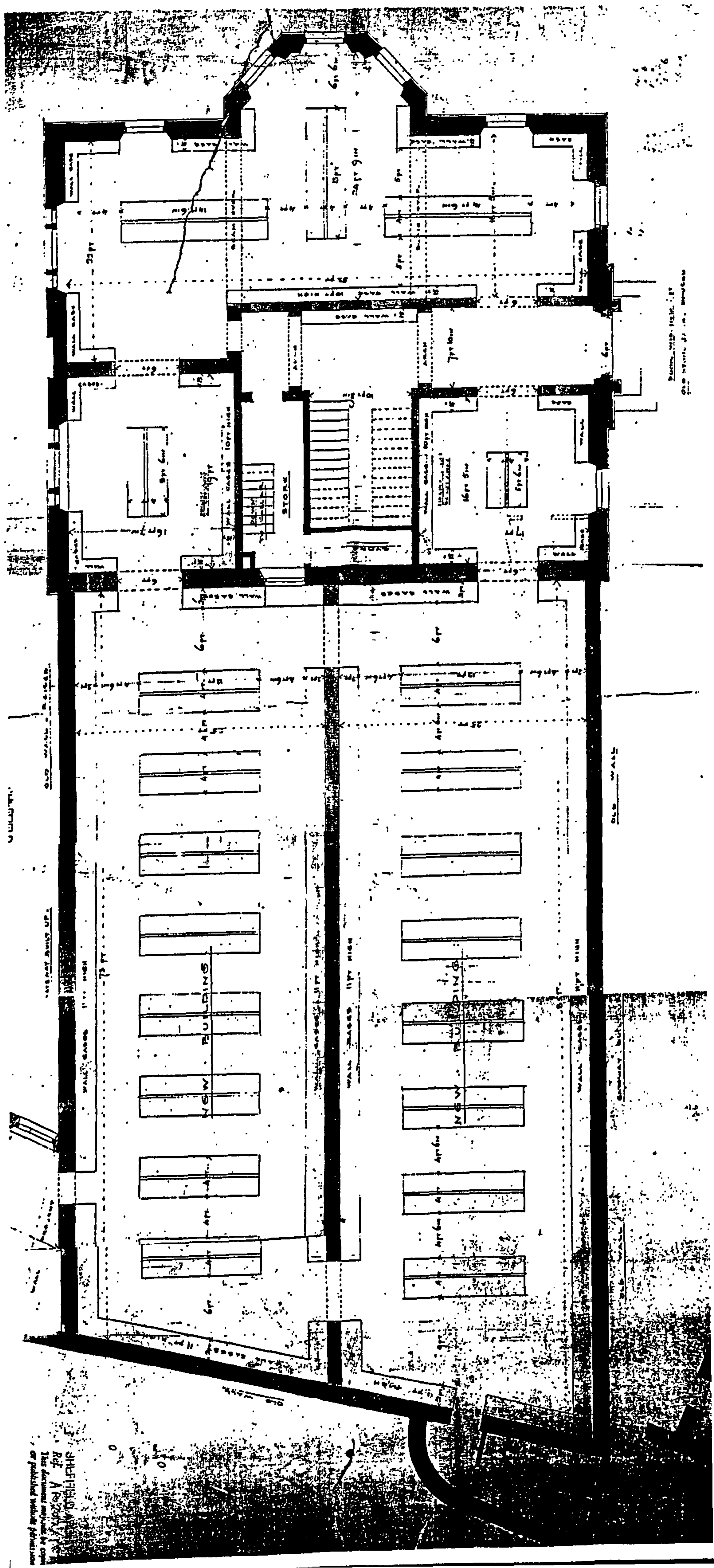
3.4.2 Interiors

It is clear from even these briefest of architectural biographies that none of the sites in question was purely museological. Just as the history of museum policy cannot be extricated from that of civic culture, so the very buildings included and bordered on other cultural and pedagogical sites. Nineteenth-century museum buildings, purpose-built or not, usually included storage space, workshops, a lecture hall or assembly room, an observatory and a library. (Equally, many libraries built in the late century, including the Doncaster Library of 1892, housed small museums.) York Museum's grounds included swimming baths, and the gardens had briefly housed a menagerie earlier in the century. Weston Park also housed an observatory – Howarth's expertise in this area earned him a Fellowship of the Royal Astronomical Society – and a meteorological station. In addition, museums often included a chemical or geological laboratory, which had been part of their architectural make-up long before the establishment of teaching labs at the civic colleges. (Advocates of the new museum idea, seeking to re-assert the museum as a site for research,

¹⁰⁸ Hain, 'Expansion of Sheffield City Museum'; Howarth et al., *Report on Suggested Extension of Sheffield Public Museum*.

Figure 3.2: Ground Floor of the Sheffield Public Museum, Weston Park (1874)

[Source: Gibbs, Sketch for Museum in Weston Park. Reproduction by kind permission of Sheffield City Archives (ref. AP 207/1). Please do not copy or publish without further permission.]



were particularly keen to include laboratories in the research sections of their museums.) The BAAS committee on local museums, established in 1886, recommended that “unless the town contains a separate college of science, a class-room, lecture theatre and laboratory would be valuable additions”, as well as a library and facilities for local scientific societies.¹⁰⁹

The fate and form of the library was particularly interwoven with the museum. At Weston Park, Howarth built up quite an extensive book and journal collection, mostly through a considerable exchange system. Institutions whose publications graced the shelves of the SPM library included the Yorkshire Naturalists’ Union (of which the museum was a proprietor), the BAAS, the Board of Agriculture, the British Museum, the Field Columbian Museum, and the Smithsonian. Lit and phils, museums, clubs and colleges all contributed to this exchange scheme, which linked the myriad sites on a local, national and international scale. The connection between museum and library, however, operated on a number of levels. Most Yorkshire towns had had libraries long before museums, and so the latter, once established, were often run as the former had been. The museum could be read like a book, and literary metaphors were often used in the representation of museums.¹¹⁰ Labels and catalogues provided the index; each display case read like a page. The national museum was an encyclopaedia, and “every provincial museum ought,” according to the BAAS Museums Committee, “to be a *fully illustrated monograph of its own district*”.¹¹¹ Flower, too, recommended that research collections “be treated as the books in a library”, and the Hull LPS presented their museum as “an excellent magazine of illustrations”.¹¹²

In the early century, museums even borrowed from libraries their fittings and furniture.¹¹³ As the decades wore on, however, most museums adopted a combination of library-style vertical wall-cases and horizontal table cases. The wall-cases either lined the edges of the room closely, leaving space in the centre for table cases, or jutted out from the walls periodically (as in many libraries) to create bays.¹¹⁴ The table-cases usually contained a number of shallow drawers below the display. As Howarth described:

the chief feature of the floor-cases [in the natural history gallery] is the utilisation of the space beneath them [which] is occupied by tiers of drawers containing a

¹⁰⁹ BAAS, *Report 58* (1888), 131.

¹¹⁰ Forgan, ‘The Architecture of Display’.

¹¹¹ BAAS, *Report 58* (1888), 126. Original emphasis.

¹¹² Flower, ‘Address’, 14; HRI, *Annual Report* (1872), 11.

¹¹³ Forgan, ‘The Architecture of Display’.

¹¹⁴ BAAS, *Report 57* (1887). Wall-cases were generally around 9’ x 4’ x 1’; floor cases 2’ or 3’ square. (Greenwood, *Museums and Art Galleries*, 294–300; Pearce, *Museums, Objects and Collections*, 98–109; Howarth, ‘Notes on the Sheffield Public Museum’.)

continuation of the specimens above. The first advantage of this in a public is that the general visitor can obtain from the exhibited specimens in the cases a fair idea of the nature of the collections without being bewildered by a multiplicity of objects [...]. Cabinets of drawers fitted in [this] manner [...] were first used in the museum in 1882 for the purpose of protecting eggs from the fading effects of light, afterwards being adopted for insects, and later for invertebrates, fossils, and minerals generally, thus greatly relieving the crowding of the cases, as well as separating in great measure the students' collections from the general collections.¹¹⁵

(These drawers of the table-cases offered a less drastic method of separating research and display; the new museum in microcosm.) The arrangement of cases within the rooms was crucial, and in common with new nineteenth-century spaces such as the railway station and the department store, crowd management and flow were considered carefully.¹¹⁶ An ill-considered case layout could give rise to congestion, or visitors' neglect of certain display areas.

Debates about the best materials for shelves, backgrounds and the curator's nemesis, dust, played across the BAAS reports and the *Museums Journal*.¹¹⁷ The curator's object was to render everything inside the cabinets except the specimen itself invisible, and so shelves were best made of plate glass, and the interiors adorned with neutral colours. Lighting was another difficult issue. On the one hand, direct sunlight introduced the danger of fading, but too little light was equally undesirable – hence Sheppard's frustration at the erection of a somewhat opaque art gallery above his museum. Lusciously top-lit galleries were ideal but rare, and gaslighting was thought to damage the specimens, which severely limited opening hours until the advent of electric lighting in the 1880s.¹¹⁸ These intimate details were the day-to-day concerns of the Victorian curator, consuming their time and attention as much as grand taxonomic schemes and universal collections. A study of museum practice must reflect this.

¹¹⁵ Howarth, 'Notes on the Sheffield Public Museum', 119–120.

¹¹⁶ Bennett, *The Birth of the Museum*, 25–33.

¹¹⁷ See for example, Waite, 'The Colouring of Museum Cases'.

¹¹⁸ The British Museum Zoology Department at Bloomsbury was notoriously ill-lit. (Whitehead, *The British Museum*, 7–8.) South Kensington had electric lights in 1882; the British Museum in 1890. (Hudson, *A Social History of Museums*, 74–99.)

3.5 Acquisition Routes

Within these grandiose buildings, inside the carefully positioned and dusted cases, sat the museum's ostensible purpose: the collection. The group of objects housed by the Victorian provincial museum varied to such an extent that generalisations on the character of the collections are all but impossible. Most were too large for their accommodation; some had definite policy statements concerning collection; few covered all areas equally; all were unique. The museum, we should remember, was not a static institution. As they expanded, the emphasis of the collections changed, changing the space in which it was housed, the expertise of the curator and the identity of the museum as a whole.¹¹⁹ In this way, argued Flower in 1889, "a museum is like a living organism".¹²⁰ Specimens were perpetually added to (and removed from) the collections via a number of different acquisition routes, which I will discuss here in turn: collection, donation, purchase, exchange and loan.

3.5.1 Collection and Donation

The curators themselves actively collected natural history specimens. How integral a part of curatorial duties this was varied from museum to museum – where James Ryley of the Halifax Museum died on one such collecting voyage, Miall was content to sit back and let the specimens come to him. Howarth was able to do a little active collecting on board Sorby's yacht *The Glimpse*. Serendipity was the curator's best friend in this respect. When fossil trees were unearthed during nearby excavations for the railway, Howarth was promptly on the scene to claim one for the museum. Keeping, during his short time at York, was a particularly active geological gatherer, as Platnaeur was after him; and of course the Yorkshire Museum benefited from the honorary curators' combined collecting efforts. Much York-based museum activity in the early 1880s revolved around the collections gathered by William Reed, the honorary curator of geology.

The majority of acquisitions, however, were not collected, but donated. Just as the British Museum benefited from the travels of Joseph Banks, local travellers sent specimens back to provincial museums from far-off lands. Coastal museums such as Whitby's received donations from the sailors docked in its port; the Hull Museum benefited from the local whaling trade; and natural history collectors great and small lodged their prized

¹¹⁹ Forgan, 'But Indifferently Lodged...'; Hooper-Greenhill, *Museums and the Shaping of Knowledge*, 1–22.

¹²⁰ Flower, 'Address', 12.

specimens in the safe, orderly surroundings of the museum.¹²¹ The same civic pride that induced the civic élite to contribute to the erection of a museum led many of them also to donate specimens. As a reward, the individual's name would be published in the museum's *Annual Report* or the local press, and might accompany the specimen on display. In this way, as Hill contends, the donor retained symbolic ownership.¹²² Many specified how the articles in question should be used, whether for educational or scientific purposes, while they avoided the trouble of storage and upkeep themselves.

Henry Denny painstakingly built up an extensive network of correspondents around the globe, establishing Leeds as the hub to which his allies in foreign parts – usually local notables on tour – sent their prime specimens. Most famous among them were a number of exotic large vertebrates, including a Bengal tiger, a giant panda, a Tibetan yak and an American bison. Miall, when appointed Denny's successor, was less than gracious. He later wrote of “objects, mostly given by people who wanted to get rid of them [...] what was I to do with badly stuffed birds, shells and miscellaneous things which were of no value and in which I myself was not prepared to take any interest?”¹²³ Instead, upon appointment he established his own more exclusive network of contributors, including his colleagues at the Yorkshire College, and Anton Dohrn, marine biologist and friend of Huxley's. With their help, he set out to build up a far more systematic, ordered collection, and would only accept specimens if they contributed to this scheme.¹²⁴ Where Miall was mildly mercenary, Sheppard was positively ruthless. “The duties of a curator”, for Sheppard, were “to beg, borrow or otherwise acquire such specimens as may be useful to him”.¹²⁵ Lacking funds for acquisition, he kept a sharp eye on the local and national press for potential finds be it through bequeathals or serendipity. He developed an indefatigable method of securing donations rather than purchases, playing particularly on civic conscience (which was one reason for his vocal support of *public* museums). His efficiency in this respect was so renowned that late in his career he was allegedly asked by a Leeds University Professor (probably Alexander Green), “how's thieving?”¹²⁶

The public museum in Sheffield was based on a large single donation by the literary and philosophical society, in turn based around the herbarium of Jonathan Salt, which had

¹²¹ Barton, ‘Haast and the Moa’; Browne, ‘Biogeography and Empire’; Camerini, ‘Remains of the Day’; Kumar, ‘The Evolution of Colonial Science in India’; Pang, ‘The Social Event of the Season’; Ritvo, *The Animal Estate*, 205–288; Sheppard, *Guide to the Municipal Museum*.

¹²² Hill, ‘Municipal Museums in the North-West’.

¹²³ Cited in Baker and Bayliss, ‘Louis Compton Miall’, 205.

¹²⁴ LPLS, *Annual Reports* (1874–1880).

¹²⁵ Sheppard, ‘Methods of Collecting’, 126.

¹²⁶ Cited in Tait, *Palaces of Discovery*, 68.

since grown to include zoological, geological and ethnological specimens.¹²⁷ It also included the botanical specimens gathered by Margaret Stovin of Chesterfield.¹²⁸ For the first few years, the museum was almost entirely dependent on donations, and fuelled by them the collections grew apace. The specimens ranged from General Pitt-Rivers' excavations book (after he visited the museum) to "1 Parrot, formerly alive in possession of donor".¹²⁹ Many local collectors and dignitaries donated various specimens throughout this era, including the ornithologist Henry Seebohm, local dignitaries such as A.J. Mundella, Wilson Overend, Alderman Bragge and Frederick Thorpe Mappin, as well as local field clubs.¹³⁰ Henry Clifton Sorby (see chapter 2) was perhaps the most important friend of the museum in this respect. A regular visitor to the museum, Sorby donated a large collection of fossils and nearly all the physical results of his research.¹³¹ (His aim in his work on the preservation of marine fauna was that they should make "admirable museum specimens".¹³²) Also among the Sheffield donors was Horatia Eden, née Gatty – the only visible reference to interaction between the Gatty family (see chapter 1) and a Sheffield natural history institution. The attractiveness of the SPM beneficiary of donation was partly due to the educational stance of the museum, popular among many donors, and partly due to Howarth's persuasiveness.

Central to the collections of the SPM, the York Museum and many museums worldwide were donations from circuses, travelling shows and menageries. Historians of science museums have largely ignored the significance of these unorthodox sites for natural history, and yet the history of museums and these ephemeral peripatetic sites are inextricably connected. The extensive network of animal collectors focussed around P.T. Barnum aided many museums in the acquisition of vertebrate specimens.¹³³ George Wombwell (in whose travelling menageries William Buckland compared modern hyenas' habits with those of his fossil specimens), frequently donated to the SPM, as did his rival

¹²⁷ Ellis, 'Mr. Jonathan Salt'; Howes, 'Jonathan Salt's Doncaster Plant Records'. Salt, a local manufacturer and botanist, was a correspondent of the botanical illustrator James Sowerby and a close friend of James Montgomery, the principal founder of the SLPS. His herbarium was extended by others during his lifetime and later in the century. (There are no known links between Jonathan Salt and the Salts of Saltaire.)

¹²⁸ Allen and Lousley, 'Some Letters to Margaret Stovin'; Skidmore, 'Some Biographical Notes on Margaret Stovin (1756–1846)'.

¹²⁹ Borough of Sheffield, *Annual Report of the CFPLM* 44 (1900), 27.

¹³⁰ Riley, et al., 'Sheffield City Museums' includes a comprehensive break-down of donors to the museum. In York, a similar network included the Rowntree family.

¹³¹ Greenwood, *Museums and Art Galleries*, 92–98; SPM, *Daily Report* (1881–1885); Sorby, Letters to E. Howarth; Sorby, Diaries.

¹³² Sorby, 'On the Preservation of Marine Animals', 438.

¹³³ Phineas Taylor Barnum, (1810–1891) impresario millionaire, ran a museum in New York (where Charles Stratton, 'Tom Thumb', made his name) and founded the Barnum and Bailey Circus. (DNB.)

John Day.¹³⁴ The menageries' donations to the museum included camel bones and a spotted hyena, and other such specimens included "a Lion in the flesh; presented by Bartlett's Lion Show".¹³⁵ Howarth also arranged to relieve the Zoological Gardens of London of their deceased beasts.¹³⁶ Surplus carcasses would only go so far, however, and at some point, capital outlay was required.

3.5.2 Purchase and Exchange

As well as accepting donations, Howarth also purchased specimens, finances allowing, from a wide variety of sources. He indulged in "judicious expenditure from time to time, of comparatively small sums in the purchase of specimens to fill the gaps".¹³⁷ Securing important specimens in this way, like donations, relied on an extensive local, national and international network of collectors, traders and museums.

Careful attention to the purchasing policy of the SPM reveals the importance of another often-overlooked site for natural history: the taxidermist's shop. Like that of the commercial museum, the business of the public museum was entwined with that of the animal preserver and dealer. Howarth purchased specimens – mostly large mammals at very reasonable price – from Wombwell's and Edward Gerrard (who also did taxidermic work for the York Museum, including the articulation of the cow mentioned above). Although Howarth wanted to keep preservation in-house, the SPM regularly engaged Arnold Hutchinson, 'Naturalist, Furrier and Taxidermist' to mount large mammals, just as the Yorkshire Museum used Edward Allen, Bird Preserver.¹³⁸ Although Hutchinson was based in Derby, there was no shortage of local expertise – Riley and Riley estimate a dozen professional taxidermists active in turn of the century Sheffield.¹³⁹ Of these, Reuben Webster was the most prominent, and upon his death the SPM bought his entire stock at discount.¹⁴⁰

¹³⁴ Buckland compared the gnawed bones of the Wombwell hyenas' feed with those found in the Kirkdale Cave. He published his findings in *Reliquiae Diluvianae* (1823). (I am grateful to Mr Jack Morrell for this information.) John Day of Day's London Menagerie bought two of George Wombwell's wagons in 1872 (and subsequently advertised his show as 'Day's, late Wombwell's'); his son Thomas, who fashioned himself as a lion tamer and called himself Martini Bartlett, kept up the menageries until the Great War. (Middlemiss, *A Zoo on Wheels*, 1–12; Turner, *Victorian Arena*, 38, 136.)

¹³⁵ Borough of Sheffield, *Annual Report of the CFPLM* 46 (1903), 25.

¹³⁶ SPM, *Museum Sub-committee Minutes* (1896).

¹³⁷ Borough of Sheffield, *Annual Report of the CFPLM* 35 (1891), 5.

¹³⁸ SPM, *Daily Report* (1881–1885); YPS, *Annual Reports* (1882).

¹³⁹ Riley and Riley, 'An Index of Sheffield Taxidermists'.

¹⁴⁰ "Mr. Webster was a Naturalist of no mean order (a friend of the late Mr. Seebohm & Mr. Gardiner both well known ornithologists)" wrote his executor, "& during his lifetime surrounded himself with perhaps the most extensive collection outside of London & certainly the best & largest in this part of the country. [...] The collection consists of Birds, Fishes and animals in all about 600 cases & mounted specimens." (SPM, *Museum Sub-committee Minutes*, 13th May 1890.)

In any one year, however, Howarth had no more than £120 at his disposal for acquisitions, which might cover the cost of five or six large vertebrates. Many other specimens were brought to the museum through an extensive system of duplicate specimen bartering. Overlaying the purchasing network was a well-oiled international exchange machine,¹⁴¹ later extended by the MA's *Museums Journal*. Although London was very much an active centre in this respect, the provinces also witnessed a hive of private and institutional activity. The Bradford Philosophical, upon establishing their small museum, noted with pleasure that "the possession of many duplicates will enable the Council to effect exchanges with collectors in other districts".¹⁴² Similarly in 1877, Howarth proudly announced, "friendly relations have been established between this Museum and kindred institutions, and advantageous exchanges effected thereby".¹⁴³ He exploited contacts (many of them made through the Museums Association, which enjoyed a multi-national membership) at Crystal Palace, South Kensington, the Bethnal Museum, and especially at the Liverpool Museum. Exchange specimens arrived from India, Australia, America and Norway. As well as exchange, some museums loaned their specimens to other institutions, following the example of the South Kensington Museum, which provided the seed collection for many small museums.¹⁴⁴ (Sheppard prompted a minor uproar by simply keeping all the items on loan to the Hull LPS for his new museum.)

The thriving exchange and loan network masked occasional bouts of bitterness and competition between museums. The Yorkshire Museum, based on the famous Kirkdale Cave bones, aroused a certain degree of hostility because it purported to be a museum for the whole county rather than the town: which same criticism must have been levelled at its parent institution, the Yorkshire Philosophical, and with which the Yorkshire College in Leeds would be charged. Certainly it had a higher profile than its peers, thanks to its close association with the BAAS and to the Queen's patronage. The honorary curators used this prestige to commandeer collections from all over Yorkshire: their fly collection, for example, is based on that of Percy Hall Grimshaw, a prominent Leeds entomologist and a protégé of Miall's.¹⁴⁵ Naturally, it was Sheppard who revolted, demanding "that in future curiosities found in the East Riding would find their way to the Hull Museum, instead of,

¹⁴¹ Barton, 'Haast and the Moa'; Thomas, *Entangled Objects*, 35–82.

¹⁴² BPS, *Report* 1 (1865), 8.

¹⁴³ Borough of Sheffield, *Annual Report of the CFPLM* 21 (1877), 7. The scheme did not always run smoothly. The British Medical Association triggered a minor uproar by returning crania damaged, and Walter Garstang (of the Lowestoft Biological Laboratory at the time, later at the YCS) had to be reminded by Sorby himself to forward some specimens earmarked for the SPM on to Sheffield. (SPM, *Museum Sub-committee Minutes* (1894); Sorby, Letter to E. Howarth, 2nd April 1906.)

¹⁴⁴ Howarth, 'The Circulation System at South Kensington'.

as had hitherto been the rule, being sent to York”.¹⁴⁶ Even in the 1890s, specimens from the Hull area still found their way to York; but by the new century, Sheppard’s unparalleled (and often unprincipled) acquisition techniques shifted this centre of gravity to Hull.¹⁴⁷

3.6 Collections Great and Small

This, then was how specimens came to be housed in Yorkshire’s museums. I have not yet outlined what manner of collections were thereby formed, nor how they were catalogued, labelled and arranged. Generalisations are once again futile: but suffice to say that the Victorian provincial collections were nothing if not eclectic, and as mentioned earlier, always changing.

3.6.1 Cataloguing and Labelling

Keeping track of this miscellany was a full-time occupation in itself. They could be catalogued in any number of ways: by donor, by species, by morphology, by room in which the object was on display. The cataloguing and arranging of the museum reflected contemporary concepts of rationality and in turn contributed to the construction of taxonomies: the SPM was meant to be “an exposition of the order in the realm of nature”.¹⁴⁸ Howarth was a meticulous recorder – he believed a museum was only a useful didactic device if the material was well catalogued – and this took up much of his time at Weston Park.¹⁴⁹ And no wonder:

The different classes of objects are distinguished by separate letters: A mammalia, B birds, and so on. A ticket is attached to each object with its class letter, year of acquisition, and number of that year [...]. In the first instance they are entered in chronological order in a general stock book, then each object, with its class letter, year, and number is catalogued on a card, this being afterwards copied into the class stock book. In this way they are really catalogued twice over; but this double cataloguing serves a double purpose, for while the number ticket on the specimen enables the particulars to be at once found in the class stock book, where the objects are all entered in chronological and numerical order, there is no occasion to keep the catalogue cards in chronological order, but these can be classified in scientific order, thus showing what specimens are still wanting to complete any

¹⁴⁵ Grayson, *Flies in the Yorkshire Museum*, 5–9.

¹⁴⁶ *Hull Museum Publications* 10 (1902), 18.

¹⁴⁷ YPS, *Annual Report* (1896).

¹⁴⁸ Borough of Sheffield, *Annual Report of the CFPLM* 40 (1896), 7; Bennett, *The Birth of the Museum*, 33–47; Hooper-Greenhill, *Museums and the Shaping of Knowledge*, 1–22.

¹⁴⁹ SPM, *Daily Report* (1881–1885); Museums Association, *Report* 4 (1893).

particular group.¹⁵⁰

Denny's cataloguing skills, in contrast, were the source of much anguish to his successor. Miall set out to impose order upon the chaos, an endeavour that occupied his entire curatorship.

Aside from the descriptive catalogues on sale, the visitor's interface with the behind-the-scenes work of the curators was through the labelling of specimens, which – like cataloguing – was a moot point for the new museum professionals. The buzzword in the late century was *clarity*, in line with the move from secretive, opaque cabinets to open, transparent public museums. The BAAS, *Nature* and the Museums Association all wanted museums to be readable texts: “a museum without labels is like an index torn out of a book; it might be amusing, but it teaches very little”.¹⁵¹ To this end, the MA labelling committee, established at the association's first meeting, sent out sample labels to all its member museums, in a (futile) attempt to standardise museum practice.¹⁵² Howarth spearheaded this campaign, and had a hand printing press installed at Weston Park. Names of the donor and long Latin nomenclature were to be replaced with clear descriptions of the specimen and their place in nature. “Effective labelling is an art to be studied;” proclaimed the BAAS committee, “it is like a style in literature[...]. The reader grasps the thought with the least possible effort.”¹⁵³ The movement to calibrate labelling was doomed to fail, however, given the sheer variety of classificatory options and display techniques. And besides, the effort involved in labelling these vast collections was phenomenal: the YPS honorary curators, preparing specially printed labels for the forthcoming BAAS meeting, gave up after 42,000 specimens.¹⁵⁴

3.6.2 Display

The British Association Museums Committee were also concerned with encouraging effective display techniques in the new breed of public, educational museums.¹⁵⁵ Many curators of the ‘new’ museums wanted to display the ‘new’ biology. Rejecting their predecessors’ row-upon-row of species, they sought new techniques that illustrated themes rather than classification; replacing layouts determined by the specimens with specimens determined by the layout.¹⁵⁶ Howarth had grand plans for his display techniques: by the

¹⁵⁰ Howarth, ‘Notes on the Sheffield Museum’, 121–2.

¹⁵¹ BAAS, *Report 57* (1887), 127.

¹⁵² Museums Association, *Report 3* (1892).

¹⁵³ BAAS, *Report 57* (1887), 127.

¹⁵⁴ YPS, *Annual Report* (1879).

¹⁵⁵ BAAS, *Report 57* (1887).

¹⁵⁶ Bennett, *The Birth of the Museum*, 59–88; Hill, ‘Municipal Museums in the North-West’.

new century he wanted the natural history collections “displayed in such a manner as will enable the general public to comprehend the main principles and laws governing the life of various animals [...] which have an attractive and instructive interest far beyond anything that pertains to the crowding of individual specimens on stands in cases”.¹⁵⁷ This was a culmination of thirty years’ developments in display concepts in Yorkshire museums, including the introduction of life histories, biogeography and habitat as display themes, and the continued spread of evolutionary and stratigraphic principles in museum cases. Different curators adopted these strategies in different ways at different times, but all agreed that museums “have no justification for punishing their visitors with unending rows of specimens”.¹⁵⁸

At the beginning of the period in question, stratigraphy was a common display technique among geology collections, most visibly expounded at the London Museum of Practical Geology from the 1850s.¹⁵⁹ It was the dominant organising principle in Scarborough and at the geology-based Yorkshire Museum, where different rooms corresponded to different epochs, within which the items were arranged by geographic area. Miall, Howarth, Martin Simpson of Whitby and A. Campbell of Halifax also adopted this method of arrangement early in their terms of office. In the 1870s and 1880s, this essentially static arrangement was supplemented by evolutionary sequences, a technique advocated fiercely by Pitt-Rivers and by Patrick Geddes in Dundee. This brought about a subtle revolution in display. Rather than like with like, specimens at different stages of preservation were juxtaposed: a variety of stuffed, bottled, fossilised and skeletal specimens were shown together in order to demonstrate the different stages of development. Visitors to the Leeds Museum were encouraged to compare fossil types with their living counterparts, and their arrangement facilitated this comparison.¹⁶⁰ At the Yorkshire Museum by the 1880s some of the palaeontological specimens were juxtaposed with contemporary osteology; and perhaps more controversially, Sheppard included human skeletons alongside those of the other primates, demonstrating man’s place in the natural order (in case 1 on the north wall – see figure 3.3).¹⁶¹

Curators utilised a similarly eclectic range of models and preservation techniques in the exhibition of life histories. Although they were a popular area of research in all the sites for life science in Yorkshire, life histories only became prevalent in museum displays

¹⁵⁷ Borough of Sheffield, *Annual Report of the CFPLM* 47 (1904), 5.

¹⁵⁸ Howarth, ‘Presidential Address’, 37.

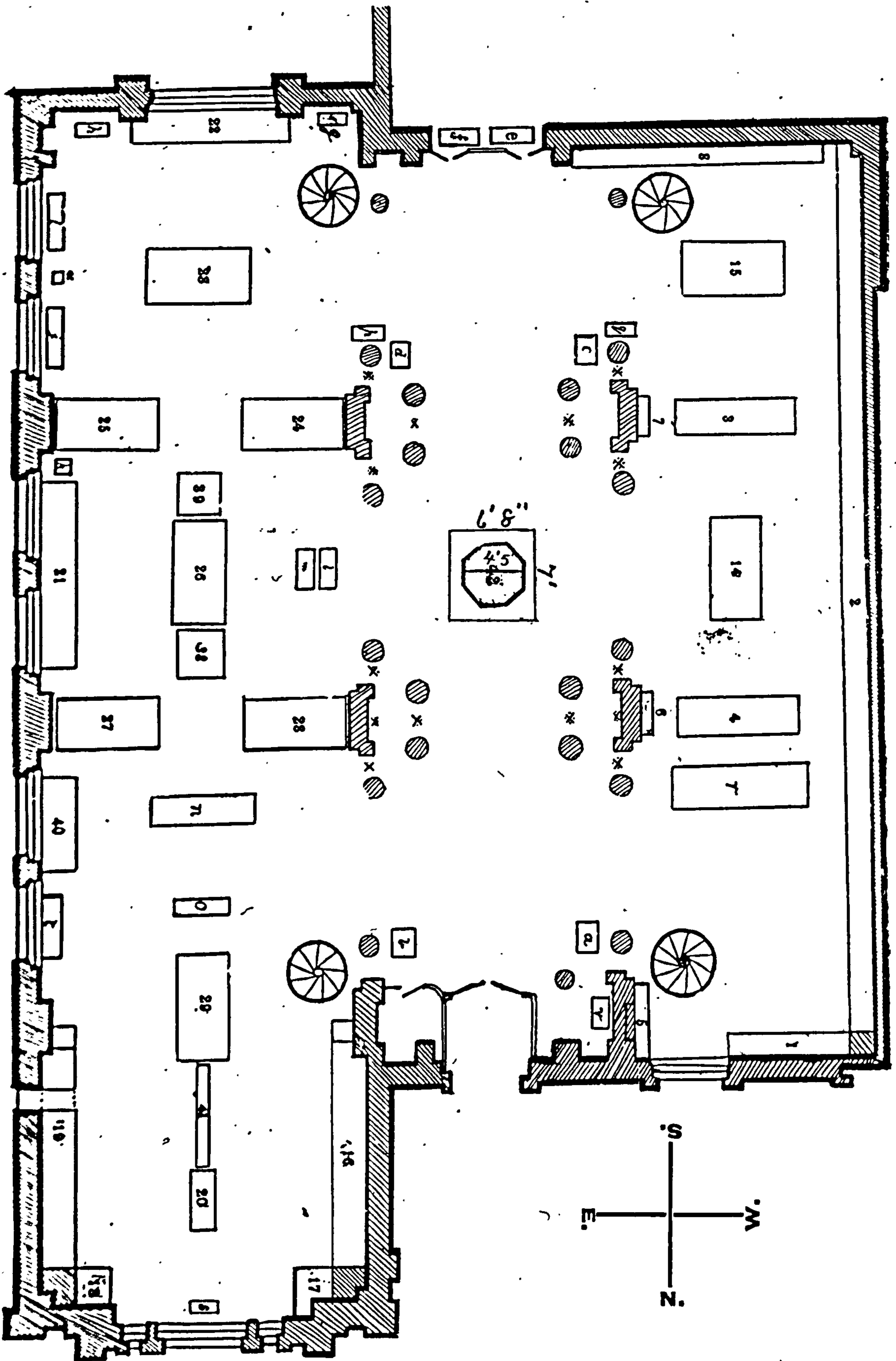
¹⁵⁹ Forgan, ‘Bricks and Bones’.

¹⁶⁰ Miall, *Descriptive Guide to the Fossil Collection*.

¹⁶¹ Keeping, *A Popular Hand-Book*; Sheppard, *Guide to the Municipal Museum*.

Figure 3.3: Ground Floor of the Hull Museum (1904)

[Source: Sheppard, *Guide to the Municipal Museum*]



PLAN OF GROUND FLOOR.

by the turn of the century, a tardiness largely due to the difficulty in their display.¹⁶² Life histories illustrated development, behaviour and environment, and so were closely related to an earlier development, the 'biological group' approach. In such a scheme, specimens were displayed in their specific ecological context as part of an organic system, a tactic that was evident in museums worldwide (especially in the Berlin Natural History Museum).¹⁶³ The bird collection in Leeds, for example, was to be altered in 1885: "it is proposed to break this up into groups, illustrative of classification, distribution, seasonal variation and other special aspects, in the hope of obtaining an arrangement more interesting than the formal ranking of long rows of species under purely zoological divisions".¹⁶⁴ By the following year, both the ornithological and entomological collection were displayed in this manner. These broadly biogeographical approaches were popular as display themes throughout the county from the 1880s, and were commonplace by the turn of the century.

Biological groups and biogeographical displays, Nyhart argues, were part of the 'environmental perspective' that appeared in museums around the world, in anthropological, historical, industrial and zoological displays.¹⁶⁵ The Sheffield branch museum at High Hazels House exhibited birds in their habitats, and the Keighley Museum offered "a collection of British birds, set up with reproduction of natural surroundings".¹⁶⁶ Howarth had already arranged some fox and badger cubs to be "mounted with the old specimens in a case with natural surroundings".¹⁶⁷ And although Pearce argues that these panoramas were a rejection of the early-century drive for sensational exhibits, the environmental tableau's demonstration of 'natural' situations could be just as dramatic.¹⁶⁸

Often even the most faithful panorama was not enough, and curators elected to bring the visitors face-to-face with real, *live* nature. It is not clear whether the fernery originally planned for the SPM was used as such, but by the turn of the century museums such as Brighton's were displaying live plants.¹⁶⁹ A pair of live racoons roamed Weston Park; the Scarborough Museum had an aquarium; and the Keighley museum, like many others, housed an aviary. In Leeds, where the most notable living exhibit was a black rat in 1886, larvae were reared in the entomological gallery. Miall carried this emphasis on live nature to the YCS (see chapter 4), leaving Waite and Crowther to continue the theme, and

¹⁶² Crowther, 'The Museum as a Teacher of Nature-Study'; Museums Association, *Report 4* (1893).

¹⁶³ Nyhart, 'Creating a 'Public' Nature'.

¹⁶⁴ LPLS, *Annual Reports* (1884–5), 7; Miall, *Descriptive Guide to the Collection of British Birds*.

¹⁶⁵ Nyhart, 'The Museum Setting'; Hyde, *Panoromania!*.

¹⁶⁶ *Museums Journal* 3 (1903–4), appendix, 98.

¹⁶⁷ SPM, *Museum Sub-committee Minutes*, 15th September 1885.

¹⁶⁸ Nyhart, 'Creating a 'Public' Nature'; Pearce, *Museums, Objects and Collections* 109–115.

¹⁶⁹ Gibbs, *Sketch for Museum in Weston Park*; Museums Association, *Report 11* (1900).

their live insects especially continued to be popular. The distinction between zoo and museum became distinctly hazy at Hull, where Sheppard introduced not only beetles but also several British grass snakes, a chameleon, a wild-flower exhibit and an aquarium.¹⁷⁰

3.6.3 Space

Many of these ambitious display projects were thwarted through want of institutional space. As Forgan has shown, this was always a problem for a museum, custom-built or not, provincial or metropolitan.¹⁷¹ As a result, it was often the case that curators had to keep specimens in the groups in which they were donated, as at Weston Park with Seebohm's birds and Mundella's shells.¹⁷² Miall alleviated the problem of space somewhat by implementing the Huxleyan teaching-by-types approach in the Leeds Museum as well as at the YCS, replacing large numbers of similar specimens with a single type (which method Bennett argues involves rendering the other species invisible with the one specimen on display).¹⁷³ Later in the century, some museums responded to the pressures of growing collections and populations by setting up branch museums such as High Hazels House in Sheffield, which opened in 1902. Howarth had complained loudly about the want of space for many years previously, indicating that improvements in display might be effected should one of his many plans for an extension be realised.¹⁷⁴ Certainly this deficiency curtailed his acquisition policy from the late 1880s, and hindered his attempts to introduce biological groups. At York, some of the rooms housed 50 cases or more, and the keepers and honoraries alike complained bitterly.¹⁷⁵ Sheppard created more space in Hull by elevating the 40 foot Sibald's Rorqual whale – washed up near the mouth of the Humber in 1835 – to hang from the ceiling of the natural history collection, thus freeing an entire gallery for specimens retrieved from the stores.

Collections shaped disciplines as much as they were shaped by them, and the physical arrangement of a given branch of natural history could exalt or blemish its status as a science. No museum had adequate room for all its collections, and relegated to a back room, upper floor or even a single cabinet, a subject like botany might be perceived as subordinate by visitors. On an institutional level, a small combined museum and art gallery was usually staffed by an art curator rather than a naturalist.¹⁷⁶ In larger museums,

¹⁷⁰ *Hull Museums Publications* (1902–1904).

¹⁷¹ Forgan, 'But Indifferently Lodged...'

¹⁷² Vine, 'Natural History of the District'.

¹⁷³ Bennett, *The Birth of the Museum*, 33–47.

¹⁷⁴ Howarth et al., *Report on Suggested Extension of Sheffield Public Museum*.

¹⁷⁵ Keeping, *A Popular Hand-Book*; YPS, *Annual Report* (1880).

¹⁷⁶ Howarth, 'Presidential Address'.

particularly the British Museum, curators of different collections often engaged in bitter turf wars to secure space for their disciplines.¹⁷⁷ In the SPM, however, natural history fared relatively well (as it did at the Hull LPS), especially after the opening of High Hazels House, although botany was smothered by zoology and later by ethnology (see figure 3.2). In the absence of any botanical expertise among his staff, Howarth allowed the Salt herbarium to fall into such disrepair that Sorby, prompted by John Gilbert Baker (the Yorkshire-born botanist, then at Kew, later President of the YNU) felt moved to recommend that it be re-housed or else it should be sent to the British Museum.¹⁷⁸ Botany, notoriously difficult to exhibit, also fared badly in York, where geology was always the priority.¹⁷⁹ Less prestigious collections were squeezed in where possible: British conchology, for example, was displayed in hanging cabinets in the Tertiary room.¹⁸⁰ Such an asymmetry must surely have impacted upon the visitors' museum experience, to which I now turn.

3.7 Visitors

Recent historiography of the book has drawn attention to the benefits of studying readers as well as writers: historical museum scholarship, dominated by active museum practitioners, has long paid careful attention to visitors as well as architects and curators.¹⁸¹ The problem with historical visitors, as with readers, is their invisibility. In the absence of visitor books, they left no documentation short of gross attendance figures. The picture we paint must largely be through inference from the curators' intentions.

3.7.1 Routes and Attractions

Although the curator's attitudes to the visitor are more accessible to the historian, these must always be treated with caution, for even if a museum was intended to be edifying, the visitor may have used it for entertainment – or indeed *vice versa*. The increased effort put into printed museum guides is evidence of the elevated importance of the visitor on the one hand, and the attempts by staff to impose a particular reading of the exhibits on the other. As the Hull LPS guide of 1860 explained,

Visitors to Museums often fail in deriving the instruction and pleasure which such collections are calculated to afford them, from a sense of confusion, which is the

¹⁷⁷ Beckman, 'Constructing the Stockholm Natural History Museum'; Miller, *That Noble Cabinet*, 224–244.

¹⁷⁸ Sorby, Letter to E. Howarth, 2nd November 1885. I am grateful to Mrs Doris Parkin for information concerning the fortunes of the herbarium.

¹⁷⁹ Keeping, *A Popular Handbook*.

¹⁸⁰ YPS, *Annual Report* (1889).

result of suddenly finding themselves in the midst of so vast a number of unknown and miscellaneous articles [the Hull Museum was particularly cramped at this time]. Not knowing what a collection contains, and perhaps without a definite purpose in looking through its treasures, ignorant of the distinct character and arrangement of its different parts, they overlook not a few of the things, which, if understood, would most interest them. For this reason, as this volume aims to be a *Guide*, it will proceed to direct the visitor to the different departments of interest in the Museum.¹⁸²

As complex for the historian as the visitor, the maps in these guides only showed the museum in two dimensions, and Hillier and Hanson argue that such plans “give little sense of the experiential reality of the building”.¹⁸³ No matter how hard curators tried to govern their experiences, the visitors could choose how to ‘read’ the museum, in what order to examine the exhibits, what route to take through the museum, and so on.

Visitors, whether subject to “architectural regulation” or not, set their own routes and agendas.¹⁸⁴ We can only guess to what extent visitors actually followed the attempts of curators to guide their visit: the trail through geological time at York; the system of simple to complex animal life set out at Hull; the route map for schoolchildren at Leeds (see figure 3.1); or the large models Crowther installed beside a microscope, telling his audience what they *ought* to see.¹⁸⁵ The accounts written by the winners of a school essay competition set in Hull, a rare record of visitors’ experiences, reveal that visitors explored the museum as they saw fit. For example, although in his printed guide Sheppard encouraged visitors to turn left into ethnography and antiquities as they entered (see figure 3.3), the visitor’s eye was nearly always captured by the whale on their right – suspended above case 14 – as similar specimens at Edinburgh and South Kensington must have done.¹⁸⁶ “Upon entering”, wrote Eva Nightscales (aged 11), “the first thing that drew my attention was the large whale suspended from the ceiling.”¹⁸⁷ Like the polar bear at Weston Park, the Bengal tiger in Leeds, and the Irish elk at York, the Rorqual was so visible and eye-catching that it became emblematic of the entire institution.¹⁸⁸ And no matter how much emphasis was

¹⁸¹ Chartier, ‘Texts, Printings, Readings’; Darnton, *The Kiss of Lamourette*, 107–187; Hudson, *A Social History of Museums*, Topham, ‘Beyond the ‘Common Context’, *Book History and the Sciences*’.

¹⁸² Hull LPS, *Guide to the Museum*, 1. Original emphasis.

¹⁸³ Hillier and Hanson, *The Social Logic of Space*, 3.

¹⁸⁴ Bennett, *The Birth of the Museum*, 51; Forgan, ‘The Architecture of Display’.

¹⁸⁵ Keeping, *A Popular Hand-Book*; Hull LPS, *Guide to the Museum*, Crowther, *General Guide to the Museum*.

¹⁸⁶ Sheppard, *Guide to the Municipal Museum*, Holdsworth, ‘A Visit to the Hull Museum’; Thompson, ‘A Visit to the Hull Museum’.

¹⁸⁷ Nightscales, ‘A Visit to the Hull Museum’, 30. Alfred Leonard also recorded, “one of the first things to greet my eyes on entering was a very large whale”. (Leonard, ‘A Visit to the Hull Museum’, 31.)

¹⁸⁸ Borough of Sheffield, *Annual Report of the CFPLM* 48 (1905).

placed on common, local specimens, it was always curiosities that caught the eye: Joseph Sprittles remembered that in the Leeds Museum “the objects of interest were Egyptian coffins with mummies, a stuffed Bengal tiger [and] huge specimens of extinct animals (skeletons)”.¹⁸⁹ The live specimens, as Sheppard had hoped – especially the chameleon – proved very popular with his young audience, and they succeeded in enticing the visitors upstairs, a notoriously difficult task for the layout designer.¹⁹⁰

3.7.2 Access

The projected audience for museums changed with the objectives of the institutions. The general evident trend was one of more expansive criteria of access over the course of the century. Initially, even ‘public’ museums such as the British Museum operated on an entry-by-ticket scheme. Access to the philosophical museums varied; honorary, associate and regular members of the parent societies were permitted free access, but access to non-members was at the keepers’ discretion. With the advent of the municipal museum, the projected audience was re-structured. In eighteenth-century commercial and private museums, entry was a privilege; by 1900, access to municipal museums was a right. Through the application of the new museum idea, however, curators sought once more to limit access – this time to the research collections, which should “be used only for consultation and reference *by those who are able to read and appreciate their contents*”.¹⁹¹

Universal access brought its own problems. Rigorous behaviour codes in museums served to transform the many-headed mob into an orderly crowd, to promote a genteel, mixed-sex environment.¹⁹² (Certainly the BPS threatened to expel visitors for misbehaviour.¹⁹³) To effect this, museum staff had to wrench their institutions from the cultural locale of the festival and fair. With the decline of the personal tour as a mode of regulation, police and later attendants were stationed around the museum, apparently with satisfactory results. In the first few weeks of the SPM, visitors’ conduct was “most exemplary” and Howarth observed “very few instances of disorderly or improper conduct”.¹⁹⁴ In defence of Sunday opening some years later, he commented on “the orderly behaviour” therein.¹⁹⁵ (Equally, the staff were not immune to criticism: the SPM keeper George Elliot was chastised for being rude to a visitor.¹⁹⁶) Their potential

¹⁸⁹ Sprittles, *Links with Bygone Leeds*, 73.

¹⁹⁰ Hudson, *A Social History of Museums*, 74–99.

¹⁹¹ Flower, ‘Address’, 14. Emphasis added.

¹⁹² Bennett, *The Birth of the Museum*, 89–108.

¹⁹³ BPS, *Report 1* (1865).

¹⁹⁴ Borough of Sheffield, *Annual Report of the CFPLM 19* (1875), 19 and 20 (1876), 7.

¹⁹⁵ Howarth, ‘Notes on the Sheffield Public Museum’, 123.

¹⁹⁶ SPM, *Museum Sub-Committee Minutes* (1884).

misbehaviour notwithstanding, working men were increasingly encouraged to visit the county's museums. In the later century opening hours were extended as far as possible in order to encourage working-class attendance. Many museums dared Sunday opening, a contested practice that generally attracted hordes of visitors. At York, the museum and gardens thronged during the free holidays. Seeking to educate further the masses, and within the limits of lighting technology, many curators opted to stay open past sunset on certain days. The Hull LPS made great efforts to attract working men to their museum on Saturday afternoons, including a course of weekly lectures.

Some visitors, however, were still accorded more privileges than others. Those distinguished enough to warrant a mention in Howarth's *Daily Report* – Sorby, Pitt-Rivers, Firth College faculty – were undoubtedly given special access and assistance from museum staff. On Fridays, the Sheffield Public Museum was closed to most of the public for cleaning, except for suitable 'students' – meaning those engaged in study in general, rather than college students. They were always given special attention by Victorian curators, and were allowed access for detailed (and quiet) study. As Howarth recorded approvingly,

The interest taken in the collections by Students has also steadily increased, due no doubt to the important additions made to the collections, and to the valuable loans received from the South Kensington Museum. 18 Students have availed themselves in the past year of the privilege of studying in the Museum on Fridays, when it is closed to the public, but these represent but a small number of the visitors who may be seen daily with note-book or sketch-book in hand taking notes or sketches of objects.¹⁹⁷

Such visitors at Hull and York as at Sheffield were even allowed to use the museum's library and to remove items from the cases.¹⁹⁸ In Leeds in 1895 the council still felt confident enough to announce, "we have reason to think that more use is made of the Museum [...] for the purpose of study than is sometimes supposed. Outside the class of professed Students, there are persons in every rank of life, Naturalists, Collectors, and others who frequent the Museum and examine its Collections with the definite object of study."¹⁹⁹ Admission, normally a penny, was free to those doing special work.²⁰⁰ Museums across the country made special provision for these students.²⁰¹

¹⁹⁷ Borough of Sheffield, *Annual Report of the CFPLM* 31 (1887), 17. By 1889, nearly 600 students were visiting per year.

¹⁹⁸ Students were the only visitors granted access to the Salt herbarium, and the Hull oological collection, for example. (Howarth, *List of Plants*, Sheppard, *Guide to the Municipal Museum*.)

¹⁹⁹ LPLS, *Arrangement and Disposal of Collections*, 4.

²⁰⁰ *Museums Journal* 3 (1903–4).

²⁰¹ B.A.S., *Report* 57 (1887).

Be they students or working men, municipal museums were not short of visitors. However difficult qualitative analysis of museum visitors may be, the Victorians were careful to construct extensive quantitative records. A small provincial museum might expect anywhere between 2,000 and 50,000 visitors per year, of which the majority were probably local. Larger museums such as those in Bradford, Hull and Scarborough attracted hundreds of thousands per annum.²⁰² Attendance figures were affected by a variety of factors, including access restrictions, location within the town and other nearby attractions. Transport was also important: York's location as a rail hub brought visitors from further afield, and the extension of the Sheffield tram system at the turn of the century to Weston Park served to increase SPM attendance. An astounding 350,000 visited Weston Park in its first year, which rivalled even the mighty British Museum's half-million. Visitors then settled down to around 125,000 per annum, supplemented by a similar number visiting the Mappin: still a massive figure compared with the Leeds Phil and Lit, which attracted no more than 50,000 in this period.²⁰³ Howarth and the museum committee were generally pleased with attendance, although on busy days the museum became somewhat congested. Even taking into account multiple visits, it is clear that museums were by far the most common exposure of elite natural history to the public at large – more than books, more than periodicals, and probably more than the field. They warrant intensive study as historical sites for the 'public understanding of science'.

3.8 Conclusion

The vibrant variety exhibited by Victorian provincial museums almost precludes any form of generalisation, and yet the issues discussed in this chapter are integral to my central arguments. Once again, the seeds of the construction of professional identities are evident. In this case, those who sought to establish a professional élite were museum-based practitioners. Just as the professional biologists contrasted themselves with the leisurely gentleman amateur, so the new breed of curators worked to replace the honoraries with a professional cohort. Although their loudest apologists were metropolitan curators such as Henry Flower, through the Museums Association, provincial museum practitioners constructed a self-aware community. They worked to regulate practices, to elevate their status from that of the salaried keeper-caretaker to a respected expert, and to gather bodies of expert staff in their institutions. I return to this issue in chapter 6, in which I discuss the

²⁰² Greenwood, *Museums and Art Galleries*, 369–377; *Museums Journal* (1903–1908).

²⁰³ Borough of Sheffield, *Annual Reports of the CFPLM* (1875–1905); LPLS, *Annual Reports* (1874–1905).

ways in which laboratory biologists differentiated themselves from curators, despite the considerable steps towards 'professionalisation' within museums. I will also proffer an explanation for the apparent contradiction between Miall's involvement in museums (and in particular the new museum idea) and his criticism thereof.

Beneath the veneer of their new, professional identity, curators continued to cooperate with those outside their ranks, with amateur naturalists and with various groups in wider Victorian society. Collaboration continued to be vital in all aspects of museum practice. Particularly striking is the extent to which their acquisition policies relied on a series of overlapping local, national and international networks. These comprised not only naturalists but also circuses, menageries, taxidermists, dealers, other museums and worthy citizens from all aspects of civic life. The museum was an integral part of the town's cultural makeup, the jewel in the municipal crown (especially during exhibitions and when the BAAS came to town), and civic worthies supported them as such through donation of funds and finances. The curators may have run the show, but the civic élite held the purse strings, first as donors and later as members of municipal committees.

Although access policies appear to have changed radically over the course of the century, if anything the middle classes strengthened their grip over provincial museums during this time. As Hill argues so eloquently,

Members of the middle-class male elite used civic institutions as an extension of their own social arena, for mutual appreciation [...] and to consolidate their own class or group identity. Other groups in society were allowed in freely, but not on the same terms: they were only to absorb lessons in municipal citizenship while there, lessons which were firmly middle-class in origin.²¹⁴

Museum space was available on different terms to different sectors of society. Whereas the private museum had been explicitly exclusive, the public educational museum was potentially a more potent a tool of bourgeois hegemony, an attempt to impose middle-class definitions of cultural and natural worlds onto other sections of society.

Whether anyone else listened to this message, of course, is another matter entirely. I presented above only a cursory discussion of the visitors' experience of museums, and further investigation is hindered by lack of documentary evidence. Given this paucity, studying the arrangement and display from the curator's perspective is the next best thing, although the historian must always bear in mind that visitors took away their own interpretation of the exhibitions, which may have been at considerable variance to the ideas

²¹⁴ Hill, 'Thoroughly Embued with the Spirit of Ancient Greece', 106.

of the museum staff. The history of display plays a vital part in the historical study of the public understanding of science, and yet despite titanic visitor figures, this remains a neglected area. Victorian municipal museums were a vital component of the creation of a public for science.

It was with the intricacies of these displays, with cabinet colours and lighting techniques, with the practical details of cataloguing and labelling, that the Victorian curator spent his time. As I argued in chapter 1, however, discussing the museum as an arena of power struggles was only one of a range of historiographical tools available to the historian, and a considerable proportion of the current chapter is concerned with the intimacies of day-to-day curating. Museological research has been studied in many histories of museums: my attention to the activities of curators, the close details of museum *practice*, is more novel. A study of nineteenth-century museums must reflect the extent to which these mundane details occupied curators, perhaps just as much as theoretical debates and collecting policies.

I will touch upon some more museums in further chapters: on the collections of field clubs in the penultimate chapter, and, next, on those museums within civic colleges. I have studied in detail only the tip of the iceberg of museums in provincial Victorian England, but I hope to have given a sense of their great variety and vitality.

Chapter 4: Biology in Civic Colleges

In addition to the lectures at the philosophical societies and the exhibits and research at the museums, another space for the production and consumption of life science emerged in the 1870s. The growth of the college biology departments, beginning with that of the Yorkshire College of Science in Leeds, facilitated the establishment of a new site for the practice of life science in Victorian Yorkshire: the teaching laboratory. This chapter, however, is not the story of the heady rise in status and significance of the lab at the expense of other sites for the practice and teaching of natural history, or the ascendance of the laboratory professional independent of his amateur field-based colleagues. Laboratory biology did not spring fully-formed in urban Yorkshire. Rather, I aim to show that the new departments were firmly embedded in civic middle-class culture and were heavily reliant on existing natural history groups for support and growth. The laboratory did not entirely replace the other sites for life science: the lecture hall, the museum and the field. Even within the colleges themselves, these other forums continued to be used in teaching and research. There is no space here to discuss in detail the contents of the courses offered by the biology departments: rather, I concentrate on two of the driving themes in this thesis: the relationship between the departments and (the rest of) middle-class civic culture, and the multiplicity of sites for the practice of life science. In order to pursue these issues, I explore the environment in which the biology departments existed, the motives for including biology on the college curricula, and the 'who?', 'how?' and 'where?' of the research and didactic practices thence established. I pay careful attention to the familial and academic connections between the various staff in the life science institutions in the county, which were manifold. Again, I want to broaden the historian's gaze from the labs of the metropolis and Oxbridge to encompass the markedly different situation in the provinces.

Louis Miall became the first lecturer in biology at the year-old Yorkshire College of Science (YCS)¹ in 1875, hired initially to teach 20 evening lectures as a trial. Upon the success of these classes he was appointed professor and day courses were initiated; he remained at the college until his retirement in 1907. By the turn of the century biologists trained by Miall in his Yorkshire College laboratory were at the helms of the two other major biology departments in the county, at Firth College in Sheffield and at the

Huddersfield Technical College (HTC). Biology was on the Firth College syllabus from 1880, its maiden session, taught for the first year by the Methodist minister-cum-microscopist William Dallinger (see chapter 2).² After a year's gap, Miall took on the zoology teaching at Firth College on a part-time basis. Although he resigned this post in 1884 due to his work in Leeds, his continued influence was ensured when he was replaced by Alfred Denny, his erstwhile assistant at the Yorkshire College. Denny was appointed professor in 1888, and he continued to work at the institution for over four decades. In Huddersfield, although Alfred Sheard had taught a handful of small life science classes at the technical school from the beginning of this period (see chapter 2),³ life science instruction began in earnest in 1896 when the council appointed as biology lecturer Thomas William Woodhead (1863–1940), a commercial traveller for a woollen company.⁴ Woodhead, who was to study at the Yorkshire College in the late 1890s, established a flourishing biology department – a rare occurrence in a technical college. This chapter details the practices and sites of biology within these three departments.

That all three institutions were in the West Riding is no coincidence. The colleges thrived in towns with relatively large proportions of middle-class and professional persons, and the industries and institutes to employ them; textile manufacturing, to which the biologists could offer a scientific service, dominated the region; and as I discuss in other chapters, the West Riding was already home to a bustling life science community. The different political and educational climates in which this triangle of colleges struggled for survival provide a critically engaging contrast, illustrating the diverse demands that biology teaching satisfied. Nevertheless, I concentrate on the YCS department: partly because of Miall's significance in Yorkshire biology and in this thesis, and partly because it was the largest and oldest of the three departments. The HTC was not technically a 'civic' college, and so features less than the other two institutions (and because the biology department only existed as a separate entity for seven years of my period). Rather, I include Woodhead's department in order to explore the similarities in the biology teaching at an explicitly technical institution and at the quasi-universities of the larger towns.

¹ Although the college soon dropped 'Science' from its title, for simplicity I use the abbreviation 'YCS' throughout.

² I can find no reason for Dallinger's departure after only a few months. He was offered the post again (and refused it) the following year, at the same time as the council offered it to Miall.

³ Sheard was unpunctual, and often left the classes in the hands of his unqualified assistant. In 1895 the council replaced him for a year with J.R. Kaye. (Barker, 'The Educational Contributions of T.W. Woodhead'.)

⁴ Woodhead had been teaching occasional evening lectures since 1890, and had been an official evening lecturer since 1894. (HTS, *Calendar (1895–6)*, *Register of Full-Time Teachers*.)

Unsurprisingly, the two largest colleges in the county were based in the two largest centres, Leeds and Sheffield, and smaller towns had to wait for similar establishments. In general, the new colleges provided a boost to the scientific culture of the town, rather than replacing or eclipsing existing groups. Students educated at the colleges fuelled the membership lists of the older philosophical societies and field clubs, as discussed in chapter 2. This is not to say that those major towns without large higher education establishments suffered a dearth of science culture. In York and Hull, for example, the museums fulfilled a similarly central role as sites for life science, and college staff lectured widely across the county. Medical schools, however, were affected: in Leeds and Sheffield they amalgamated with the colleges, and no medical school survived beyond the 1860s in a town without a college.⁵

The first section treats the establishment of the colleges themselves: situating them within wider movements in higher education in the late nineteenth century; placing them in the culture of provincial civic pride; and examining their different relationships with local industry. Turning to the founding of biology departments, I reveal the importance of amateur groups and of nonconformist networks in the appointment of staff (particularly Miall) before examining the four kinds of justification for biology teaching (viz., liberal education, local industry, medicine and teacher training). In 4.4 I trace the architecture of the colleges as they grew to include custom-made laboratories and museums, and, following Forgan, I discuss the spatial relationships between these sites. I then move on to examine the modes of teaching and the variety of didactic spaces within the departments. I discuss in turn the lectures and technologies of display; the practical work in the laboratories (and the significance of Huxleyan teaching methods); the importance of academic museums; and the declining significance of the field as a site for teaching. Despite the increased emphasis on the lab at the expense of the field, I make clear that laboratory teaching did not replace the museum as a site for life science pedagogy. Turning from consumption to production, I show that the laboratory replaced neither the museum *nor* the field as a site for biological research. To show this I outline the research programmes of Miall and William G. Smith at the YCS and Woodhead at the HTC. Both Smith and Woodhead were prominent figures in the development of plant ecology in Britain, and I pay careful attention to this branch of study, which required expertise in laboratory and field. Finally, I turn to the student constituency for biology, establishing that in their student bodies as well as their choice of staff, the colleges reinforced the

⁵ Anning, 'The History of Medicine in Leeds'.

dominance of the middle-class men over the production, dissemination and consumption of natural knowledge.

4.1 *The Rise of the Civics*

The establishment of the Yorkshire College of Science in 1874 and of Firth College in Sheffield six years later are generally treated by historians of education as part of the rise of civic proto-universities in late nineteenth-century provincial England. During the 1870s, coincident with the economic boom of 1868 to 1873 and particularly in the aftermath of the Paris Exhibition of 1867, local industrialists and civic luminaries planned higher education institutions in Bristol, Leeds, Sheffield, Birmingham, Liverpool and Nottingham. (Owen's College, Manchester, had already been founded in 1851.) These colleges had a great deal in common: their supporters and students were predominantly middle class; women were often admitted; courses were relatively cheap, mostly part-time, and sub-degree level; they were non-residential; and they were dominated by local students and locally-determined subjects.

The colleges, like the philosophical societies, the museums and the field clubs, were shaped by civic pride, as they were by many aspects of the civic culture in which they were embedded. They were but the latest phase in a series of parallel projects designed, as Anderson puts it, "to assert the cultural maturity of the great Victorian cities".⁶ Indeed, the colleges were part of the towns' drive to achieve the very status of a city. The intense inter-town rivalry that generated civic pride was exacerbated by the choice of the Leeds planning committee to christen their project the *Yorkshire* College of Science; a county-wide claim that invoked ire in other towns and probably lost them considerable local sponsorship. More visible manifestations of civic pride were the soirées and exhibitions mounted by the colleges and society alike. Take, for example, the fine art and industrial exhibition at the Huddersfield Technical School in 1883, which attracted nearly one-third of a million visitors, and at once demonstrated the cultural vitality of the town and helped to pay for a new building (the young Tom Woodhead "was able to prepare a very comprehensive collection of local plants of the Exhibition").⁷ All colleges held conversaciones, often in conjunction with their prize-giving ceremonies. Despite their common foundation in civic pride and these other similarities, individual colleges sat very differently in their respective civic environments.

⁶ Anderson, *Universities and Elites*, 31–2.

⁷ Anon., 'Dr. Woodhead Retiring', unpag.

4.1.1 The Yorkshire College of Science and Leeds Industry

Before the founding of the civic colleges, instruction in the sciences in Yorkshire was provided by occasional university extension lectures, the Yorkshire Union of Mechanics' Institutes (see chapter 2), and the Yorkshire Board of Education (YBE). Church institutes, Athenaeums and occasional independent educational enterprises also provided some further education: in Sheffield, for example, science teaching was available from mid-century at the People's College.⁸ It was in this environment of piecemeal educational provision and the formation of the school boards that the YBE first discussed the possibility of a college of science in the county.⁹ These vague plans had been precipitated by partisan complaints concerning the perceived superiority of continental industry, exaggerated by the declinist rhetoric of Leeds' businessmen after their return from the Paris Exhibition. "Without Education", wrote Thomas Nussey upon his return, "we cannot expect to have skilled workmen of the highest class."¹⁰ As H.H. Sales told the Devonshire Commission, "the Paris Exhibition of 1867 aroused the attention of Yorkshire manufacturers to the importance of scientific instruction".¹¹ Although historians have recently questioned whether this alarmist attitude towards continental science and technology training was justified, it had a stimulating effect on Yorkshire educationalists.¹² In 1868 the engineer James Kitson (later Lord Airedale) suggested to the YBE a central college of science instruction for the West Riding, for the technical training of manufacturers and science teachers.

The roots of the YCS, then, were deeply steeped in industry, and the strength of its engineering, textiles and mining departments reflected this. Local industrialists were never quite prepared to donate as generously as the college council urged them, however. The Cloth Workers' Company of London provided the bulk of the finances, as part of their efforts to establish a system of technical textile training based on a Continental model. Even many German firms contributed; and yet Yorkshire companies were renitent.¹³ Local industrialists may have withheld sponsorship through loyalty to traditional training

⁸ Founded by the Congregationalist Reverend Robert Bayley in 1842 (possibly the first of its kind in the country), the People's College was continued by 16 of his students when he left Sheffield six years later. Among these students was Edward Birks, later to be botany lecturer at the Sheffield School of Medicine and Firth College. Despite his influence, Sorby's occasional lectures and the Principalship of William Dallinger in the 1880s, very little life science was taught at the People's College, which closed in 1888. (Smith, *The Story of the People's College, Sheffield*.)

⁹ Some years before 1873, according to J.D. Heaton. (Reid, *A Memoir of John Deakin Heaton*, 203–244.)

¹⁰ Cited in Shimmin, *The University of Leeds*, 11; Sanderson, *The Universities in the Nineteenth Century*, 156–157.

¹¹ Royal Commission on Scientific Instruction, *First, Supplementary, and Second Reports*, appendices, 39.

¹² Edgerton, *Science, Technology and the British Industrial Decline*, 1–14; Gooday, 'Lies, Damned Lies and Declinism'.

¹³ Cardwell, *The Organisation of Science*, 172–179.

methods, or they may be suffering from the slump in the Yorkshire worsted trade of 1860 to 1880, it is difficult to tell. Moreover, unlike Manchester, Leeds was not the single dominant town in its area; it had to compete with other major centres, such as Bradford. Leeds would for many years play Cinderella to Liverpool and Manchester, particularly after University College Liverpool joined Owen's as a college of the Victoria University in 1884. Undaunted, the YCS opened for business in 1874 in rented premises in Cookridge Street, with three professors teaching experimental physics and mathematics, geology and mining, and chemistry – the sciences that the committee felt served industry most effectively.¹⁴

4.1.2 Firth College and Higher Learning

Whereas the birth of the YCS was closely related to industry, Firth College was founded in Sheffield in the wake of the Oxbridge-inspired university extension lectures, which in Leeds had little to do with the new college.¹⁵ From 1875, the humanities-based scheme enjoyed considerable success – 3566 tickets sold in three years – and prompted by this, the master cutler, philanthropist and then mayor Mark Firth endowed £20,000 for a college:

being convinced of the benefits resulting from the lectures and classes [...] by teachers appointed by the University of Cambridge, and being desirous of aiding to carry out in his native town of Sheffield [...] a system of higher education in connection with the English Universities, for the promotion of the moral, social and intellectual elevation of his fellow townsmen.¹⁶

Thanks to his conviction, Firth College had more in common with University College Liverpool – founded on the principles of liberal education – than with the Yorkshire College, and in Sheffield the college continued to cultivate more links with the ancient universities than many of the other civics.¹⁷ This Firth College dedication to 'higher' learning in Sheffield was furthered by the dominance, relative to Leeds, of professionals over manufacturers in its student and governing bodies.¹⁸

Although Leeds industrialists played a key role in the establishment and running (if not the financing) of the YCS, local industry paid little heed to the young Firth College,

¹⁴ Chairs held by Arthur Rücker, Alexander Green and T. Edward Thorpe respectively.

¹⁵ Welch, *The Peripatetic University*, 45–85. An observer noted "how little the Yorkshire College was concerned in the origin of the University Extension movement in Leeds", or *vice versa*. (Lawrence Miall, Letter to Mr Reynolds, 16th November 1899.) Louis Miall's son Lawrence was a journalist at the *Leeds Mercury*, and researched the relationship between the YCS and the Extension Lectures from the newspaper's files.

¹⁶ FCS, *Calendar* (1891–2), 13.

¹⁷ It had been Mark Firth's intention that the college "be forever used and employed [...] for such purposes of higher education, and especially for the teaching and cultivation of any branches of learning taught or cultivated in the English Universities". (FCS, *Calendar* (1891–2), 14.) In 1886, Firth College became an affiliated college of the universities of Oxford and Cambridge.

¹⁸ Smith, *Conflict and Compromise*, 208–247.

whose council sported one sole representative of the Cutlers' Company to represent the manufacturing industries. In the case of the steel industry, there was no fairy godmother like the Cloth Worker's Company to come to the rescue when local industrialists failed to deliver. Save for a small grant from a draper's firm, Firth College income was from such monies as could be raised from private subscribers in the town, a little from the corporation and later (like the YCS) a small treasury grant. When industrialists such as Henry Stephenson and Frederick Mappin did contribute, it was only to the technical school. By 1893, Firth College's annual income (excluding fees, which went to pay the staff) was less than £4000, compared to Yorkshire College's £23,000.¹⁹ The council constantly appealed to the town and the corporation for more funding, in order to house the college effectively, and even to equip properly the existing premises.

Nevertheless, in January 1880, Firth College opened its doors for lectures. The maiden subjects clearly indicate the direction in which it was to be guided: the 'pure' sciences, mathematics, chemistry and physics; history, classics and music in the arts faculty; and only mechanics as a nod towards technical education. As the second principal Viriamu Jones wrote, although "the advantages of technical education in a town like Sheffield cannot be overestimated", he argued that "enlightened interest in some branch of literature, philosophy or science is the very best way of spending the leisure time of a busy life".²⁰ This attitude would have a profound effect on both the mode of teaching and the growth of the biology department.

4.1.3 The Genealogy of the Huddersfield Technical College

The origins of the Huddersfield Technical College were distinct again from those of the YCS and of Firth College. The HTC was but one of a series of manifestations of a single institution that traced its roots back to the Young Men's Mental Improvement Society set up in 1841 by Frederic Schwann, a German émigré, for the workers in his export business.²¹ Some three years later the society was reformed as a mechanics' institution and became perhaps the most prosperous MI in nineteenth-century Yorkshire (see chapter 2). Thanks to support from the newly-formed county borough council, the Cloth Workers' Company of London, and powerful local dynasties such as the Whig Ramsdens and the Tory Brookes, the institution moved to grand premises on Queen Street South in 1883. There it merged with the Female Educational Institute (est. 1846), to become the

¹⁹ Cited in Chapman, *A Modern University*, 94.

²⁰ Cited in Chapman, *A Modern University*, 33, 34.

Huddersfield Technical School and Mechanics' Institution (HTS). In 1896, the popularity of the mechanics' institutes having waned, the school was renamed the Huddersfield Technical College. By this time it was chronically in debt, and the college was transferred to the town in 1903.

The HTS, like other Yorkshire mechanics' institutes, concentrated its teaching resources on textiles, industrial art and chemistry. Despite this markedly different development, it emerged with many features in common with the YCS and the two institutions enjoyed a particularly close relationship, with representatives on each others' councils. Both enjoyed the patronage of the Cloth Workers' Company, who were keen to encourage technical education in the textile-producing West Riding, and stepped in to fill the breach when local businesses were not forthcoming with the massive sums necessary to float the fledgling colleges. Both institutions reflected the diversity of local industry in their strong chemistry, engineering and coal mining departments, and yet constantly battled to overcome the wariness of local manufacturers. At various stages educationalists such as Michael Sadler (later to be vice-chancellor of Leeds University) suggested that the YCS absorb the Technical College – and the biology department in particular – as a satellite institution.²²

4.2 Civic Support for Biology

The civic pride that stimulated the birth of the colleges did not guarantee the inclusion of biology departments therein. The very inception of the departments depended upon the support of two loosely defined groups operating within urban Yorkshire in the nineteenth century: local learned societies and denominational patronage networks. Both of these factors have been largely ignored in the secondary literature on provincial higher education, and yet they were crucial for the foundation of college biology. Although operating in different realms of civic life, I have juxtaposed them in this section because they were both especially characteristic of Yorkshire, which of all the counties in Victorian England had the strongest vein of dissent and the most prosperous and numerous philosophical societies and field clubs.

²¹ O'Connell, *The Polytechnic of Huddersfield*, 'From Mechanics' Institution to Polytechnic'. An older Huddersfield Scientific and Mechanics' Institute had been founded in 1825, but it floundered shortly thereafter through lack of funds.

²² Sadler, *Report on [...] Education in Huddersfield*.

4.2.1 Local Societies

Argles and Sanderson do not explore the role of local learned societies in the founding and support of the young colleges, and yet these organisations had as profound an impact on the college curricula as the groups they do examine.²³ Local institutions – and the Leeds Philosophical and Literary in particular – were instrumental in the establishment of the YCS, in fund-raising, and in lobbying for the introduction of biology to the syllabus.

As early as 1826, the flax merchant and MP John Marshall, the then President of the Leeds Phil and Lit, began to lobby for a University for Yorkshire in the *Leeds Mercury*.²⁴ The campaign continued on and off for half a century, until, upon the announcement of plans for the college, the LPLS declared their intention to support and to co-operate fully with the new institution. Soon after the college opened for business, the society's council recorded

with great satisfaction the founding of an institution which promises to do much for scientific education in this town and district. The consolidation and extension of the College of Science will promote in the surest and most rapid manner those studies which this society endeavours to cultivate. We may expect before too long to include among our members a number of trained investigators; the resources of the society, particularly the museum and the library, will be more largely utilised; and scientific research which so far as Leeds is concerned has long seemed to be on the verge of extinction, may be re-awakened.²⁵

There was considerable overlap between the two institutions' ruling bodies: the physician John Deakin Heaton, for example, a prominent member of the LPLS, was the first chairman of the YCS council.²⁶ The council later included representatives not only of the LPLS, but also of philosophical societies from Bradford, Halifax, Huddersfield, York and Sheffield.

The philosophical societies – along with the field clubs – had been the primary sites for natural history instruction before the foundation of the colleges.²⁷ The amateur groups, however, did not feel that the education they could provide was sufficient, and pushed hard for the inclusion of biology on college syllabuses. This was partly in support of the colleges' campaigns for charters (see below), and partly to increase the use of their

²³ Argles, *South Kensington to Robbins*, 45–57; Sanderson, *The Universities and British Industry*, 61–120, *The Universities in the Nineteenth Century*, 142–147. They focus rather on local industry, the medical schools and the university extension lectures.

²⁴ Shimmin, *The University of Leeds*, 3–29.

²⁵ LPLS, *Annual Reports* (1874–5), 9.

²⁶ Reid, *A Memoir of John Deakin Heaton*, 203–244.

²⁷ Royal Commission on Scientific Instruction, *First, Supplementary, and Second Reports*, 391–400.

museums and the attendance at their natural history lectures. Miall's YCS lectures, like many others, were delivered at the Philosophical Hall or in the society's library, "to take full advantage of the Natural History Collection in the Museum".²⁸ Miall later wrote, "While the College was young and struggling, it received important help from the society, whose meeting-rooms and other resources were freely used for College purposes".²⁹ Other members of staff felt the same: the LPLS council, felt T. Edward Thorpe, the first professor of chemistry, was "among the most influential supporters of the young and struggling institution to which we were attached".³⁰

Field clubs also continued to have extensive contact with the biology departments in various ways: both the YCS Students' Scientific Association and the staff's Priestley Club were part of the same publication exchange system as the Leeds Naturalists' Club, and there was considerable overlap between the staff of the Yorkshire College and the field club members. James Abbott, for example, a prominent member of the Leeds Naturalists, was the first demonstrator at the biology department, and the staff in all three colleges were active members of the local naturalists' clubs. Most significantly, however, the clubs provided an audience for the evening classes during the fledgling years of the departments. That Miall continued to refer to his subject matter as 'natural history' is evidence of the importance of local naturalists in this respect.³¹ Similarly in Huddersfield, Woodhead – whose early interest in botany was fostered by the Halifax and Huddersfield naturalists' clubs – was the professor of *natural history*.³² Huxley, by contrast, emphasised the discontinuity between natural history and biology: unlike his relatively isolated provincial colleagues, Huxley had no great need to enrol the support of amateur naturalists.³³ The colleges remembered this support and these early links: in 1915, the decade-old University of Leeds awarded honorary degrees to six prominent amateur Yorkshire naturalists.³⁴

4.2.2 Congregationalist Networks

The growth of the colleges and the departments depended on the particular environment of urban Yorkshire, where philosophical societies and field clubs were especially strong. There is also evidence that the very appointments were dependent on another locally

²⁸ YCS, *Annual Report* 3 (1876–7), 9.

²⁹ Miall writing in Kitson Clark, *The Leeds Philosophical and Literary Society*, 149.

³⁰ T. Edward Thorpe writing in Kitson Clark, *The Leeds Philosophical and Literary Society*, 136.

³¹ Miall, *Thirty Years of Teaching*, 209–225.

³² Anon., 'Huddersfield Loses and Eminent Son'.

³³ Huxley, 'On the Study of Biology'.

³⁴ These were six Yorkshire Naturalists' Union stalwarts: Thomas Sheppard, John Taylor, Thomas Nelson, William Roebuck, Harold Wager and Thomas Woodhead. Although the latter pair were professional

contingent resource: the middle-class Congregationalist network discussed in chapter 1. While the indications that the early college biologists utilised this network to found and further their careers are not explicit, they are certainly highly suggestive. If so, then the situation stands contrary to the prevailing image of the meritocratic character of professional society in general, and science in particular, in the late nineteenth century. The patronage system, rather, was still embedded in Victorian civic life in the 1870s and beyond. It seems almost certain that Miall exploited his familial links to such prominent nonconformist dynasties as the Baineses and the Salts to establish his position, and that of professional biology in Yorkshire. Not only that: I argue below that his Congregationalist background had an impact on the very character of his biology teaching. Despite widespread emphasis on both the nuclear family and on meritocracy, it is clear that extended family networks were vital in the world of work.³⁵

Miall's family is discussed in chapters 1 and 2: important to remember here are the links between the Mialls and the Baineses. Edward Baines Junior was a staunch advocate of the Yorkshire College, endowing the £3000 raised by public collection and given to him on his 80th birthday to fund major building work on what was to become the Edward Baines Memorial Wing. Along with Titus Salt, Baines was an active Congregationalist and a member of the disestablishmentarian Liberation society, founded by the Congregationalist Minister turned politician and editor, Edward Miall: Louis Miall's uncle. Baines and Miall senior sat on the same Liberal backbenches for Leeds and Bradford respectively: it is also likely that the Salts and the Baineses came into contact with Louis Miall's father, a Congregationalist minister in Bradford. The Baines connection was vital for the founding of Miall's department at the YCS. Biology was introduced at the college as part of the move to include arts and pure science on the curriculum: a campaign led by Edward Baines the younger. As for the Salts, Titus was to donate £1000 to the College, and Miall's chair was endowed by George Salt (Titus' son), who gave £150 per year on the condition that Miall was the first professor.³⁶

Thanks then to his father's and his uncle's positions in the Congregationalist world, Miall benefited from the patronage of the manufacturing middle class who populated the Independent chapels. He was later to make use of his familial links with the nonconformist professional class: among the many notables who supported his nomination for the Royal Society was P.H. Pye-Smith. The Pye-Smiths were a ministerial and legal

biologists, they were awarded degrees explicitly for their work with the YNU. (*The Naturalist* (1915); see chapter 5 below.)

³⁵ Davidoff and Hall, *Family Fortunes*, 215–222; Hobsbawm, *The Age of Capital*, 230–250.

Congregational family: Rutherford Pye-Smith was professor of surgery at the Sheffield Medical School and attended the same chapel as the Leader family, proprietors of the *Sheffield Independent*, and the brewing Birkses (who were in turn related to the Crossleys of Halifax, who like the Baineses and the Salts donated to the YCS).

Miall was not the only Yorkshire biologist to utilise these connections. Edward Birks may have been one of the Sheffield Congregationalist Birkses, in which case Alfred Denny, Miall's assistant at the YCS and his successor at Firth College, was also part of the Congregationalist matrix.³⁷ Birks was manager of the George Street Bank, and an amateur botanist of such note that he was appointed lecturer in botany at the medical school in 1859, teaching the course for 30 years.³⁸ He was also treasurer of the medical school and later of University College Sheffield. When Denny took over the teaching of basic science at the medical school, he thus succeeded Edward Birks, who was also his father-in-law.³⁹ Birks had been treasurer of the Sheffield Field Naturalists' Club, and he ensured that the outstanding balance of the defunct society's account – over £18 – went to Denny's department to buy sorely needed apparatus.

The Congregationalist influence extended West from Leeds as well as South. The biology department at the Huddersfield Technical College was refashioned and re-built by Thomas William Woodhead, who also had connections to the Congregationalist intelligentsia.⁴⁰ Woodhead was brought up as an Independent in the powerful Milton Church, which by the turn of the century was the largest of the Huddersfield Congregationalist Chapels. He attended the Upperbridge Public School, a dissenting academy in Holmfirth, and went into the woollen industry, first as an office worker and later as a commercial traveller. All the while, however, Thomas had been attending a variety of classes at the HTS, and at Milton Church, where he was taught by his distant relation Ernest Woodhead.⁴¹ He was more closely (and more significantly) related, however, to Joseph Woodhead, his father's first cousin, a powerful Gladstonian Liberal and founder of the *Huddersfield Daily*. Joseph was deeply involved in local and national politics;

³⁶ YCS, *Minute Book* (1874–8), 180.

³⁷ I am grateful to Professor Clyde Binfield for this information. He is in no way responsible if my contention proves to be inaccurate.

³⁸ Chapman, *A Modern University*, 111.

³⁹ It is likely that another of Birks' daughters married Tusting Cocking, dean of the medical faculty.

⁴⁰ Barker, 'The Educational Contributions of T.W. Woodhead'; Royle, 'Religion in Huddersfield'.

⁴¹ Anon., 'Dr. Woodhead Retiring'. Woodhead passed his DSA elementary stage animal physiology in May 1885. He also studied botany, history, geography, English literature, Latin, French, maths, chemistry and physics. (Barker, 'The Educational Contributions of T.W. Woodhead'; Woodhead, *Certificates*.)

both he and his son were intimately involved with the HTC.⁴² Thomas Woodhead's family connections can only have stood in his favour when the HTC decided to appoint him as full-time lecturer in biology in 1896 (he had been periodically teaching evening classes in botany and animal physiology at the HTS since 1890).⁴³

Not only did Miall's and Woodhead's Congregationalist backgrounds affect their careers: it also had implications for *how* they practised their science. In particular, I would argue that their nonconformist principles contributed to their dedication to pedagogy. Stephen Miall wrote of "the ideas and experiences which [Louis Miall] probably unconsciously acquired in his youth. He had so many relatives engaged in teaching that he must have heard a quantity of talk about it when he was a boy."⁴⁴ Although Miall turned his back on the family faith, he did not reject the Congregationalist values firmly instilled at home and at Silicoates School. He attended this dissenting academy alongside many other sons of the nonconformist ministry, and he was profoundly impressed by the teaching: so much so that he later sent his sons there.⁴⁵ Binfield writes that "Edward Miall had been a schoolmaster and was a schoolmaster's son. As a minister and editor he remained an educator": similarly, Miall junior was a zealous didact of the dissenting tradition.⁴⁶ Central to nonconformist and especially Congregationalist thought was the principle of voluntarism, as advocated by Edward Miall and Baines: education, like religion, should be a personal choice, not enshrined in a national institution.⁴⁷ The blend of education Louis Miall advocated smacked of Congregationalist voluntarism, founded as it was on active participation on the part of the student and teacher alike.

Woodhead also drifted away from the chapel, but nevertheless retained his Congregationalist outlook and drive to teach. In both their ambition to follow teaching careers and their means of achieving these goals, the biologists' position relative to powerful dissenting dynasties proved vital. It is tempting to contrast them in this respect with Henry Sorby – an Anglican – who although similarly committed to propagating a professional ideal (as discussed in chapter 6), chose to pursue this goal through research rather than teaching. Miall, Denny and Woodhead all emerged from a similar background:

⁴² Joseph was secretary of the Anti State Church Association, elected Mayor of Huddersfield in 1876 and sat for Spen Valley from 1885. Thomas later followed his example, and became a Liberal town councillor.

⁴³ Ironically, he was supported by Sir Joseph Crosland, the Tory owner of the *Huddersfield Chronicle* who had beaten Woodhead the elder in the 1893 Huddersfield by-election. (HTS, *Calendars*; Moriarty, 'Politics and education in Huddersfield'; Perks, 'Late Victorian and Edwardian Politics in Huddersfield'.)

⁴⁴ Cited in Baker and Bayliss, 'Louis Compton Miall', 201.

⁴⁵ Miall, *Manuscript Autobiography*.

⁴⁶ Binfield, *So Down to Prayers*, 111.

⁴⁷ Koditschek, *Class Formation and Urban-Industrial Society*, 252–319.

on the fringes of powerful urban élites, they exploited family patronage networks to establish themselves in what they were to fashion as a professional sector of civic culture.

4.3 Why Biology? Justifications and Audiences

Biology was first taught at the YCS in 1875, at Firth College in 1880 and seriously at the HTC from 1896. In all three institutions it was a minor subject whose place in the curriculum had to be vociferously justified and subsequently sustained. The main arguments deployed by those who advocated biology teaching related to four markets that, they claimed, the subject serviced: liberal education; local industry; medicine; and teacher training. These four markets varied between towns, and each in a different way had considerable impact on the teaching and practice of biology in the colleges.

4.3.1 Liberal Education and the Campaign for Charters

Defined by Sanderson as “the education of a free or liberal man who had no need to seek employment or use his education for vocational purposes”, a liberal education thereby stood at odds with the vocational aims of many within the colleges.⁴⁸ Rather than supply technical training, the advocates of liberal education sought to emulate the German University ideal of *Wissenschaft*, pure knowledge for its own sake. To this end, all three institutions, and especially Firth College, developed pure science (including biology), literature and (non-industrial) art departments.

The most significant incentive to provide a non-vocational curriculum was the lure of a charter: the possibility – remote in this period – of becoming a university, with the accompanying increase in status and student fees. Calls for more arts, pure science and medicine as a means to gain a charter are explicit in the YCS *Annual Report* as early as 1876, and the students themselves supported these sentiments. The college soon dropped the ‘Science’ from its title, and placed a much greater emphasis on arts and on pure science. Because the prospect of gaining a charter independently was remote, the council pursued the next best thing: joining the Victoria University, formed by Owen’s College, Manchester in 1880 and joined by University College, Liverpool in 1884. To this end, and despite considerable resistance, the council brought arts into the syllabus in 1877 – thanks to a handsome endowment from Edward Baines – to broaden further the courses offered by the existing mathematics, physics, chemistry, geology, biology and engineering

⁴⁸ Sanderson, *Education and Economic Decline*, 23.

departments.⁴⁹ Leeds joined the Victoria in 1887, and finally became an independent university in 1904.

Firth College did not fare so well in this respect.⁵⁰ Whereas the YCS began with technical education and expanded to include liberal subjects, Firth College embarked with a liberal syllabus and only in 1897 did it broaden its remit by incorporating the technical and medical schools to become University College Sheffield (UCS). The strength of the combined institution, its new council hoped, would be greater than the sum of its parts, and they re-iterated their aim to provide “higher literary and scientific education by University methods of teaching”.⁵¹ Although the major motivation for this amalgamation had been to increase their chances of admission to the Victoria University after their failed application in 1895, their renewed efforts immediately following the formation of the UCS were once again ignominiously rejected by Manchester, Leeds and Liverpool, who argued that another institution would make the government of the University too cumbersome, and that the Sheffield science teaching facilities were inadequate. (Nevertheless, UCS was awarded university status in 1905.)

The introduction of biology at Firth College – as an extension course provided for by Mark Firth in the first session – was a manifestation of the dedication of the Firth grandees to higher learning, which, as at the Yorkshire College, was part and parcel of the professional-led drive for University status, through a ‘complete’ curriculum. That the biology department, formally founded in the college’s second season, never attracted as many students (see figure 4.1) or employed as many staff as at the Yorkshire College was symptomatic of the ultimate failure of the Firth College pledge to provide this higher learning.

In the much smaller town of Huddersfield, the HTC harboured no such ambitions, settling rather for an ‘affiliated institution’ status with respect to the Victoria University, until 1905, when it became affiliated to the new University of Leeds. Nevertheless, just as Lyon Playfair encouraged non-technical teaching at the YCS,⁵² the Conservative *Huddersfield Chronicle* had supported liberal education at the HTS. Despite its explicitly technical goals, with the Tory Sir Thomas Brooke at the its helm, the HTS concurred, and its massive attendance allowed it to support successful classes in theoretical science, and in languages,

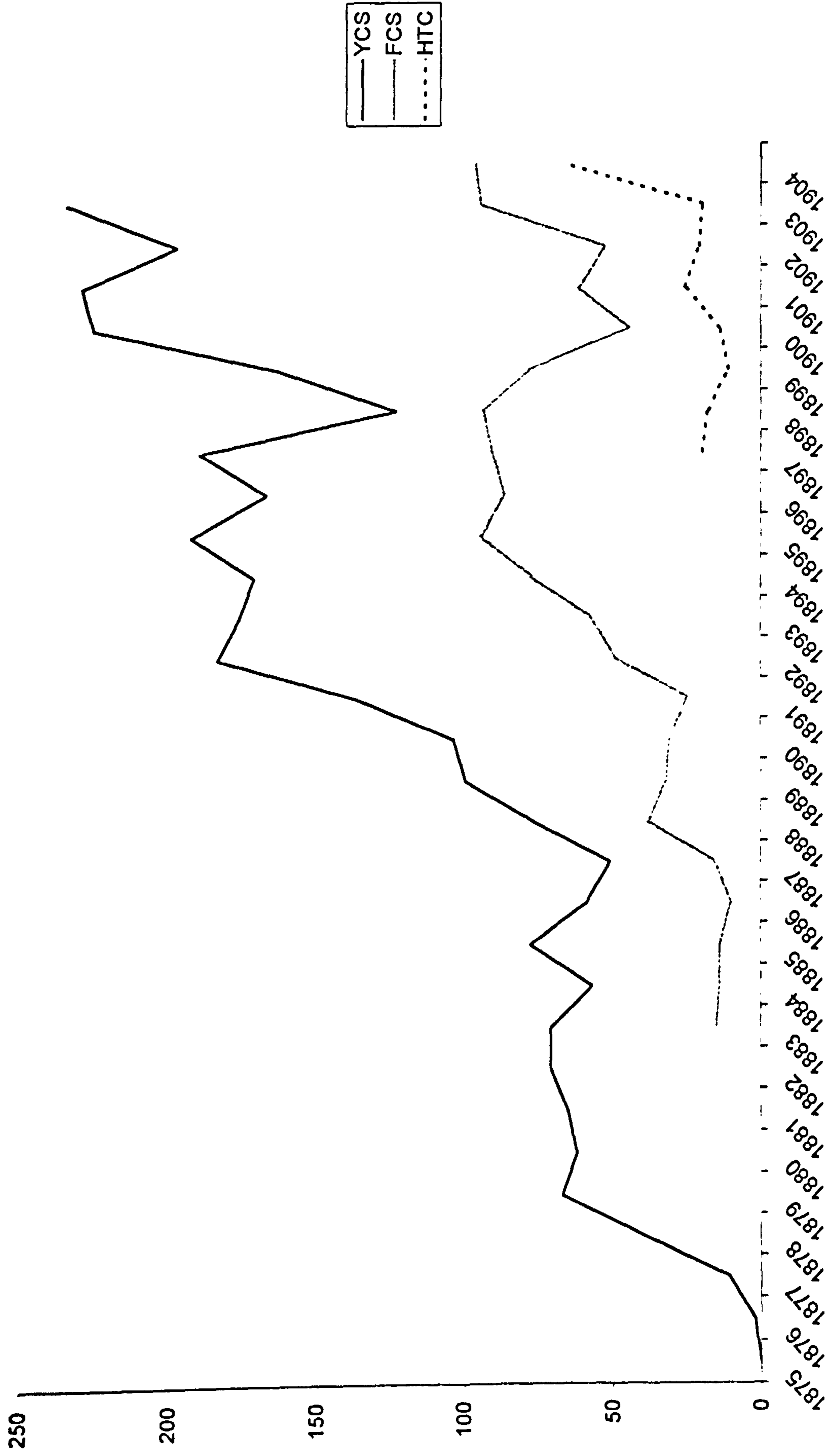
⁴⁹ Sir Andrew Fairbairn was opposed to the introduction of arts on the grounds that it would deter manual workers – whom he assumed would only want a practical education.

⁵⁰ Chapman, *The Story of a Modern University*, 90–102.

⁵¹ UCS, *Calendar* (1897–8), 2.

⁵² Shimmin, *The University of Leeds*, 69–83; Taylor, ‘County College and Civic University’.

Figure 4.1: Day-Class Entries in Yorkshire Biology Departments, 1875-1904
 [Sources: FCS, *Calendar*; UCS, *Calendar*; HTC, *Calendar*; YCS, *Calendar*]



art and literature.⁵³ The college remained content to submit its most advanced students for external degrees, however, and never seriously vied for its own degree-awarding status.⁵⁴ The establishment of the HTC biology department had never been a device to secure a charter: rather, the subject was justified by its service to the day training college (see below) and its use in industry.

4.3.2 Service to Industry

Although it is possible to present liberal and technical education as in opposition, the biologists managed variously to provide both. Woodhead privileged the latter, to the approval of Michael Sadler, who commended services that the biology department provided to local industry.⁵⁵ Woodhead carried out research into the microscopic structure of wool; samples of faulty cloth were sent in for analysis; and he offered courses on the biology of textile fibres and on economic biology (which latter course included topics relevant to agriculture, food production, forestry, dyeing and tanning).⁵⁶ At the YCS, Miall also appealed to the textile industry as a benefactor of its research and teaching: even if it was the national and even the international textile industry (including the Cloth Workers' Company of London and Badische Anilin) that gave the most support to the college, college officers were always keen for departments to provide assistance to local industry.⁵⁷ And so in 1877 Miall offered "a course of six lectures on the source and microscopic characters of animal and vegetable fibres", which covered "wool, mohair, alpaca, camel hair, cow hair, silk, flax, hemp, china grass, jute, agave, Manila hemp, New Zealand flax, cotton, &c".⁵⁸

Later in the century, the potential of biology to assist local agriculture began to play a significant role in the shape of the departments. Although many of the external lectures provided by the YCS were related to farming, the agriculture department was not founded until 1891, before which time the biology department provided this type of education.⁵⁹ The two departments subsequently worked closely in concert. Botany was a major

⁵³ Huddersfield MI, *Annual Reports* (1870–1884); HTS, *Calendars* (1884–1896). Sir Thomas, of the textile Brookes family and Mayor of Huddersfield, was President of the institution from 1879–1886. (O'Connell, 'From Mechanics' Institute to Polytechnic')

⁵⁴ The textile-dominated HTC remained just that until 1958, when it became the Huddersfield College of Technology, becoming a polytechnic in 1970 and a university in 1992.

⁵⁵ Sadler, *Report on [...] Education in Huddersfield*, 79. His report prompted an angry retort from local teachers, who felt he was ill-informed on the college's activities. (Huddersfield Teachers' Association, *Criticism of Prof. Sadler's Report*.)

⁵⁶ Anon., 'Huddersfield Loses an Eminent Son'; HTC, *Calendar* (1902–3); Sadler, *Report on [...] Education in Huddersfield*.

⁵⁷ Cardwell, *The Organisation of Science*, 172–179.

⁵⁸ YCS, Flier for a Course of Lectures on Animal and Vegetable Fibres.

component of the agricultural instruction; in 1901, the year the college opened an agricultural laboratory, Miall established a class in experimental plant physiology, taught at Manor Farm, Garforth (taken on lease in 1898); and William Smith taught agricultural botany and forestry. Popular courses in economic entomology offered by the biology department were part of a wider movement by British Universities to appropriate agriculture, forming a science from what had been a craft.⁶⁰ The appeal to agriculture is also evident to a lesser extent in Huddersfield, where Sheard briefly taught a course on 'Principles of Agriculture' for teachers, and where gardeners, nurserymen and timber merchants took courses in the biology department by the turn of the century.⁶¹

4.3.3 Medical Training

In Sheffield, however, the dominant local industry – steel – had no need for the services of biologists. Instead Denny looked to another source of students and status: medical training. Getting botany and zoology onto medical syllabuses was as crucial for the biologists in Yorkshire as it was for T.H. Huxley and E.R. Lankester in London.⁶² Provincial medical schools were in turn receptive to what they perceived as the cultural authority of scientific training – authority for which they themselves were partly responsible – on their curricula.⁶³ For decades these schools had been losing students who moved elsewhere for their pre-clinical studies. The medical authorities demanded a new professional training to replace the traditional role of apprenticeship; a training that included a firm grounding in basic sciences, including biology.⁶⁴ This is not to say that the medical schools had neglected life science courses. Botany – and *Materia Medica*, which entailed a grounding in plant science – was on the Sheffield Medical School curriculum from its inception in 1828, taught from the 1870s by Denny's father-in-law, Edward Birks.⁶⁵ Similarly at the Leeds School of Medicine (est. 1831), both subjects are evident from the start, and from 1866, the school also offered a comparative anatomy course.⁶⁶

⁵⁹ Funded by the Yorkshire County Councils and the Board of Agriculture. (Anon., 'The Yorkshire College, Leeds'.)

⁶⁰ Kraft, 'Building Manchester Biology'; Palladino, 'Between Craft and Science'.

⁶¹ HTS, *Calendar* (1885–6); Sadler, *Report on [...] Education in Huddersfield*.

⁶² Huxley, 'On Medical Education', 'The Connection of the Biological Sciences with Medicine'.

⁶³ Sturdy, 'The Political Economy of Scientific Medicine'.

⁶⁴ Butler, 'A Transformation in Training'.

⁶⁵ Allum, *The Sheffield Medical School*, 1–7; McCrie, 'The Sheffield Medical School'; Porter, *The Medical School*, 29–64. The Sheffield Medical School joined similar institutions in Manchester (est. 1824), Birmingham (1825), Leeds (1831), Newcastle (1832), Bristol (1833) and Liverpool (1834). Sheffield had previously been the home of a Medical Book Society (1817) and a Medical and Surgical Society (1819). Unfortunately, no records exist for the medical school between 1835 and 1881.

⁶⁶ It seems likely that the 'Mr. Denny' who taught botany there in conjunction with John Hey (of the influential Leeds medical dynasty) was Henry Denny, Alfred's father and Miall's predecessor as curator at the Leeds Museum.

Gradually, however, these courses were supplemented and eventually replaced by the biology classes at the colleges, as the relationship between medical school and civic college became ever closer.

By the 1870s, the Sheffield Medical School was in dire need of new premises: in 1888, led by the indefatigable Mariano Bartolomé, the school opened a new building opposite Firth College on Leopold Street. The two institutions had long been liaising, and by 1891 college staff taught all the basic sciences.⁶⁷ Arthur Hall, who was particularly influential at the medical school, had studied at the new physiology laboratories of Cambridge University, and was a particularly vocal advocate of laboratory training for medical students. Similarly in Leeds, the possibility of amalgamation of the YCS and the Leeds School of Medicine was discussed by both councils from soon after the college's birth, and the proposition became a great deal more attractive to the medical school during the early 1880s, after the Victoria University was granted the power to award medical degrees. With a view to joining the university, the school and college amalgamated in 1884.

Miall and Denny used the increasingly close relations to their advantage. Miall – who had been a student at the Leeds School of Medicine himself – began teaching the medical students comparative anatomy and botany from 1878 in the philosophical hall, using the philosophical society museum (although medics had been attending his courses before this).⁶⁸ Upon the amalgamation, the medics accounted for a large increase in the student numbers, and fees from medical students accounted for 20% of the income of the college as a whole.⁶⁹ The department's courses were adapted to suit the new influx: Miall introduced 'Medical Biology', and the botany course was arranged so that it constituted preparation for the Royal College of Physicians exam (49 out of the 62 students sat the course for this reason in 1881).

In Sheffield, Miall had failed to secure medical students as an audience for zoology teaching during his short tenure. It was left to Denny to bid for the medical constituency, first securing the biology teaching and then, upon his father-in-law's retirement in 1891, taking over the botany teaching as well. He expended great energies making his teaching attractive to the medical students, adapting courses to meet the requirements of the Royal Colleges, focusing on medical plants and lecturing on 'Germs in Relation to Disease'.⁷⁰ In

⁶⁷ Sturdy, 'The Political Economy of Scientific Medicine'.

⁶⁸ Miall's biographer wrote that the YCS "worked in easy conjunction with the Leeds School of Medicine, which required courses of botany & zoology for its students & L.C. Miall's classes in botany were sometimes attended by medical men in full practice either in view of a Fellowship of the Royal College of Surgeons or from interest in the subject". (Anon., Manuscript Biography of L.C. Miall, 17–18.)

⁶⁹ Baker and Bayliss, 'Louis Compton Miall'; Vernon, 'Civic Colleges'.

⁷⁰ FCS, *Calendars* (1890–1892).

the meantime, for a small charge, the medical school allowed the biology department to teach and to store its museums in their new accommodation.

Even Woodhead, in a town with no local medical school, realised the advantage of tailoring his courses to suit potential medics: the HTC biology department taught hygiene, which included a strong element of public health, and advertised their course as a thorough grounding for those “intending to follow the Medical Profession”, offering courses recognised by the Royal Colleges and by the Pharmaceutical Society.⁷¹

4.3.4 Teacher Training

The biology departments, then, to varying degrees, served to provide the colleges with a liberal syllabus, the textile industry with assistance and the medical schools with pre-clinical training. The fourth market that the departments claimed to satisfy was teacher training. During the late century, ‘nature study’ became increasingly popular in schools, and Miall was one of its major advocates.⁷² Schoolteachers, as a result, increasingly needed to be trained in biology, and Miall and the other Yorkshire biologists were happy to oblige.

Schoolteachers had always been part of the projected student body of the Yorkshire College (largely in response to the educational reforms of the 1870s), and the council included representatives of a number of grammar schools.⁷³ The YCS biology course became increasingly tailored to their needs in the early 1880s, when the government introduced subsidies for pure science teacher training, and more so in the 1890s after the day training school was opened. From 1901, the department ran peripatetic summer courses in nature study. Miall’s daughter Winifred Wager details the teachers’ opportunities in the biology department: “school-masters and mistresses came at first with the idea of getting up a few object lessons for their schools, but eventually many of them came year after year from love of the work, and were the most enthusiastic students that attended the Department”.⁷⁴

By the end of the century, Firth College also became more geared towards educating schoolteachers. The evening, extension and Saturday classes had always included a number

⁷¹ HTS, *Calendar* (1899–1900), 23.

⁷² By the turn of the century nature study was included in most school curricula, and by 1902 it was part of the Board of Education regulations. (Jenkins, ‘Science, Sentimentalism and Social Control’; Bainbridge, ‘Origins of the Nature Study Movement’.) Keeney examines nature study in the American context; Jenkins and Swinnerton detail the twentieth-century history of the movement; Allen argues that the prevalence of nature study seriously tarnished the reputation of natural history as an *adult* pursuit. (Keeney, *The Botanizers*, 135–145; Jenkins and Swinnerton, ‘The School Nature Study Union’; Allen, ‘On Parallel Lines’, *The Naturalist in Britain*, 181–184.) Professional involvement with the nature study movement continued beyond the instruction of schoolteachers, as evidenced by the presence of Miall, Patrick Geddes and other University professionals in the School Nature Study Union.

⁷³ YCS, *Report of the Committee*.

of working teachers, but from 1890 it also housed day training colleges for teachers, which meant that significant proportions of the arts and science departments consisted of trainees and pupil teachers. Even before the introduction of the training scheme, many were working towards the certified teacher's qualification of the Education Department.⁷⁵ By 1884, the Science and Art Department were paying 75% of the fees of Science teachers attending biology classes, and from 1896 Denny – keen to educate schoolteachers – offered a course in 'Object Lessons in Natural History'.⁷⁶

Pupil teachers comprised the largest audience for the day biology classes at the HTS/HTC throughout this period, although the college was not an official day training college until 1903. Again, the courses were designed with these students in mind, and the college arranged special classes for pupil teachers from 1898.⁷⁷ Sadler was keen in his report to encourage teacher training at the college. Woodhead's department, he recorded, usefully engaged in "the training of teachers, especially with a view to nature-study", and that the largest student constituency was "about twenty elementary schoolteachers preparing for their certificate".⁷⁸

4.4 Development and Premises

Appealing both to local industry and to liberal education, and fuelled by large groups of medical students and trainee teachers, the young departments struggled to reach maturity. Although they managed steadily to gain students (see figures 4.1 and 4.2), they were stifled by inadequate accommodation: not only for lectures and laboratory work, but also to house their museum collections and botanical greenhouses, for the colleges retained a multiplicity of sites for the study of life. And although no department within the colleges was blessed with space, the biologists had more cause for complaint than their colleagues in other sciences. Miall's rooms were tucked in behind the much larger accommodation of the YCS chemistry department (see figure 4.3); Denny's allotted space on the second floor of the UCS was half the size of the neighbouring chemistry department (see figure 4.4), and he had to make do with departmental funds of under half that of the physics department. Both Woodhead and Denny campaigned for decades for their salaries to be brought into line with that of the other science professors. The biologists were reasonably successful at

⁷⁴ Wager, 'Louis Compton Miall', xvi.

⁷⁵ FCS, *Minutes of Council* (1883).

⁷⁶ Denny, 'The Relation of Museums'; FCS, *Prospectus* (1884–5).

⁷⁷ HTC, *Calendars*.

⁷⁸ Sadler, *Report on [...] Education in Huddersfield*, 79, 80.

Figure 4.2: Evening Class Entries in Yorkshire Biology Departments, 1875-1904
 [Sources: FCS, *Calendar*; UCS, *Calendar*; HNS, *Calendar*; HTC, *Calendar*; YCS, *Calendar*]

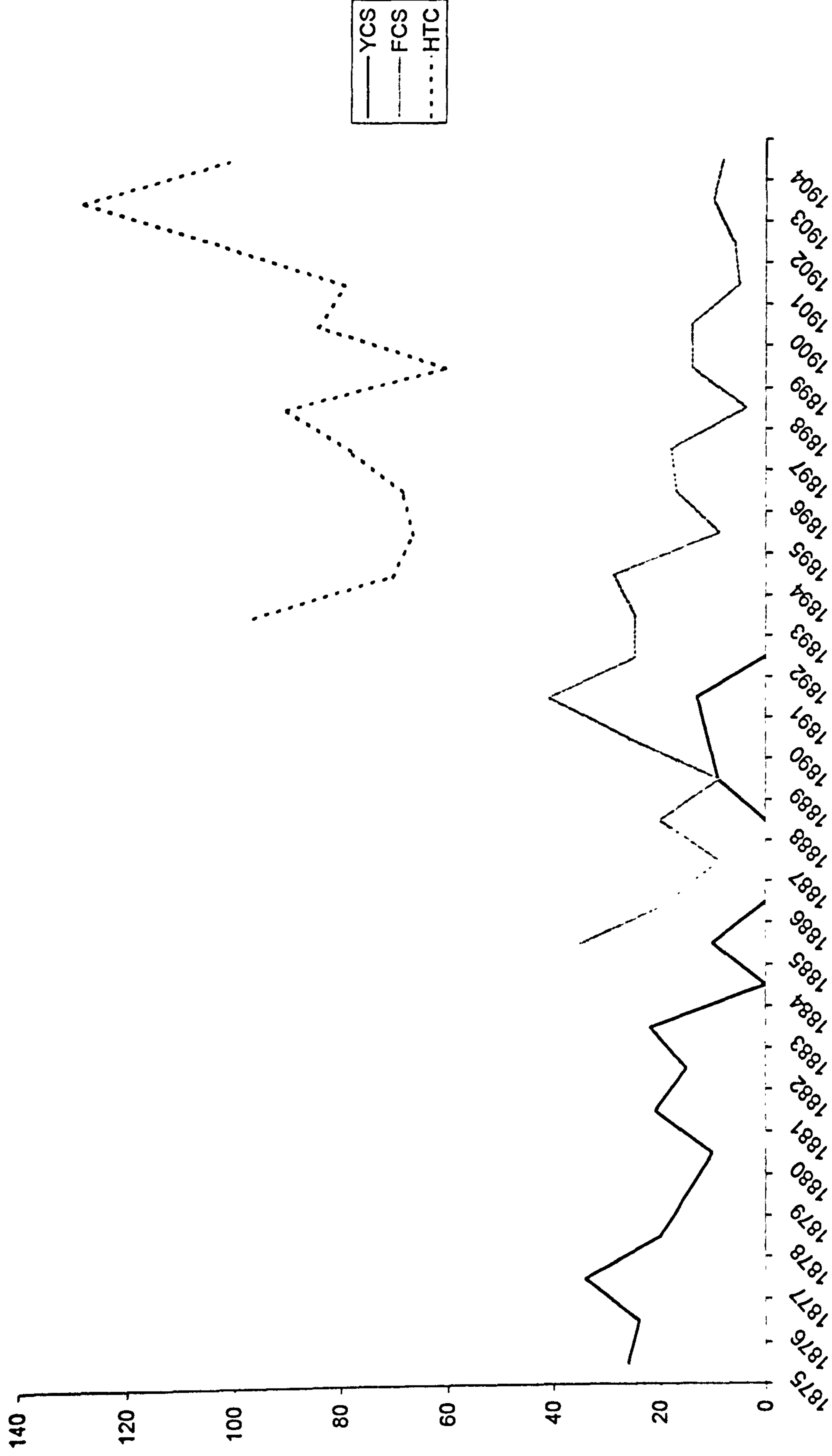
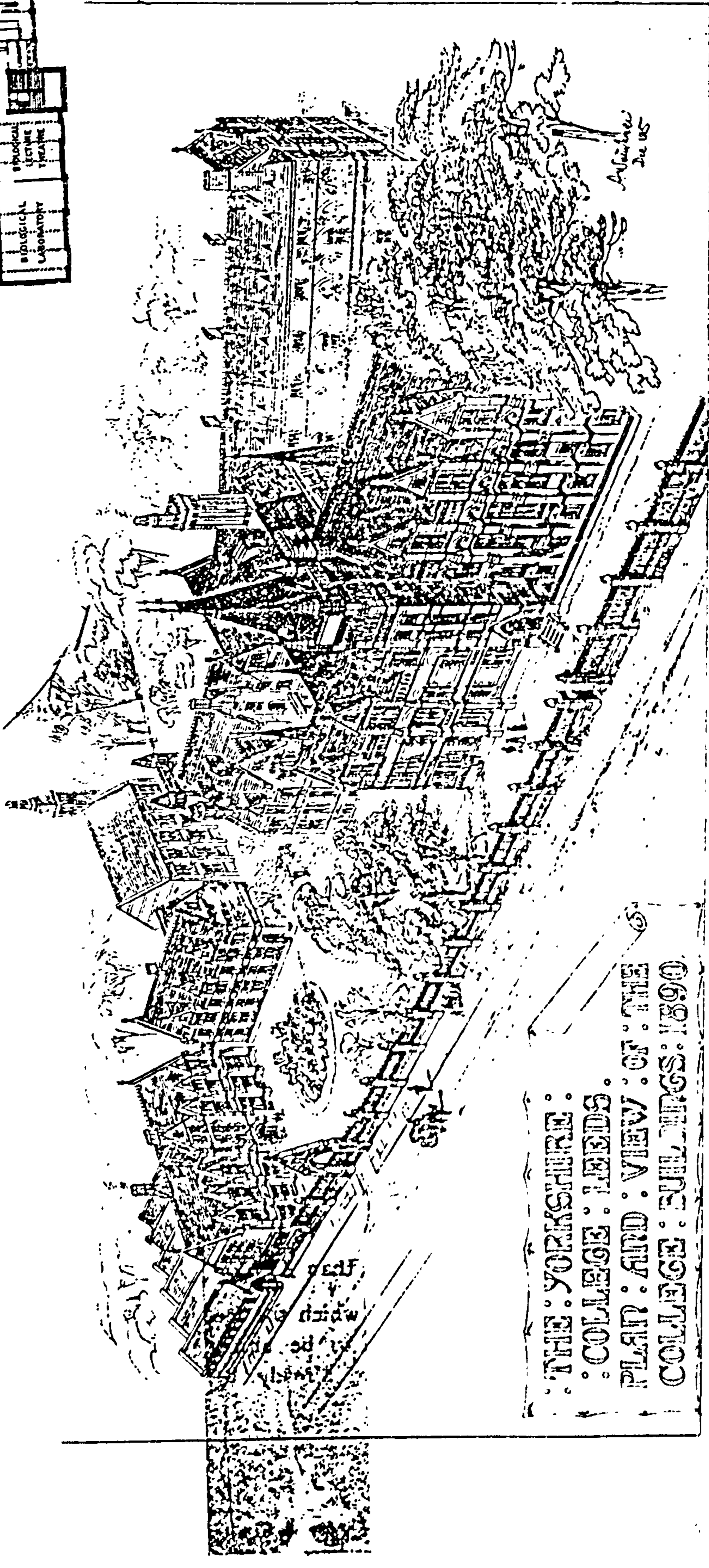
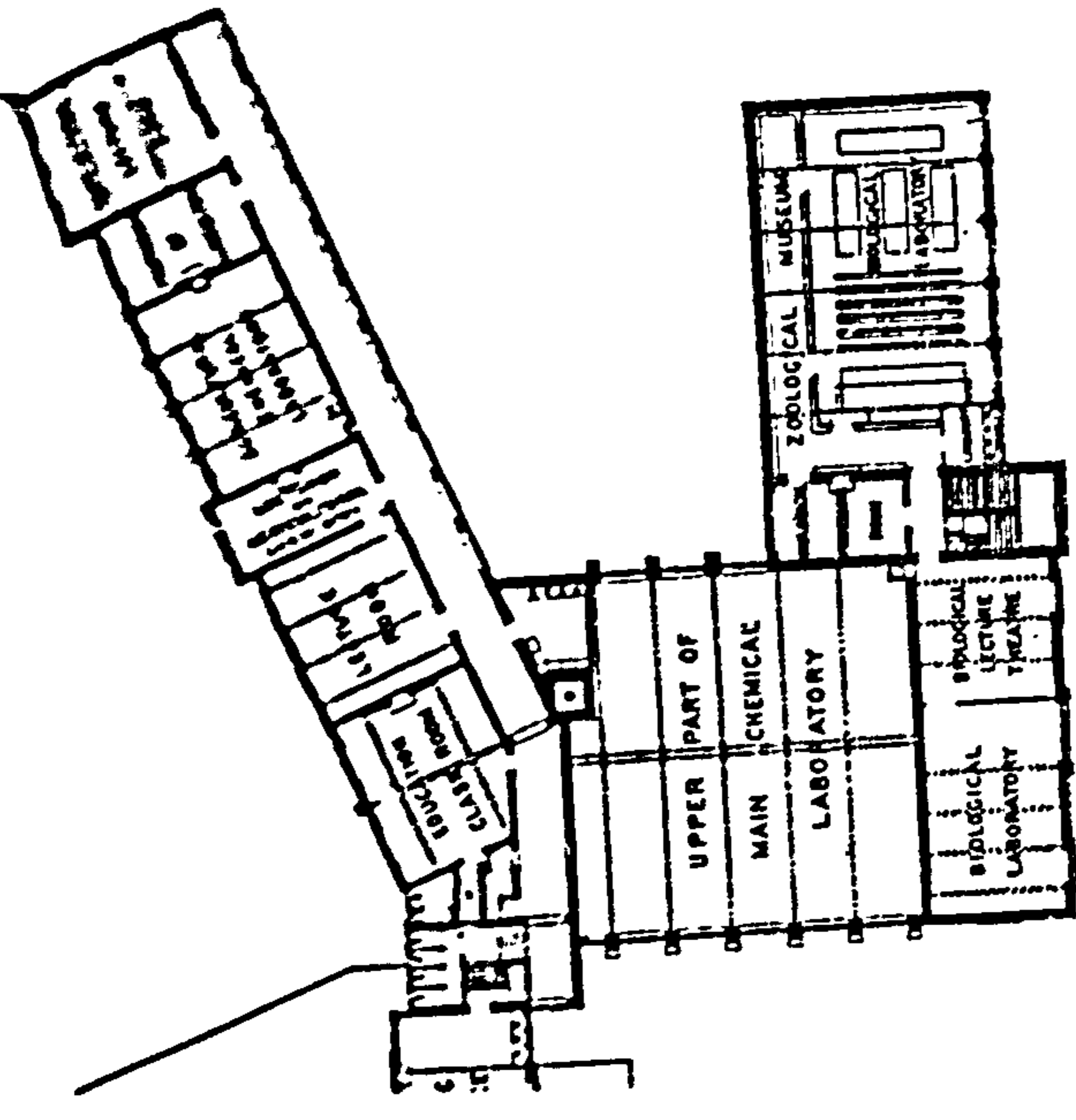


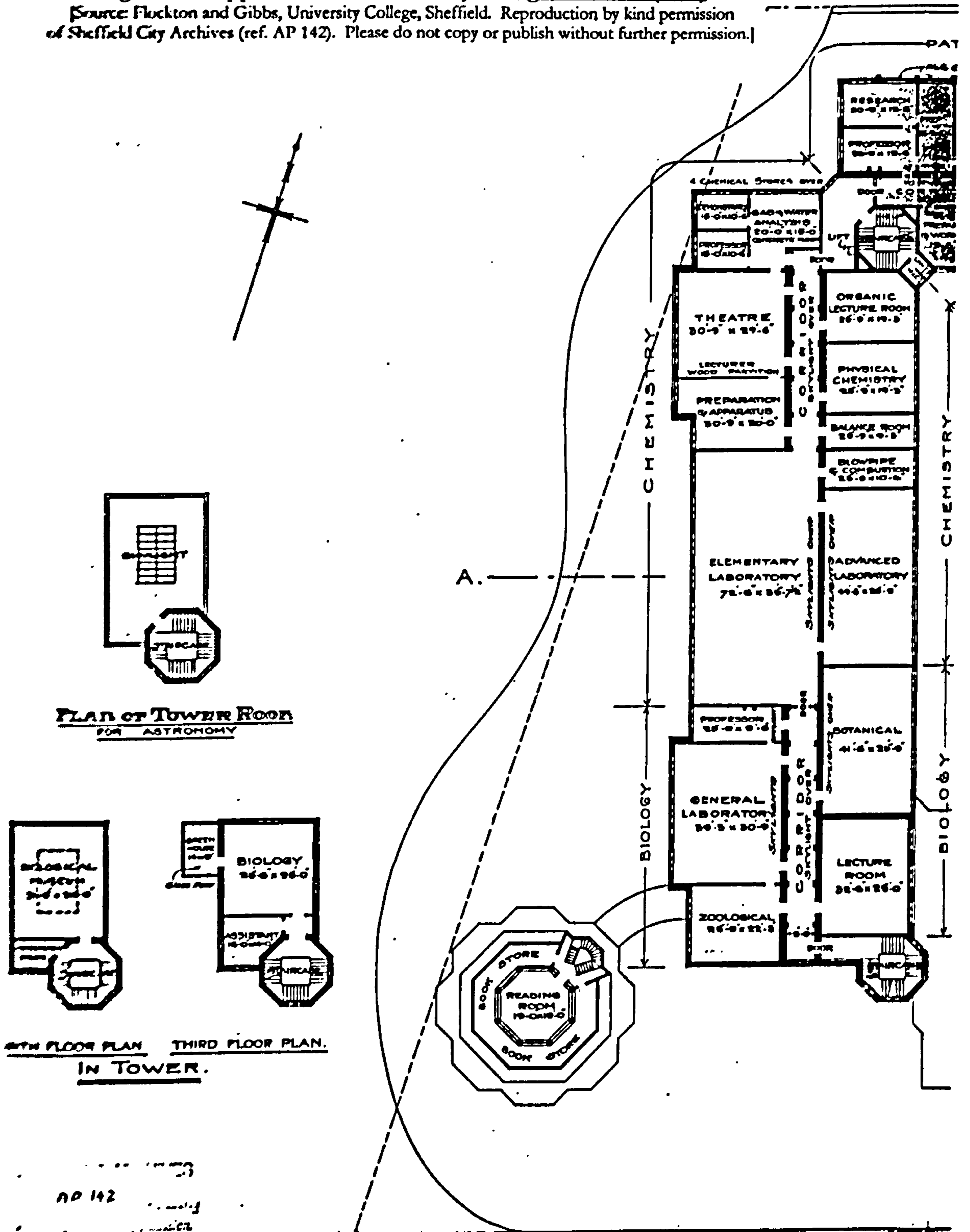
Figure 4.3: Second Floor of the Baines Wing
of the Yorkshire College, Leeds (1890)
[University of Leeds Archives]



THE YORKSHIRE
COLLEGE : LEEDS.
PLAN : AND : VIEW : OF : THE
COLLEGE : BUILDINGS : 1890.

Figure 4.4: Upper Stories of University College, Sheffield (1903)

[Source: Fluckton and Gibbs, University College, Sheffield. Reproduction by kind permission of Sheffield City Archives (ref. AP 142). Please do not copy or publish without further permission.]



appealing to local constituencies for funding a students, but they could never compete with the big guns.

4.4.1 Staff

Given the limited funds of the colleges, growth in staff at the departments was also slow. In the absence of other lecturers, however, where possible the biologists implemented schemes of demonstrators and assistants, similar to that utilised by Huxley in South Kensington. These assistants were drawn from London and Oxbridge, from the most advanced students in their own departments, or from local field clubs. Miall often used these assistants and juniors at the Yorkshire College to perform what he saw as 'peripheral' teaching duties: to manage laboratory sessions and to teach Saturday and evening classes. He appointed his first demonstrator, James Abbott, a prominent member of the Leeds Naturalists, in 1877. Abbott was succeeded by Alfred Denny, who subsequently went on to replace Miall at Firth College in Sheffield. Among the later demonstrators in Leeds was Harold Wager (employed 1887 to 1893), who was to be Miall's son-in-law and his successor, who had trained at the Royal College of Science under Huxley's system. The new staff were increasingly well qualified, as Miall began to gather around him at the YCS a small professional community and to appoint other lecturers. By the turn of the century, there was seven staff in all: professor (as Miall had been appointed in 1879), assistant lecturer in botany, assistant lecturer/demonstrators in zoology and botany, junior demonstrator in biology, assistant/keeper of insect collections, and laboratory steward.

Denny, by contrast, remained alone on the Firth College biology payroll until 1896 – despite arguments in Council that the department should be expanded to aid the campaign for admission to the Victoria University – when the Oxford-educated B.H. Bentley was appointed assistant lecturer in botany. They were joined by J.T Evans as assistant lecturer and demonstrator in 1903 – a considerable lag behind similar staff expansion in other Firth departments, and those at the Yorkshire College. Woodhead meanwhile had his own problems: despite his expertise in the area, when first hired by the HTC, the Department of Science and Art refused to recognise him as a qualified botanist. Although he ran the department, he only taught the physiology and biology classes: Dr. S.G. Rawson, Principal of the HTC and a chemist by training, officially ran the botany class, with Woodhead as his assistant. This arrangement was short-lived; Norman Walker, an assistant of Miall's at the YCS, soon took over botany, until the following year, when Woodhead was awarded his botany certificate, thus satisfying the DSA. Woodhead was assisted by a number of student apprentices, presumably the pick of the crop from the

HTC students, including Frederick Mosley, son of the college's curator.⁷⁹ Family networks were important at every level of appointment.

4.4.2 Laboratories

If staff numbers were a problem, accommodation was even more so: and this frustrated the biologists, who were all in their own way dedicated to practical teaching. In part, this dedication arose from a desire to emulate teaching methods from the Continent, and from Germany in particular. Miall had spent the summer of 1872 in Germany in order “to look at the German system of education and see for [himself] how far such a system would be possible in Industrial England”.⁸⁰ Denny's department subscribed to the pro-German *Annals of Botany* and to *Zoologischer Anzeiger*: a modern language was considered vital for the study of biology at the college.⁸¹ Woodhead studied in the cytologist Edvard Strasburger's lab at the Botanical Institute in Bonn, and when justifying the expense of the building work at the HTC, Rawson cited the German model of laboratory education.⁸²

The Yorkshire biologists had difficulty emulating the German scale of laboratory training. The Yorkshire College had only managed to raise one third of the projected £60,000 deemed necessary to build the college, and its early development was inhibited by this lack of funds. Nevertheless, by 1884 they were able to leave their cramped premises in Cookridge Street and set up in new buildings on an estate on Beech Grove. Miall was then able to shift his practical teaching from the medical school laboratory to a custom-built lab on the second floor of the new Baines Wing (see figure 4.3). Perhaps reflecting the disciplinary hierarchy within the college, the geologists enjoyed more accessible accommodation on the first floor, and both were dwarfed by the chemical department: but Miall had sufficient light for microscopic work and enough space for a small museum. Miall had a hand in designing the new lab, which he considered to be more vital a pedagogical space than the lecture theatre.⁸³

The Firth College department at which Miall first taught had no laboratory facilities – the initial college building comprised of a central hall surrounded by some classrooms, a physics laboratory and a rudimentary chemical laboratory. These rooms were small and under-equipped, and for the first decade there was no laboratory accommodation

⁷⁹ Natural history was a family affair for the Mosleys: Seth's other son, Charles, was later assistant curator at the Tolson, and they both helped their father edit his many journals and books. (Mosley and Mosley, *An Account of the Birds of the Huddersfield District*.) Frederick Mosley helped Woodhead prepare the many distribution maps necessary for his Ph.D. publications. (Woodhead, 'Ecology of Woodland Plants'.)

⁸⁰ Anon., Manuscript Biography of L.C. Miall, 15.

⁸¹ UCS, *Annual Report* (1901).

⁸² HTC, *Calendar* (1900–1).

⁸³ Miall, Letters to Stephen Miall, *Thirty Years of Teaching*, 1–10.

specifically for biology. Precious little biological practical study could be carried out until 1886, when a small donation was used to purchase specialist equipment. Denny was constantly battling for funds for equipment and specimens (and to increase his paltry salary).⁸⁴ The size and location of the departmental lab are unclear until 1889 when the council, noting that “the Biological Laboratory is a small room with no space for the specimens required”, began to look for more spacious accommodation.⁸⁵ The obvious choice – soon taken – was the physiology laboratory of the medical school. This was itself, however, chronically insufficient, and the completion of the biology laboratory (quickly dubbed ‘diabolical’ by the students) on the new top floor of Leopold Street – which included a physical laboratory, several classrooms and a lecture room – was a welcome relief.⁸⁶ The laboratory measured 32 by 20 feet, slightly smaller than the nearby physical laboratory (see figure 4.4). A skylight ran the length of its high ceiling, and it was well-ventilated with ‘special flues’.⁸⁷ Like others in the college, the diabolical lab reflected the dedication of Firth staff to the lab as a site of teaching, especially that of William Hicks (principal from 1883 to 1905), who had been one of the first students at the Cavendish Laboratory. In 1903 the department moved to the new Weston Bank site, where the biology department enjoyed five times the floor space, including two sky-lit laboratories, a museum and a greenhouse on the roof of the tower.

Woodhead and his predecessor, Alfred Sheard, had to make do with occasional use of a small lecture room on the first floor of the Huddersfield Technical School.⁸⁸ “Biological Classes are held anywhere and everywhere,” noted the Principal, “the unhappy lecturer, with unhappy face and laden with microscopes being constantly encountered in the corridors seeking for a vacant room.”⁸⁹ Woodhead complained that all he had to work with was “one large bay window and half a dozen bottles”, and he was determined to resolve the situation.⁹⁰ During the years following his appointment, Woodhead became increasingly dedicated to the laboratory as a site for life science, continuing to undergo laboratory training in Bonn, at the Royal College of Science, and attending courses at the YCS in zoology and advanced laboratory work in botany.⁹¹ In 1900, already Fellow of the

⁸⁴ FCS, *Prospectuses* (1884–1890).

⁸⁵ FCS, *Prospectus* (1888–9), 22.

⁸⁶ Not everyone felt warmly about this room. Prospective students were advised, “if I were you, I should not go into this room, because it does not smell nice”. (‘Standard I Teacher’, ‘Our College’, 171.)

⁸⁷ Flockton and Gibbs, *Plan of Additions*.

⁸⁸ HTS, *Calendar* (1885–6).

⁸⁹ HTC, *Calendar* (1896–7), 144.

⁹⁰ Cited in Barker, ‘The Educational Contributions of T.W. Woodhead’, 29.

⁹¹ Miall, impressed, considered Woodhead to be intelligent, thorough and enquiring. (Sheail, ‘T.W. Woodhead and the Study of Vegetation and Man’.)

Linnean Society, Woodhead went to study in the Cambridge University Botany and Bacteriology laboratories, under Marshall Ward and his distant relative German Sims Woodhead respectively. Declining Ward's offer to take up a botanical post there, he brought back to Huddersfield firm and educated ideas as to the importance of laboratory training.

From 1897, Woodhead headed a distinct biological department (now separate from 'Other Sciences'), and he was able to convince the council that the jubilee extension should include a biology laboratory. Building began in 1897, and after taking five years to complete, it included physical and chemical laboratories, engineering workshops, cookery rooms, a museum and a school of art.⁹² Woodhead was heavily involved with the design of the new laboratory, even more than Miall had been with the Baines Wing of the YCS. J.F. Hudson, later Principal of the HTC, wrote that "as a member of staff, [Woodhead] practically created our Biology Department, which has been built and elaborately fitted under his supervision".⁹³ The laboratory Woodhead created – which, like Denny's, was accompanied by a small greenhouse – was widely acclaimed. Sadler was certainly impressed:

The [HTC] is fortunate in having one of the best biological laboratories in the North of England. In it there is every convenience for dissecting and microscopic work and I am not surprised to hear that the laboratory has been taken as a model by several other institutions which contemplate similar work. [...] The department is probably one of the best equipped in the College: the facilities are such that work of a University standard can very well be carried through there.⁹⁴

His old mentors Sims Woodhead and Marshall Ward travelled to Huddersfield for inspiration in laboratory planning, as did staff of the agriculture department of the University of Leeds.⁹⁵

4.4.3 Museums

As significant an architectural and pedagogical feature of the HTC as the department laboratory was its museum, which, as in all three colleges, was constructed in direct juxtaposition with the laboratory. Just as in the metropolis (where UCL and the British Museum were neighbours, and South Kensington hosted a plethora of different sites),

⁹² Balmforth, *Jubilee History of the Corporation of Huddersfield*, 43–46. The building was based on a survey carried out of the architecture, equipment and fittings of colleges in Leeds, Bradford, Manchester and Liverpool. (HTC, *Building Sub-Committee Minute Book*.)

⁹³ Cited in Barker, 'The Educational Contributions of T.W. Woodhead', 29.

⁹⁴ Sadler, *Report on [...] Education in Huddersfield*, 79, 81.

⁹⁵ Anon., 'Huddersfield Loses an Eminent son'.

museums and colleges^{were} inter-dependent. Museums were an important architectural feature of many departments – metallurgical, pathological, physiological, industrial – in all the college buildings. As Forgan notes, “laboratories as it were grew up in the shadow of the museum”.⁹⁶ The Huddersfield Technical College formed a new natural history museum in 1896, based on the collections of the Huddersfield Literary and Scientific Society (which had been absorbed into the HTC in 1885) and that of Seth Lister Mosley’s Economic and Entomological Museum in Beaumont Park, and supplemented in 1901 by the collections of the Huddersfield Naturalists.⁹⁷ Mosley, who was already familiar with the society’s collections (having helped Charles Hobkirk to catalogue them in 1877, and supervised their transfer to the HTS), moved with his collection and gave his services as a curator initially without salary.⁹⁸ Mosley clashed with the college authorities, however, arguing that the collections should be made public, rather than only open at selected short times for those who were not students or staff – he had only agreed to the transfer on the governors’ “promise that it should be made open to the public”.⁹⁹ Only in 1919 was his goal realised, when the collections were transferred to Ravensknowle Hall to form the Tolson Memorial Museum: Woodhead moved with them as director, and Mosley took up the post of curator with his son Charles as his assistant.¹⁰⁰

The HTC is the best documented of the academic museums. Although the plans of the Yorkshire College show its biological museum (see figure 4.3), the historian can glean very little else about it. The collection was probably built up by Miall and his staff, and certainly supplemented by the Leeds School of Medicine botanical museum in the 1880s. By 1898 it “consisted of cases along the corridors. [...] A small number of skeletons – many spirit preparations particularly fishes – mostly from the Wheelhouse collection of the original Medical School.”¹⁰¹ Miall purchased two significant entomological acquisitions in the 1890s, one of which was part of the collection of R.H. Meade, the Bradford physician-naturalist who had recommended Miall for the post of curator at the Bradford Philosophical Society.

⁹⁶ Forgan, ‘The Architecture of Display’, 155, ‘Museum and University’.

⁹⁷ HTC, *Calendar* (1896–7).

⁹⁸ Mosley announced his career change thus: “Mr S.L. Mosley’s Museum at Beaumont Park is now closed as a public institution. There or elsewhere it has been open to the public, either free or at a nominal charge, for 30 years. The formation of a town museum in Huddersfield [as he hoped the HTC collection would become], and the appointment of Mr Mosley as curator, renders its existence no longer a necessity. [...] Many specimens not needed in this capacity have been removed to the new museum at the Technical College.” (*Naturalists’ Journal* 9 (1900), 143.)

⁹⁹ Mosley, ‘Autobiography’, 29; O’Connell, *The Polytechnic of Huddersfield*.

¹⁰⁰ Leigh Tolson donated the house as a monument to his two nephews, killed in action during the Great War. (Barker, ‘The Educational Contributions of T.W. Woodhead’; Davies, ‘The Making of a Municipal Museum’.)

¹⁰¹ Cited in Baker and Edmonds, ‘Louis Compton Miall’, 41.

Denny was also committed to the museum as a site of life science pedagogy.¹⁰² For although the department for many years lacked a specific museum room, Denny was praised for building an extensive collection – ‘a renowned museum’, allegedly one of the finest in the country – which he housed in the lab.¹⁰³ It dominated the space: “miserable relics, called specimens confront you everywhere. Standing at the door you may observe a pot full of deceased & diseased frogs, in a large glass case to the left you see bones of many defunct animals, all neatly arranged with an eye for effect.”¹⁰⁴ Denny based his collection on that of the British Museum, and was very grateful for duplicate specimens from the *Challenger* collection sent North for his museum.¹⁰⁵ In the new Weston Bank site, at long last, the department had dedicated museum space in the tower (see figure 4.4). Laboratories and museums still existed in juxtaposition as the new century dawned.

4.5 Pedagogical Modes and Sites

Having established who was teaching biology, and where, I now arrive at the central portion of this chapter, in which I examine *how* life science was taught. This section, like the thesis in general, is set out according to site: I examine in turn the modes of pedagogy in the lecture hall (interaction and illustrations) and the laboratory (dissection and microscopy). After detailing the prevalence of Huxleyan pedagogical techniques in the practical courses of the departments, I examine the continuing significance of museum study and the declining use of the field as a site for teaching. Nowhere is it clearer that the laboratory was but one of a number of sites in which the biologists taught.

4.5.1 Lectures and Technologies of Display

The courses all began in the lecture hall (especially in the early years of the departments, when this was the only pedagogical space in the built environment available). Miall’s lectures, which like those of his colleagues grew more advanced as the department became more established, were apparently quite interactive affairs. He instructed his assistant Norman Walker on how to conduct classes:

In an adult class the business of directing the effort by putting questions is [...] easily managed. If any question proves too hard to be answered within a reasonable time, it is supplied by the tutor. In this way the structural features of an

¹⁰² Denny, ‘The Relation of Museums’.

¹⁰³ Chapman, *A Modern University*, 30–31. The collection still exists today, housed in its own room in the department’s Denny Building.

¹⁰⁴ ‘Delta’, ‘Our Occupations’.

¹⁰⁵ Denny, ‘The Relation of Museums’.

organ or organism under consideration can be drawn from the class by questioning and, at the same time, instead of a waiting attitude, an attitude of alert enquiry is maintained.¹⁰⁶

Nevertheless, the pedagogue was clearly the driving force, for the students “must be told what to look for before they will open their eyes; they must be told what to think, or they will not think at all”.¹⁰⁷ The lecture hall was a site for implementing discipline.

It is difficult to recover what went on in the lectures: what is clear is the novel fashion in which Miall illustrated them. Secord has studied the importance of illustrations in botanical lectures, and the use made by educators such as William Hooker and J.S. Henslow of lithographs and vast Elephant Folio prints; and Bucchi details the importance of wallcharts to science education.¹⁰⁸ The replacement of other devices in popular lectures with magic lanterns is discussed in chapter 2: Miall, however, brought this technology into the classroom to supplement existing methods. According to a fellow member of the staff discussion group the Priestley Club, Miall was

the first to demonstrate the possibility of using a lantern successfully in a room illuminated by daylight [...] and he was certainly the first to put the plan into actual and continuous operation for the purpose of illustrating courses of lectures. [...] There is probably no other educational institution [in 1890] in which the optical lantern is used to such a large extent for ordinary class-work as at the Yorkshire College [...] the initiation and growth of the system being due to Professor Miall.¹⁰⁹

Although the slides did not have the advantage of being left on the wall for students to continue to view, the lower cost of production and vast reduction in storage space outweighed these disadvantages. Miall could show several hundred slides during a lecture, compared to the 40 or 50 folio diagrams that could fit on a wall, which were cumbersome to replace between lecture courses and subject to wear and tear. Microphotographs were also more suitable to the medium of the lantern: as an excited contributor to the *Review of Reviews* gushed, “it is so obvious an advantage to be able to throw upon a screen, a thousand-fold magnified, before the eyes of the whole class, the exact picture of the

¹⁰⁶ Walker, *An Introduction to Practical Biology*, v. Walker attributed this mode of lecturing to Miall, and claimed this method had been carried out at the YCS.

¹⁰⁷ Miall, *Thirty Years of Teaching*, 211.

¹⁰⁸ Bucchi, ‘Images of Science in the Classroom’; Secord, ‘Botany on a Plate’.

¹⁰⁹ Bothamley, ‘The Optical Lantern as an Aid to Teaching’, 226. Miall used new, more powerful oxy-hydrogen lanterns, and specific combinations of blinds.

microscopical infinitesimals [...]. Diagrams cannot for a moment compare with the slides."¹¹⁰

There is no evidence that Woodhead, despite his YCS training, used lantern slides in his lectures. As late as 1900, he ordered a number of diagram frames and a diagram cupboard (one way of solving the storage problem): clearly he subscribed to this mode of illustration rather than the lantern.¹¹¹ He used Mosley's sumptuous hand-coloured plates as teaching aids, and he encouraged his students to make detailed, accurate line reproductions of these and his diagrams of microscopic preparations.¹¹² Along with micro-photographs, these were "designed not as substitutes for actual specimens, but as aids to the practical observation of plants".¹¹³ Real specimens from nature, for Woodhead, were preferable to any form of illustration. His physiology lessons, like Sheard's had been, were "fully illustrated by means of diagrams, models, the human skeleton, occasional dissection [...] and (in the Advanced Class especially), microscopic preparations".¹¹⁴ The classes had more in common with an anatomical demonstration than a philosophical lecture.

In Denny's case, all that we are able to tell about his lectures are that they provided the guidelines to the laboratory sessions: whatever pedagogical and illustrative techniques he utilised, he was apparently (according to one eyewitness) an uninspiring lecturer, and he never had the appeal of Dallinger, who was an experienced lecturer and had attracted audiences of up to 150, four times larger than any class Denny taught.¹¹⁵

4.5.2 Laboratory Teaching

At all three colleges teaching moved quickly from lectures to practical work. Miall insisted to the Devonshire Commission in 1872 that such a mode of study be included in the teaching of biology. "Unless a practical examination is made an integral part [...] the system cannot be expected to produce any permanent benefits," he had told them, as "the teaching of scientific subjects ought [...] to be of a highly practical character."¹¹⁶ Miall had introduced practical biology at the YCS even before the department had its own lab in 1884, and it took an increasingly important role in his YCS courses from the early 1880s.¹¹⁷ Denny was also a firm advocate of such training, telling the Museums Association,

¹¹⁰ [Stead], 'The Magic Lantern Mission', 561.

¹¹¹ IITC, *Building Sub-Committee Minute Book*.

¹¹² Woodhead, *Miscellaneous Notebooks*.

¹¹³ Woodhead, *The Study of Plants*, 4.

¹¹⁴ IITS, *Calendar* (1890-1), 62.

¹¹⁵ Personal communication with Mrs Doris Parkin, who remembers Denny was as a small man with a squeaky voice.

¹¹⁶ Cited in Baker and Bayliss, 'Louis Compton Miall', 210.

¹¹⁷ YCS, *Calendars* (1880-1905).

“training of a practical nature is desirable, and, in fact, necessary [...]. In towns which have their University College, this can be done without difficulty by arrangement of a laboratory course of instruction.”¹¹⁸ Such instruction was novel to the county, where there had previously been an “entire absence of practical examination”.¹¹⁹

The laboratory teaching at all three colleges was of a relatively similar character, based on Miall’s course at the YCS. The student would come in one afternoon or evening a week to whatever custom-built or makeshift laboratory the college had at the time. These were not especially pleasant spaces in which to work: “in the laboratory”, recorded one Firth College student, “the atmosphere is even more polluted & tainted than that of the Chemical Department. [...] At the far end of the room are stationed mysterious jars evolving a strange & unpleasant odour, giving a decidedly fish-markety aroma to the place. Scattered here & there are various other pots with similar unsavoury contents”.¹²⁰ Armed with a strong stomach, then, the student would enter the lab and sit at a bench “supplied with every convenience for dissecting and microscopic work [...] with a separate drawer or locker for instruments”.¹²¹ Prevalent amongst this equipment was the scalpel: much of the student’s time in the laboratory was spent dissecting, thanks to Miall’s insistence that students should not merely observe, but participate in practical work. “To find out your own way,” he wrote, “to puzzle out your own problems, and to work at your own rate are the first elements of productive investigation [...]. Knowledge that we get without personal effort is knowledge in appearance only; it strikes no root, and soon withers.”¹²² Woodhead’s also intended his courses to develop habits of careful thought and observation, and encouraged his students to work “from their own observations and experiments. The chief value of each course”, he felt, “lies in the practical work.”¹²³

And so the scalpel-wielding student was presented with a specimen, which in a botany course was normally a common plant gathered from a local park.¹²⁴ Zoological material, according to another disgruntled UCS student, was not quite so fresh:

When dissection claims attention, you soon furls up your sleeve

But before you’ve gone on very long, you’d rather like to leave

You begin to cut a “Dogfish” up – (you don’t think it smell fresh)

¹¹⁸ Denny, ‘Relation of Museums’, 43.

¹¹⁹ Royal Commission on Scientific Instruction, *First, Supplementary, and Second Reports*, 405.

¹²⁰ ‘Delta’, ‘Our Occupations’, unpag.

¹²¹ HTC, *Calendar* (1899–1900), 23.

¹²² Miall, *House, Garden and Field*, 261.

¹²³ HTC, *Calendar* (1899–1900), 23.

¹²⁴ Woodhead, *The Study of Plants*, 3–4; HTC, *Calendar* (1897–8).

and you soil your fingers frightfully whene'er you feel its flesh.¹²⁵

(See figure 4.5.) If not a dogfish, the soggy specimen was likely to be a frog, a rabbit, a worm, or (especially in Miall's case), a cockroach, which were all favourite representative types. The Yorkshire biologists appropriated this heuristic technique from Huxley: each of the major natural divisions was represented by one archetype, which was studied in great detail and from which generalisations were then drawn.¹²⁶ Propped open on the dissecting bench beside the typical specimen would be Huxley's *Lessons in Elementary Physiology* (1866) from Macmillan's school class book series. Later, it might be supplemented by a text written by one of his London coterie: Milnes Marshall's *The Frog* (c. 1888); Frederick Bower's laboratory manual *Practical Botany for Beginners* (1894); D.H Scott's *Introduction to Structural Botany* (1894); or Sydney Vines' *Students' Text-book of Botany* (1894).

Increasingly, however, the students would be found sitting in front of a microscope rather than with scalpel in hand.¹²⁷ The student was presented with this most privileged piece of apparatus as an unproblematic extension of the eye – in the laboratory, the microscopist gained *direct access to Nature*.¹²⁸ Nevertheless, they were given careful guidance in its use: Miall urged in 1904, as he had throughout his career, “it is indispensable that at least one competent naturalist [preferably himself], skilled in the use of the microscope, should be there to direct and explain”.¹²⁹ To the student this discipline was somewhat exasperating. In zoology, “to place a worms' nephredum upon a micro-slide/looks quite a simple little task, - until the same you've tried”, and similarly in botany

[...] you put your slide under the microscope, -

But to think you'll see much, you'll find is empty hope.

With care and exactness you sketch everything you see

And if that is not possible, draw what you think should be. [...]

This process repeat, till your patience is fairly done,

And again every day, till the end of the Session's come.¹³⁰

¹²⁵ 'Spadix', 'The Joys of Zoology', unpag.

¹²⁶ Huxley explained, “as, for example, among the plants, we take a yeast plant, a *Protozoicus*, a common mould, a *Chara*, a fern, and some flowering plant; among animals we examine such things as an *Amoeba*, a *Volvox* and a fresh-water polype. We dissect a star-fish, an earth-worm, a snail, a squid, and a fresh-water mussel. We examine a lobster and a cray-fish, and a black beetle. We go on to a common skate, a cod-fish, a frog, a tortoise, a pigeon and a rabbit.” (Huxley, 'On the Study of Biology', 155.)

¹²⁷ Miall introduced a YCS course devoted entirely to practical microscopy in 1891.

¹²⁸ Gooday, 'Nature' in the Laboratory'.

¹²⁹ Miall, *House, Garden and Field*, 82.

¹³⁰ 'Spadix', 'The Joys of Zoology', unpag., 'Our 'Vale Meium'', unpag.

Figure 4.5: 'The Biolmaniac'
Source: UCS, *It* (1897), unpag.



ARTISTIC STUDIES IN
BLACK & WHITE
BY "SCOTT"

No. 14. THE "BIOLMANIAC"

"I know the scientific names of beez's animalculous"
(Pitaisé of Penzance):

Those select students who survived this ordeal and went on to excel either with the microscope or the scalpel were allowed back into the laboratory during time set aside for students who desired “to do work of a more advanced nature”, especially in embryology, when “special facilities will be afforded to students desirous of continuing their studies and of carrying out more advanced work”.¹³¹ These advanced sessions were initially sparsely populated, but by 1896 Principal Hicks of Firth College proudly announced, “a great deal more advanced work has been done by students, whilst several original investigations in different branches of science have been carried on”.¹³² And for those unsated even by this diabolical double helping, there was always the Firth College Students’ Biological Society (see 4.7.3), for “advanced students”, which included in its manifesto the pursuit of independent advanced study.¹³³

4.5.3 Museum Teaching

Biology teaching and research, however, were not limited to the lab and the lecture hall: despite the privileged role of the laboratory in the rhetoric of the new biologists, the museum was still a vital site for the teaching of college biology. Although he professed to despise “stuffed mammalia [...] their grotesque deformity, their unnatural attitudes, and their proneness to contract in unexpected places”, Miall made use of both college and society collections in his teaching, rearranging the Philosophical Hall museum to suit the didactic purposes of his college courses.¹³⁴ Clearly Denny also made use of his extensive collections in Sheffield, prompting Elijah Howarth to report to the Museums Association, “it was very encouraging to all engaged in Museum work to see the great importance attached to Museums in connection with the University teaching”.¹³⁵ The college forged strong links with Howarth’s Weston Park Museum, and the college council celebrated the proposed move to the present site because it had “the great advantage of making the Weston Park Museum available for teaching purposes”.¹³⁶ In turn, the proximate juxtaposition of the new University College was greeted with glee by the museum committee: “with the erection of the New University College adjoining Weston Park it is eminently desirable that the natural history collections should be arranged so that they can

¹³¹ FCS, *Calendar* (1894–5), 92; HTC, *Calendar* (1900–1), 138.

¹³² FCS, *Calendar* (1896–7), 170.

¹³³ UCS, *Calendar* (1897–8), 276.

¹³⁴ Miall, ‘Museums’, 360. The LPLS council reported “that the increasing use of the museum for teaching purposes in connection with the Yorkshire College renders it necessary to replace the somewhat hap-hazard arrangement of the past by the classification almost universally adopted by teachers”. (LPLS, *Annual Report* (1876–7), 12.)

¹³⁵ Museums Association, *Report 2* (1891), 4.

¹³⁶ UCS, *Annual Report* (1902), 4.

be used by students”.¹³⁷ (Howarth hired J.W. Baggaley, a student under Alfred Denny at the UCS, as his successor at the museum.¹³⁸)

As noted earlier, the HTC museum was frequently used by students (and to Mosley’s frustration, not by the public). It was clearly an important didactic resource, as Mosley noted bitterly: “having grown from the beginning, it is now made use of by nearly every department in the college”.¹³⁹ It may not have been as effective as the departments may have wished, however: the council was keen to extend the museum “in all directions in which it bears upon the direct studies of our students” but a year later Woodhead forlornly noted, “a series of typical skeletons would be of great value for the students in Zoology [the extant collections were largely ornithological], but for these we must wait”.¹⁴⁰

4.5.4 Fieldwork

Practice in the built environment had its limits: Miall was apparently keen to study live nature, and in context. “I find my best subjects”, he wrote, “in my own garden, or in the next field, or in the brook at the bottom of the valley”, and he advised teachers, “when and where possible the education will be carried on out of doors, in garden, field and hedgerow”.¹⁴¹ In the early years of the Yorkshire College, Miall introduced fieldwork as a major component of the syllabus. Soon after his appointment, the *Annual Report* noted, “out-door work has been carried out during the summer term [...]. Frequent excursions have taken place for practice [...] in making observations on the geology and botany of the districts visited.”¹⁴² The Saturday and evening classes advertised fieldwork as a major component of their syllabuses, as did later courses in agricultural botany and forestry.¹⁴³

Except for these agricultural courses, however, references to field excursions run by the biology department dwindle by the late 1880s.¹⁴⁴ It is evident that as the YCS department’s laboratory practice became more established, the fieldwork became less privileged, and eventually disappeared altogether. Although Miall was still researching in the field (he studied insects in the field during the summer breaks), his teaching had moved entirely indoors. He was able to transpose the practice of life science from site to site by

¹³⁷ Borough of Sheffield, *Annual Report of the CFPLM* 47 (1904), 5.

¹³⁸ I am grateful to Mrs Doris Parkin, who also studied under Denny, for biographical information concerning Baggaley.

¹³⁹ Mosley, ‘Autobiography’, 29.

¹⁴⁰ HTC, *Calendar* (1899–1900), 216; HTC, *Calendar* (1900–1), 238.

¹⁴¹ Miall, *Thirty Years of Teaching*, 217; Miall cited in Baker and Bayliss, ‘Louis Compton Miall’, 216.

¹⁴² YCS, *Annual Report* 6 (1879–80), 23.

¹⁴³ See for example YCS, *Annual Report* (1898–9).

¹⁴⁴ In 1879, “botanical excursions will be made frequently”; in 1885 only “occasionally”; and 1887 there is no mention of fieldwork. (YCS, *Calendar* 5 (1878–79), 63 and 12 (1885–86), 91 and 14 (1887–88).) In the geology department, by contrast, fieldwork carried on throughout the century.

advocating a commonality of practice in all sites for life science, teaching hands-on study in the laboratory as he had in the museum and field. By 1904, the students and staff of the Yorkshire College practised biology in the laboratory alone, where Miall could exercise more control, and fashion his subject, as Huxley did, to mirror the methodology of the physical sciences.

Denny had never included fieldwork in his syllabus: at Firth College the built environment was favoured at the expense of the field. This was partly because of Denny's commitment to the museum, and partly because the relationship between local field clubs and the department was not as strong as the equivalent relationship in Leeds. The only life science fieldwork associated with the university college was that offered by the Student's Biological Society, established in 1897, who arranged field trips "from time to time for the investigation of the neighbouring districts".¹⁴⁵ Woodhead, by contrast, was firmly committed to the field as a site for life science pedagogy, in keeping with his ecological interests. Miall advised naturalists to "study things alive, and do not omit to examine carefully the spot where they grow. When you carry them away, remember that you may be leaving half the story behind you", and although Miall did not necessarily practice what he preached, his old student Woodhead did, leading his students on gathering expeditions as often as possible.¹⁴⁶ At the HTC, unlike in Leeds and Sheffield, fieldwork formed a vital component of the courses. And this multiplicity of sites is also evident in the research carried out at the colleges.

4.6 Research at the Colleges

The rise of formal laboratory teaching was only one innovation brought about by the new colleges: another significant change was the establishment of academic research schemes. Contrary to many histories of biology, however, this research did not contribute to the ascent of professional laboratory biology at the expense of amateur field natural history: rather, the most wide-reaching research scheme to emerge from Yorkshire, the plant ecology of William Smith and Thomas Woodhead, was the disciplinary site of a renewed strength in the amateur-professional relationship. Before examining the origins of this research school, however, I will outline Miall's (predominantly morphological) research,

¹⁴⁵ UCS, *Calendar* (1897–8), 276.

¹⁴⁶ Miall, *House, Garden and Field*, 218. Woodhead argued that ecology "gives to field work a more definite aim, and broadens the outlook of the student by linking up Botany with the study of climate, geology and topography". (Woodhead, *The Study of Plants*, 3.)

which although carried out mostly in a laboratory context, was not necessarily lab research.¹⁴⁷ The new institutional setting was not vital to his research career.

4.6.1 Morphology

Miall's first interest was in floristic botany, resulting in a publication with Benjamin Carrington, *The Flora of the West Riding* (1862), a small work for which Miall contributed the phanerogamic studies. He followed this with a number of geological and botanical surveys during the 1870s. At the Leeds Museum, however, he embarked on more detailed morpho-zoological studies of the crocodile (1878) and the Indian elephant (1879). From these he moved to marine and economic entomology in the 1880s, carrying out work that he eventually published as *Natural History of Aquatic Insects* (1895) and *The Injurious and Useful Insects* (1902). At the YCS, together with Denny, he made a detailed study of the cockroach, which gave rise to *The Structure and Life History of the Cockroach* in 1886: a detailed exposition of one of the most popular Huxleyan types, an entomological companion to Huxley's International Scientific Series text *The Crayfish: An Introduction to the Study of Zoology* (1880). It was for his work on aquatic insects that he was awarded an FRS in 1892, supported by Huxley. These projects, while involving a fair amount of physiological work, also relied on extensive fieldwork and on research he had embarked upon at the museum.¹⁴⁸ As Desmond notes, the 'new' biology retained much of the descriptive aspect of morphology as it moved from museums to the new labs.¹⁴⁹ It is clear that the laboratory setting was not vital to Miall's research career: if he made it appear so, it was to strengthen further his professional position, as discussed in chapter 6.

Other YCS staff continued the morphological character of Miall's research: Wager and Walker, for example, worked on the structure of plant roots.¹⁵⁰ Alongside Miall and other members of YCS staff, they presented the results of their work at the meetings of the Priestley Club. Founded shortly after the opening of the college, the club was "formed so that papers could be read & scientific topics discussed in a regular manner" by "members of the [Leeds Phil and Lit] Society and a few gentlemen of neighbouring towns".¹⁵¹ It was soon dominated by the YCS faculty, but a handful of local naturalists continued to contribute. They met every few weeks, initially at the Philosophical Hall, to discuss their

¹⁴⁷ Miall's research is discussed in more detail in Baker and Bayliss, 'Louis Compton Miall' and Baker and Edmonds, 'Louis Compton Miall'. Denny, alone at the Firth College department, did not have so much time for original investigation.

¹⁴⁸ Miall, Letters to Stephen Miall.

¹⁴⁹ Desmond, 'Redefining the X Axis'.

¹⁵⁰ Wager and Walker, 'On the Structure of the Root'.

¹⁵¹ Anon., Manuscript Biography of L.C. Miall, 20; LPLS, *Annual Report* (1875–6), 10.

latest research, often illustrated with lanterns.¹⁵² The philosophical society council considered the club to be “supplying a valuable stimulus to original scientific work in this town and neighbourhood”.¹⁵³

4.6.2 Plant Ecology in Yorkshire: The Academic Perspective

Although few students carried out advanced independent research at any of the colleges, one group at the YCS who did just that was an informal band that consisted of William Munn Rankin, Charles Edward Moss, and Thomas William Woodhead. The work they carried out around the turn of the century arguably prompted the growth of plant ecology as a discipline in England.¹⁵⁴ They were led by William G. Smith, a young Scot who joined the department in 1897. With his brother Robert, Smith studied under Patrick Geddes in Aberdeen: William went on to gain a Ph.D. from Munich, and Robert worked with Charles Flahault in Montpellier. Flahault was one of the first wave of biologists developing *œcological* approaches to botany along with Oscar Drude in Germany, Eugenius Warming in Denmark, and Frederic Clements and Roscoe Pound in the United States. Ecology developed differentially according to the physical environment in which these various practitioners worked: but they all drew to some extent on Humboldtian biogeography and Darwinian notions of the fragility of the balance of nature. Coined by Haeckel in his *Generelle Morphologie der Organismen* (1866) to refer to the study of the relationship between organisms and the external world, *œcology* was introduced to the BAAS in 1893 by the physiologist John Burdon Sanderson (the modern English spelling was settled at the International Botanical congress of the same year).

It was the brothers Smith – and William alone after Robert’s death from peritonitis in 1900 – who brought plant ecology into the British context. Upon their return from the Continent in the late 1890s, they set about co-ordinating a complete ecological survey of Scotland, employing the concepts central to ecological plant geography: the notion of a plant association, the relationship of flora and their environment, and botanical mapping. They found, however, that the techniques developed by Flahault and Warming in Europe and by Clements on the mid-west plains did not apply so well on the British archipelago, where edaphic (soil-related) factors played a greater role than in the more climate-determined continental ecology.

¹⁵² Priestley Club, *List of Papers*.

¹⁵³ LPLS, *Annual Report* (1875–6), 11.

¹⁵⁴ Bowler, *The Fontana History of the Environmental Sciences*, 361–378; Sheail, *Seventy-five Years in Ecology*, 3–35; Tansley, ‘The Early History of Modern Plant Ecology’; Worster, *Nature’s Economy*, 190–220; Woodhead, ‘Botanical Survey and Ecology in Yorkshire’, ‘Ecology of Woodland Plants’; [Woodhead], ‘Obituary Notice: William Gardner Smith’.

Soon after his appointment at the Yorkshire College, William Smith set about enrolling the most advanced students in a Yorkshire-based ecological project. Drawing on an established tradition of vegetation mapping in the county, he collaborated with Charles Moss and with William Rankin on Yorkshire-based surveys in the first years of the twentieth century.¹⁵⁵ Moss was a schoolteacher and an active member of the Halifax Naturalists, and both he and Rankin enrolled in Smith's classes at the Yorkshire College.¹⁵⁶ Woodhead also studied under Smith, and he joined this informal group: along with Arthur G. Tansley of UCL, they went on to form the Committee for the Survey and Study of British Vegetation (later the British Vegetation Committee, later still the British Ecological Society).¹⁵⁷

Woodhead's work on the structure and environment of the bluebell and the bilberry stimulated a keen interest in the plant ecology he learnt at the YCS, and he reinforced this during his strenuous botanical tours of the Alps with Carl Schröter of Zurich.¹⁵⁸ He took Smith's ecology back to the HTC, and building on his own morphological projects – on the structure of alder roots, for example – used it to embark upon a series of studies with his students.¹⁵⁹ Woodhead's contribution to plant ecology was to concentrate on far smaller areas than the county-scale or nationwide surveys pursued by the Smiths. He took areas of only a few acres – for example, Birks Wood near Huddersfield – and studied them intensively.¹⁶⁰ He examined the impact of a plant's environment on its very structure, combining micro-scale morphology and life histories with large-scale surveys. He also distinguished between complementary and competitive plant associations.

I discuss the significance of plant ecology as a disciplinary site for the continued interaction of amateurs and professionals in the following chapter: what is important to note here, however, is the multiplicity of sites involved in the study of plant ecology, particularly Woodhead's. He later wrote,

The significance of this work is that it has brought together the biochemist and physiologist, the histologist, morphologist and systematist, who have too long

¹⁵⁵ Smith and Moss, 'Geographical Distribution of Vegetation in Yorkshire'; Smith and Rankin, *Geographical Distribution of Vegetation in Yorkshire*.

¹⁵⁶ [Crump], 'Charles Edward Moss'; Lowe, 'Yorkshire Naturalists in the History of Ecology'; [Tansley], 'Charles Edward Moss'.

¹⁵⁷ Sheail, *Seventy-five Years in Ecology*; Woodhead, 'Botanical Survey and Ecology in Yorkshire'.

¹⁵⁸ Woodhead, 'The Bilberry', 'Notes on the Bluebell'. His work on the Bluebell, combined with his studies of the ecology of woodland plants, contributed to his Ph.D., awarded in 1906 from Zurich under Schröter, who was later part of the same informal and formal ecology networks as Smith, Woodhead and Tansley.

¹⁵⁹ Sadler, *Report on [...] Education in Huddersfield*; Sheail, 'T.W. Woodhead and the Study of Vegetation and Man'.

worked in isolation, and forced their attention once again on the fundamental problems of the relation of the plant to its environment [...]. If ecology has done nothing else, it has justified itself in proving and emphasizing the inter-dependence of these various branches of botanical study.¹⁶¹

Plant ecology required massive amounts of fieldwork in an era when the laboratory was apparently ascending to primacy. At the YCS and the HTC, both field *and* lab were crucial sites for research at the turn of the century – if not for teaching – especially Woodhead’s approach, which required detailed study of the life history and structure of each species.¹⁶²

4.7 Student Bodies

Having glanced at the production and producers of scientific knowledge, it remains to examine its consumption and consumers. Just as in previous chapters I discussed the audience of lectures and the visitors to museums, I will now outline what can be gleaned about the students of the colleges. Whereas details of the composition of lecture and museum audiences were scanty, if they existed at all, the colleges were careful to document student statistics: moreover, it is possible to examine the differences between the projected (working-class) and actual (middle-class) student constituencies, and to propose some reasons for the discrepancies.

4.7.1 Class

The YCS was originally set up “to increase the culture of every individual working man and working woman in the land”. It was

intended to supply an urgent and recognised want, viz., instruction in those sciences which are applicable to the industrial arts [...]. It [was] designed for use of persons who will afterwards be engaged in those trades as foremen, managers, or employees; and also for the training of teachers in technical science.¹⁶³

Their actual student intake, however, included many more managers than employees, and many drawn from Leeds’ growing professional stratum.¹⁶⁴ From the first intake, the student body included schoolmasters, medical students and ladies – but few artisans. Although various scholarships were available, the cost was largely prohibitive to the working classes: fees in 1876 were £1/1s per student for a year of lectures, twice that to include the laboratory course (in which students were expected to pay for their own

¹⁶⁰ I am grateful to Dr David Barker for sharing his expertise on Woodhead’s ecological work.

¹⁶¹ Woodhead, ‘Botanical Survey and Ecology in Yorkshire’, 121.

¹⁶² Sheail, ‘T.W. Woodhead and the Study of Vegetation and Man’, 127.

¹⁶³ Anon., ‘The Inauguration of the Yorkshire College of Science’, 509; YCS, *Report of the Committee*, 1.

¹⁶⁴ Taylor, ‘Victorian Leeds’.

equipment and specimens).¹⁶⁵ The lack of artisans had been anticipated by Sir Andrew Fairbairn, who had predicted, “you will never get working men to attend lectures unless they meet people of their own class. The fact of middle-class men being present drives them away.”¹⁶⁶ Miall agreed, telling the Devonshire Commission that “it is more easy to persuade a young man of the middle classes who has received a good education to join a science class than it is to persuade an artizan”.¹⁶⁷

In order to encourage the reluctant artisans, the YCS offered alternatives to the expensive full-time courses: at its inception it had been planned that “evening classes should be formed in the College in the principal towns for young men engaged in daily labour”.¹⁶⁸ The department also offered evening classes at the college, which, like the day courses, involved a considerable amount of practical work and excursions, meeting first in the Philosophical Hall, and subsequently in the museum. Miall passed these classes to Denny in 1881, and they subsequently died out fairly quickly, despite their success elsewhere (see figure 4.2). Saturday classes were also available at the department, again replete with practical work and excursions. By the turn of the century, however, even the Saturday classes were out of the financial reach of many (at £5/5s per annum). The only cheap alternative remaining was that of attending as an ‘occasional’ student.¹⁶⁹

Despite the everyman rhetoric of the Firth College founders, and claims of students “drawn indifferently from all classes”, after the first few years the studentiate settled down to consist mainly of the sons of the professional middle class, with only a small number of working-class men taking evening classes.¹⁷⁰ By 1889, Hicks admitted that manufacturers and workmen were showing little interest, and eight years later the UCS council pressed that training for professional life should be an integral part of their remit. Upon the absorption of the medical schools into the colleges into the 1880s, the student populations of the biology departments were further bolstered by a large group of (rowdy) quasi-professional men. College intake statistics reveal that the majority of students had not attended state-funded schools.¹⁷¹

Firth College did attempt to remedy this situation through a series of popular lectures given in the Great Hall on Saturday evenings, delivered by the likes of Dallinger,

¹⁶⁵ “Each student is required to provide himself with a Microscope [...], a dissecting case [13s/6d], a biological drawing book [1s], two razors and a strop.” (YCS, *Calendar* 19 (1892–3), 111.)

¹⁶⁶ Cited in Shimmin, *The University of Leeds*, 17.

¹⁶⁷ Royal Commission on Scientific Instruction, *First, Supplementary, and Second Reports*, 407.

¹⁶⁸ YCS, *Report of the Committee*, 1.

¹⁶⁹ In 1885, for example, 18 of the 62 students chose this option. (YCS, *Annual Report* 12(1885–6).)

¹⁷⁰ FCS, *Minutes of Council* (1883–4), 142; FCS, *Prospectuses*.

¹⁷¹ FCS, *Minutes of Council* (1892–6).

Sorby, Hicks and Denny. (Again, Dallinger's were the best attended, often attracting over 500, compared to Sorby's audiences of less than 200.) In 1887, the College acted in keeping with its extension lecture roots and began to provide peripatetic free lectures in the outlying towns.¹⁷² Denny was fully committed to the scheme, preparing for them carefully, and illustrating them with lantern slides. He spoke on a variety of subjects, giving single lectures and week-long courses. Nevertheless, despite the best efforts of the officials of both the colleges, laboratory biology at Firth College and the YCS was, like natural history lectures and museums, a predominantly middle-class phenomenon. Perhaps working men had little use for the qualifications (DSA, or those of London and Victoria Universities) offered as the end result of study at the departments. Only at the HTC did the evening classes manage to attract labourers and textile workers, and the class entry sizes testify to this (see figure 4.2).

4.7.2 Gender

Academic biology, then, was dominated by the middle classes: it was also a largely male activity. Just as the staff were by and large middle-class, they were almost all male (except for an unnamed assistant at the HTC in 1895, and 'Miss Simpson', Miall's assistant at the YCS). It is unclear what the gender distribution of the Yorkshire College student population was: women were admitted in principle from the outset, but it was only in the 1890s that they began to comprise any significant proportion of the biology classes, as more and more teacher trainees joined the courses and ladies began to attend courses at the medical school (although schoolmistresses were only admitted in 1896).¹⁷³

Neither are there exact figures for the number of women attending Firth College, although it is clear that they too were a minority, despite a brief period of lower fees for women designed to promote equal access.¹⁷⁴ During the 1880s the Sheffield biology department taught a smattering of female students (in 1885 two evening classes in botany were offered especially for ladies), and then almost none during the 1890s, until the turn of the century when a few more enrolled.¹⁷⁵ The HTS, by contrast, had a large proportion of women from its formation in 1884, when the mechanics' institute amalgamated with the Huddersfield Female Educational Institute: women were then admitted to all classes. In 1890, 18 of the 23 students who sat physiology exams were female. It is clear from the examination returns and the concerns of the governors in the 1890s that there were still a

¹⁷² These included treasury-funded coal-mining lectures, some of which were run in conjunction with the YCS.

¹⁷³ Anning and Walls, *A History of the Leeds School of Medicine*, 96–98.

¹⁷⁴ FCS, *Calendar* (1891–2).

sizeable number female students continued to study at the college: possibly because so many of the classes were in the evenings.¹⁷⁶ In order to sustain this, they offered subject matter they considered appropriate:

SPECIAL SUBJECTS FOR GIRLS

The Day School is open to Girls as well as Boys; in the Lower School they take the same subjects as the boys, but in the Upper School they may, if desired, take Needlework, Dressmaking, Physiology and Hygiene, in place of Chemistry and Physics on the Science side.¹⁷⁷

Life sciences were evidently considered a more appropriate feminine activity than the physical sciences, despite concerns earlier in the century about the suitability of human anatomy as an object of study for a female audience. Any concerns about the modesty of female students was far outweighed by the advantages of the hygiene course taught alongside physiology, which included general health and home economics.

4.7.3 Student Societies

In the 1890s students in all the colleges began to exhibit more solidarity, and formed unions and societies: alongside the athletic clubs and debating groups, clubs for further study in the departments began to appear. Among them were the YCS Students' Association, an informal students' scientific society and later a Geological Society,¹⁷⁸ and the University College Sheffield Students' Biological (or 'Diabolical') Society. Established in 1897, the latter society organised meetings and excursions, the outcome of which was mixed – one such trip was concluded after “a few accidental captures and the killing of a rat (on strictly scientific principles)”.¹⁷⁹ The society was formed, however, with a view to the advanced study, discussion and propagation of biology. They elected Denny vice-president and Sorby their president, although it seems likely that the student honorary secretary actually ran the society and its 'reading section' (“to promote periodical reading and discussion of current biological literature”¹⁸⁰). Like other clubs, they read papers and exhibited specimens at four meetings per term, including on at least one occasion live

¹⁷⁵ These trends can be gleaned from prize-winners and other hints in the FCS *Minutes of Council and Calendars*.

¹⁷⁶ HTC, *Calendars*. One governor “drew attention to the proposed adaptation of Room 23 as a ladies lavatory”. (HTC, *Governors' Meetings Minute Book* 23 February 1897.) Both the YCS and the Finsbury Technical College were notably lacking in such facilities. (Beresford, ‘Red Brick and Portland Stone’; Brock, ‘Building England’s First Technical College’.)

¹⁷⁷ HTC, *Calendar* (1894–5), 5.

¹⁷⁸ Miall, *House, Garden and Field*; YCS, *Gryphon* 1 (1897–8).

¹⁷⁹ ‘Polian Vesicles’, ‘Murmurs Diabolical’, unpag.

¹⁸⁰ UCS, *Floreamus!* (1897), 13.

specimens. Their discussions were fervid, and there was quite a sense of occasion surrounding their meetings:

The Biologists have been observed varnishing skeletons and hanging up aesthetic diagrams, with a view to their annual tea – a vast impressive orgie [...] out of respect to [Denny], dogfish steak, fried in paraffin and served with frog sauce [a reference to the professor's choice of types for study], was the order of the day.¹⁸¹

At the turn of the century, as it had for decades before, life science continued to be practised for pleasure, in informal settings.

4.8 Conclusion

The practice and place of life science instruction in civic colleges was shaped by the particular economic, religious and political climate of Victorian Yorkshire. Traditional histories of higher education overlook the significance of local contexts in providing the demand and the audience for particular departments. Biologists had to adapt their courses according to the needs of local industry, the fate of nearby medical schools and the emergence of 'nature study' in schools. The role of local learned societies and of nonconformist networks – both especially strong in Yorkshire – have been ignored, despite their significant impact on the personnel and popularity of the biology departments. Conversely, the character of the teaching at the three departments was relatively similar, despite diverse educational environments. I have shown that this was largely due to the prevalence of the academic dynasty founded by Louis Miall, whose assistants and students gained the chairs in the other colleges, and whose appropriation of Huxleyan teaching modes, to an extent, was exported by his retinue to other parts of the county. This should not, however, be seen as the success of colonising tactics on the part of Huxley: Miall and his coterie chose to adapt such didactic techniques as representative types to suit their own locally contingent ends.

The introduction of formal laboratory training in biology, then, brought about a number of changes in the practice and place of life science: but not necessarily in the revolutionary manner that we might expect. Despite the introduction of new methods in a new site for life science, this is a story of amplification and consolidation more than it is of innovation. College biology emerged from – and remained firmly embedded in – middle-class culture, despite the efforts of the well-meaning college authorities to encourage artisan attendance. More people obtained biology qualifications – and yet the Department of

¹⁸¹ 'The Microbes', 'Turned Up', unpag.

Science and Art and the Yorkshire Union of Mechanics' Institutes had previously fulfilled this role, and continued to do so. Biology gained a larger audience, but not a significant number compared to the still-thriving philosophical society lectures and the vast field clubs. The multiplicity of sites for the practice of life science endured, and the laboratory supplemented rather than eclipsed the existing built spaces, the lecture hall and the museum. This chapter has vindicated Forgan's close attention to the juxtaposition of lab and museum spaces. New, academic museums emerged, but the departments gave the civic and philosophical museums a new lease of life, rather than challenging or competing with them. The genesis of laboratory biology comprised the addition of another site for the practice of life science, rather than a replacement of the lecture hall or the museum. Despite the decrease in the significance of the field excursion as a mode of teaching, the field, like the museum, remained vital to the research activities of the biologists. It is to the activities of those who had all along practised in the field – naturalists' societies – that I turn to in the following chapter.

Chapter 5: Field Clubs

In 1887, Miall was elected president of the Leeds Naturalists' Club. Although he had been involved in natural history clubs since his teens, it was not until his presidency of the club that he fully addressed the practice of field clubs: that is, long after his career in other sites for life science was well underway. By the 1880s the popularity and membership of Yorkshire natural history clubs had reached colossal proportions. This chapter details that phenomenon. Miall's subsequent anti-field club rhetoric – examined in the following chapter – belied both the variety and dynamic character of the Yorkshire naturalists' practices, and his own extensive personal involvement with these groups.

In the following pages I detail the massive growth in field clubs and naturalists' societies in the late nineteenth century, and the goals and practices of the members and organisers of these groups. I examine a number of clubs across the county, and especially the Yorkshire Naturalists' Union, a federation of around forty of these groups. In doing so, I wish to support three main arguments. Firstly, I contend that a twenty-year 'boom' in field club activity that began in the 1860s was due to the increasing involvement and dominance of the middle classes in natural history. Life science, in turn, was an integral part of middle-class civic culture, and these groups cannot profitably be studied in isolation therefrom – embedding natural history in the public sphere is one of the central goals of this thesis. Similarly my second claim, that naturalists' groups exhibited a wide range of practices in a variety of sites, corresponds to the arguments of earlier chapters. Finally, I contend that natural history did not wither or stagnate in the last decades of the century, as some historians have implied. Rather, the élites within the naturalists' groups sought to reassert their authority over the field as a site for life science research through extensive networking and a deliberate programme of specialisation.

The first section outlines the natural history renaissance of the 1860s, 70s and 80s: the momentum of which ensured the popularity of natural history until the new century. I examine the ascendance of middle-class groups relative to their workingmen predecessors; and although there were a wide variety of such associations, I focus on naturalists' clubs in particular. I introduce the Yorkshire Naturalists' Union (YNU) and I examine the role of natural history clubs in civic culture. Mirroring section 4.3 in the previous chapter ('Why Biology?'), in 5.2 I present the manifold motives for participating in natural history pursuits, from their purported character-building benefits to the attractions of a sociable

day out in the country. Multiplicity is also the central issue in the following section, in this case, of sites and activities. 'Field' clubs, I argue, participated in a range of activities in a number of sites – indeed, their meetings and lectures were often more popular than their excursions.

The first half of this chapter, then, addresses the first two of three arguments: that middle classes dominated natural history, and that they did so in a variety of ways, in a range of places, for a number of different reasons. In order to address these issues, I focus on the earlier years of my period, and I provide a synchronic analysis of the differences between groups rather than change over time. The second half of this chapter is more diachronic in character. I outline the attempts of élites within these groups who sought to harness the efforts of their members: an endeavour I term *amateurisation*. I thereby follow Lowe, who observed insightfully in 1978:

The emergence of a professional corps of scientists towards the end of the nineteenth century in Britain did not signal the demise of the amateur; but was associated, in fact, with a considerable growth of amateur involvement and interest in science. Historians have failed to recognise this persisting 'amateurisation' of science. The important development is not the exclusion of the educated layman as such but the differentiation of amateurs and professionals within science.¹

Lowe applied his neologism to the expansion of provincial publishing in this period. I wish to build upon and to use it in the many other areas of field club practice, and, in chapter 6, to juxtapose it with the professionalisation of biology. In the 1870s and 1880s, Miall and others sought to secure expertise and authority over the laboratory: correspondingly, amateurs in Yorkshire, conscious of the increasing prestige of the laboratory and the practitioners therein, worked to secure a role in the growth of knowledge and to reassert their authority over the field. This can be seen in the attempts of club leaders who wanted to ensure that the advancement of scientific knowledge was the primary aim of their members, engulfing or indeed eclipsing the myriad of other objectives. Like the professionals, they set up essential passage points between other practitioners and particular kinds of knowledge about a particular area. The professionalising biologists wanted to replace an out-dated identity – the musty curator – with a new, efficient professional: amateurs sought to replace the image of the lone naturalist collecting for aesthetic or other unsuitable ends with a new, rigorous, collective identity. They went

¹ Lowe, 'Locals and Cosmopolitans', 10. Lowe uses the term again in later work, but does ^{not} elaborate. (Lowe, 'The British Association and the Provincial Public'.)

about this by steering the societies away from floristic lists to ecological mapping; by encouraging exchange and collaboration between groups; and through specialisation.

Although the focus of this chapter is on field clubs and federations, they were only part of a range of civic associations which included natural history within their remit. Appearing in cameo roles, where apposite, are scientific associations, microscopical societies, photographic clubs, and an assortment of societies devoted to archaeology, gardening and other pursuits. Their inclusion has helped to answer the recurring cluster of queries that run throughout this thesis: *who* naturalised in late Victorian Yorkshire, and furthermore *why*, *where*, and *how*? In answering, I present a bustling and varied community of naturalists, whose traditions and projects, though changed, were still thriving as the twentieth century dawned.

5.1 Natural History Clubs and the Middle Classes

From the 1860s onwards, middle-class naturalists swarmed from the growing industrial towns onto the Yorkshire countryside, hammers and butterfly nets in hand, collecting, recording and shooting. Working-class practitioners were still evident in this period, as they had been for decades, but their small groups were dwarfed by the vast federations of bourgeois naturalists that comprised the field club 'boom'. It is important to track the emergence of the middle-class naturalist and detail the variety of clubs, societies and unions to which he might belong (for, as I discuss, they were mostly men). These groups, I will argue, were an integral part of the public sphere: they operated within the network of voluntary associations utilised by the bourgeoisie to assert cultural authority over the Victorian city.

5.1.1 The Field Club 'Boom'

From the late 1850s a new breed of scientific society began to appear alongside the philosophical societies and the working men's botanical groups from which many of them had been spawned. The members of such 'field clubs' or 'naturalists' societies' constituted the largest group of practising naturalists in this era. They ranged in size from 30 to 300 members, organised meetings and excursions, generally did not own premises, but often published proceedings or reports. (As well as autonomous clubs, many philosophical societies and mechanics' institutes included field clubs; schools often boasted a natural history club; and occasionally the naturalists' societies themselves, as in Hull, established a junior naturalists' group.) In 1864, the amateur Huddersfield bryologist Charles Hobkirk could claim, "there is scarcely a town in the kingdom, and in the North of England scarcely

a village, in which some such society, either 'Botanical' or 'Entomological' or 'Naturalist' does not exist, whilst 'Field Clubs' are continually exploring every portion of the country".² By 1873 there were over 100 such clubs in Great Britain and Ireland, outnumbering the combined total of all other provincial scientific societies. Their total membership probably amounted to tens of thousands of naturalists, prompting one contemporary observer to understate, "a taste for Natural History Science generally, is evidently largely on the increase", and another to dub his time "the era of the field clubs".³

Yorkshire was especially blessed when it came to these groups. A survey in *Nature* of that year listed 33 in the county – more than any other in the three kingdoms – of which 23 had been founded since 1860. As James Britten of the British Museum commented in his capacity as *Nature's* surveyor, "the West Riding bristles with little Field Clubs".⁴ The greatest concentration of natural history practitioners and activity in the county – displaying a similar geographical distribution to the mechanics institutes and colleges – was centred on the Leeds-Bradford-Huddersfield nexus. This densely populated, topographically varied area was home to the oldest of these groups, the Huddersfield Naturalists' Society (founded in 1847), and also to clubs at Holmfirth, Halifax, Heckmondwike, Wakefield, Clayton West, Ripponden, Elland, Leeds and others besides.⁵ (Nationally, the West Riding thereby contrasted starkly with Scotland and Wales, where field clubs were sparse.) From this "great stronghold of naturalists in those early days [in the] south-western corner of the West Riding with Huddersfield at its centre", the field club movement radiated outwards over the following decades.⁶

It is clear that there was a massive growth in the founding of naturalists' groups in the last third of the century (see appendix 3). The 1860s through the 1880s saw the greatest number of clubs established; three of the largest naturalists groups, based in Leeds, Sheffield and Bradford, all began in the 1870s. Lowe's national survey supports this; by the 1880s, he estimates that there were around 100,000 field club members across the country.⁷ These clubs supplemented, and to some extent replaced, the meeting-based workingmen

² *The Naturalist* 1 (1864–5), 1.

³ J. Wainwright, an early president of the West Riding Consolidated Naturalists' Society, recorded in the *Yorkshire Naturalists' Recorder* 4 (1872), 72; [Britten], 'Local Scientific Societies', 38.

⁴ [Britten], 'List of Scientific Societies', 521. James Britten (1846–1924) edited the *Journal of Botany* from 1880 until his death. (Desmond, *Dictionary of British and Irish Botanists, Who Was Who*.) I am grateful to Dr David Allen for biographical information and references concerning Britten.

⁵ George Porritt, President of the Huddersfield Naturalists in 1898, was mistaken when he claimed, "our own Society is, I believe, the oldest Provincial natural history Society in the country", as the Berwickshire Naturalists' Club had been established in 1831. (Porritt, 'Our Society, and its Work', 2.)

⁶ Roebuck, *Salient Features*, 3.

⁷ Lowe, 'Locals and Cosmopolitans'. See especially his graph on page 18.

botanical clubs of the early century.⁸ The Leeds Naturalists' Club (LNC), for example, founded in 1870, supplanted an older botanical society, of which no records remain (whereas the new clubs left ample documentation). Other middle-class clubs grew out of the artisanal groups. The Huddersfield Naturalists emerged from a 'Botanist Society' inspired by the rambling Stalybridge artisan-botanist Jethro Tinker in 1847, and the Sheffield Naturalists probably originated in the early 1870s as a section of an earlier field naturalists' society.⁹ When the West Riding Consolidated Naturalists' Society (WRCNS) was first formed by a handful of West Riding societies, they nearly all met in public houses; by the time the WRCNS evolved into the Yorkshire Naturalists' Union, none of them did so on a regular basis.¹⁰

Pub-based botanical groups continued to emerge in the late century – for example in Honley in 1875 and at Berry Brow in 1891 – and also a number of 'co-operative' naturalists societies were evident, but not in the number or size of the middle-class field clubs. They appear to have co-existed in harmony for the most part. Alfred Clarke of the Huddersfield Naturalists, for example, was also involved with the older, pub-based District Botanical Society.¹¹ Clarke was a consulting chemist: in the following section, I establish whether such an occupation was typical of a field club member.

5.1.2 The Social Constitution of the Field Clubs

The new clubs were richer, more wide-ranging and better documented than their predecessors, routinely keeping records and ensuring they survived. Although many of their activities were carried out in a rural context, the larger field clubs were very firmly based in urban centres – several field clubs were founded in London in this era – and they were populated by the civic middle class.¹²

The Leeds Naturalists, formed by YMCA members in 1870, were joined later that year by a small mutual improvement group led by Thomas Hick, a schoolteacher, and the physician Arnold Lees (thereby becoming the Leeds Naturalists' Club and Scientific

⁸ Secord, 'Science in the Pub'.

⁹ Barker, 'The Educational Contributions of T.W. Woodhead'; Charlesworth and Ellis, *The History of a Society*; Ward, 'The History of the Sorby Society'. David Spalding, in his manuscript card catalogue of local naturalists' groups kept in the SPM archives, supports this version of the genesis of the SNC. In the society's own literature, however, they claim an autonomous origin in 1872, possibly in order to disassociate themselves from their humble predecessors. (SNC, *Annual Report* (1882).)

¹⁰ Lowe, 'Locals and Cosmopolitans'.

¹¹ 'F.A.M.', 'Alfred Clarke'.

¹² The South London Microscopical and Natural History Society was founded in 1871, the South London Entomological and Natural History Society the following year, and the Hackney Microscopical and Natural History Society in 1877. (*Yearbook of the Scientific and Learned Societies of Great Britain*.)

Association).¹³ Amongst their founder members were a printer, an engineer, a chemist, a physician and several teachers. Other societies were dominated by similar professional and commercial élites, who attended all the meetings of the club, gave most of the papers and led the excursions.¹⁴ These regulars – who tended to vote each other into the principal offices of the club – were also responsible for most of the publications of the societies and for a considerable proportion of the instruction offered. Some groups bolstered this exclusivity through membership by election; most had prohibitive membership charges of up to ten shillings per annum.

Genuine working-men naturalists – iron moulder James Needham of Hebden Bridge, or currier William Nelson of Leeds, for example – were rarely active in the field clubs by the end of the century. Needham's obituarists stress his trade precisely because he was unique in this respect amongst his fellow mycologists.¹⁵ And yet the rhetoric of working-man natural history endured. The history of the Bradford Natural History Society records the peculiarity of "the West Riding, in respect of the serious scientific work done by working-men naturalists".¹⁶ "It is the business of this and kindred societies", recorded the LNC council, "to welcome members from all grades of folk, and bridge over small differences of caste for the common weal"¹⁷ George Porritt, a prominent wool-merchant and president of the Huddersfield Naturalist and Photographic Society (HNS), declared that "in our field meetings everyone meets on an equal footing, and in the mutual intercourse between class and class it is inevitable that each will find out the good qualities of the other", and yet it is clear that if there were still artisans participating in these trips, wealthy, leisured individuals such as Porritt were clearly in control. His claim that the HNS "was really founded as a Working Men's Society, and such, in the main, it has remained ever since" belied the majority of active members who were merchants, professionals and manufacturers.¹⁸ The history of the HNS notes "the fine body of men who were spoken of as 'working men naturalists'", but these fine men are sparse in the membership.¹⁹

Many historians of nineteenth-century natural history have been seduced by this harmonious rhetoric. Allen paints the natural history field club as a "masterpiece of social

¹³ Lees, 'Thomas Hick'.

¹⁴ Barber, 'History & Progress of the WRCNS'. At the Sheffield Naturalists' Club, Alfred Allen, William Dallinger, Thomas Dobb, S. Doncaster, Albert Hall, Elijah Howarth, Reverend T.S. King, George Newsholme and Edward Snelgrove dominate the meetings of both societies over this period. Like the Leeds Naturalists, they were predominantly middle-class men – clergymen, medical practitioners, middle managers and men of commerce.

¹⁵ Crossland, 'James Needham'.

¹⁶ Maltby and Winter, *Fifty Years of Local Science*, 5.

¹⁷ LNC, *Minutes* (1895).

¹⁸ Porritt, 'Our Society, and its Work', 8, 1.

mechanics” and Barber argues that “by Victorian standards, natural history was an unusually classless pursuit”.²⁰ Merrill’s picture of naturalists “famous and obscure, rich and poor, privileged and plebeian” all united in a common pursuit is attractive. Nevertheless, it is highly questionable whether Victorian natural history, as she argues, “simply filtered down to the middle and working classes, where it found a wider audience”.²¹ That naturalists from all walks of life were able to communicate (following subtle forms of epistolary etiquette) I do not deny: but to claim that they naturalised side by side as equals is a much stronger claim to which the prosopography of the field clubs gives the lie. Rather, I follow Secord in this respect, when she argues against claims “that correspondence rendered natural history a ‘classless’ pursuit”.²² Artisans and gentlemen may have rubbed shoulders in the field, but they did so on different terms, and they took their results to different places.

This class-harmony rhetoric, then, was mostly wishful thinking: rather, the middle-class naturalists encouraged artisans and workers to participate in natural history alongside them, on their terms, as part of a programme of ‘rational recreation’ firmly under their control. But as John Sim complained in vain in the *Yorkshire Naturalists’ Recorder*:

The mechanic or labourer who earns his bread by the sweat of his brow, may, by care and economy, save his weekly earnings, as much as will procure a few books on either Zoology, Botany, Geology, &c., at a moderate cost – many of our mechanics and labourers &c., spend more of their earnings in one month in the ale-house or spirit-shop than would be amply sufficient to supply them with a few valuable works on any department of Natural Science.²³

The YNU’s journal, *The Naturalist*, ran into severe financial difficulties when the price was lowered “in order to place our publication within the reach of all classes of Naturalists”; working-class subscribers did not exist in sufficient numbers, if at all.²⁴ Artisan botanists may have continued to operate within correspondence networks, but few joined the ranks of the new field clubs.²⁵ The leaders of the new societies may have wished to dismantle social barriers, but they failed. Like the mechanics’ institutes and many other instances of rational recreation, the educational and leisure pursuits designed for the working class were largely practised by the middle classes who promoted them.

¹⁹ Charlesworth and Ellis, *The History of a Society*, 29.

²⁰ Allen, *The Naturalist in Britain*, 142; Barber, *The Heyday of Natural History*, 35.

²¹ Merrill, *The Romance of Natural History*, 4, 11.

²² Secord, ‘Science in the Pub’, 389.

²³ Sim, ‘On the Study of Natural History’, 21–22.

²⁴ *The Naturalist* 3 (1866–7), preface.

²⁵ Secord, ‘Corresponding Interests’.

Workingmen naturalists, then, were sparsely distributed in the new field clubs. Also notably absent were women, of any class. Many women wrote about natural history and participated in correspondence networks (Margaret Gatty is a well-studied example), but few were actively involved in the naturalists' societies.²⁶ This is not to say that they were not admitted: Yorkshire clubs, like others across England, increased opportunities for women to join in the late century. "There can be no more refining pleasure and occupation for ladies", argued Bendelack Hewetson of the LNC in 1895, probably in an effort to boost membership, "than the study of the various branches of natural science."²⁷ Other groups offered reduced subscription rates.²⁸ By the end of the century, women were admitted to most clubs and to the YNU, but to little avail.²⁹ The Sheffield Naturalists boasted a membership of around one quarter female – and a few active women members – but this was exceptional. Photographs of YNU field days reveal that by 1906, despite complaints about flirtation at the excursions (see 5.2.5 below), few women were present aside from those who served the refreshments.

5.1.3 Federal Organisation: The Yorkshire Naturalists' Union

The greatest Victorian innovation in the social structure of natural history was the naturalists' union. From the 1860s onwards, coincident with the field club boom, individual societies organised themselves into vast, county-spanning associations. These federations, often modelled on the BAAS, were a crucial part of the amateurs' efforts to remain indispensable to life science. Organised into such meta-societies, their leaders reasoned, they would be able to retain authority over the field as laboratory-based academics claimed the built environment as an exclusively professional domain.

At least six British regions were home to this "second organisational tier" of institutional natural history by the turn of the century.³⁰ They each included dozens of

²⁶ Ewing, 'Margaret Gatty'; Gates, *Kindred Nature*, 48–50; Lightman, 'The Voices of Nature'; Maxwell, *Mrs Gatty and Mrs Ewing*; Rauch, 'Parables and Parodies'; Sheffield, *Revealing New Worlds*; Shteir, *Cultivating Women, Cultivating Science*, 184–186.

²⁷ LNC, *Minutes* (1895).

²⁸ In 1872, the SNC charged 10s/6d for men and 5s for women; by the mid 1880s, the Huddersfield Naturalists charged 4s for men and 2s/6d for women.

²⁹ Women were admitted to the HNS in 1882, although for a spell later in the decade their accommodation was deemed unsuitable for lady members (perhaps because of the inclusion of a darkroom?). One – Miss Sykes – eventually reached the hallowed status of vice-president in 1904. (Charlesworth and Ellis, *The History of a Society*.)

³⁰ A union of natural history societies was established in 1877 in the Midlands; similarly in Eastern Scotland (1884); Lincolnshire (1893); Ireland (1894); Durham County (1903); and Lancashire (1906). Accompanying these natural history-based federations were a number of associations not limited to life science: the Devonshire Association for the Advancement of Science (1862); the Cumberland Association for the Advancement of Literature and Science, formed in 1876, which grew to encompass Westmoreland eight years later; the Northern Association of Literary and Scientific Societies (1887); and the South-Eastern Union of Scientific Societies (1896). Other types of special interest clubs also formed associations in this era, for

clubs (generally the wealthier middle-class societies, that is, those who could afford their levies), whose combined membership was counted in thousands. They organised regular excursions and held peripatetic annual meetings; they produced a publication or were strongly connected with one; they moved to collaborate with other such unions; and they set as their goal the co-ordination and regulation of the activities of their constituent clubs. As well as the region-based unions, towards the end of the century a number of national and international-scale federations began to emerge, including Seth Mosley's British Field Club (co-ordinated from his private museum in Huddersfield), the Union Jack Field Club and the British Empire Naturalists' Association.³¹

The oldest and largest of these federations was the Yorkshire Naturalists' Union. In September 1861, a group of naturalists representing different clubs in the southern reaches of the West Riding met at the house of Henry Ashton in Heckmondwike to contemplate the possibility of collaboration. William Talbot, a Wakefield entomologist, "introduced the question of the advisability of more combined and organised discourse [and] on his motion it was unanimously resolved to form a Union of Societies".³² The following January, they met again to define the objects and rules of this association, and thereby established the West Riding Consolidated Naturalists' Society, initially comprised of five societies from within ten miles of Huddersfield. They resolved to hold quarterly meetings, mostly lectures and discussions, and soon afterwards excursions were introduced. Their membership expanded as clubs sprang up in the wake of their meetings in other parts of the West Riding.

In 1876, George Taylor Porritt of Huddersfield and William Denison Roebuck of Leeds reorganised the WRCNS, extending their district and rubric (as the YUMI had done before them, developing from a West Riding to a Yorkshire coalition). The following April the federation was re-named the Yorkshire Naturalists' Union, and their journal, *The Naturalist*, grew from a record of the original constituent societies to "a medium for inter-communication among naturalists in the North of England".³³ Over the next three decades, the union steadily grew, as illustrated by figure 5.1 (where the massive growth in clubs in the 1880s is clearly visible). It gained clubs as they were formed or became financially stable, settling in the 1880s at between 35 and 40. Although it lost some to

example the Yorkshire Photographic Union. (Allen, *The Naturalist in Britain*, 153–155; Lowe, 'Locals and Cosmopolitans'; Morrell and Sarjeant, 'The Geological Societies'; *Year-Book of Scientific and Learned Societies*.)

³¹ Allen, *The Naturalist in Britain*, 176–185; *Naturalist's Journal*; Sheppard, *Yorkshire's Contribution to Science*, 13–90. Among the Union Jack Field Clubs were branches in Scarborough, Whitby and Frizinghall, and the Lindley Mechanics' Naturalists' Society was affiliated to the British Field Club.

³² Roebuck, *Salient Features*, 4.

³³ *The Naturalist* (1892), preface.

secession, as Roebuck smugly noted in 1904, none survived long after leaving its folds.³⁴ The Heckmondwike club, in the thriving heartland of the YNU, was the only club to enjoy an unbroken association with the union.

5.1.4 Field Clubs and Civic Culture

The extent to which natural history institutions were embedded in civic culture cannot be overstated.³⁵ In the case of the field clubs, this is clearly evidenced by their varied accommodation, their grand conversaciones and their visibility in the local press. Although ostensibly dedicated to fieldwork, an urban base was vital to a naturalists' society, for lectures and meetings, and to store their library, museum or herbarium. The clubs were most commonly housed in their local philosophical hall (see chapter 2), but they also shared accommodation over the decades in a wide variety of civic buildings: schools, YMCAs, mechanics' institutes, town halls and other municipal buildings, and – for those towns blessed with such an institution – at the local civic college.³⁶ All of which various chambers were in some kind of pedagogical, morally unproblematic space, contrasting with their original habit – and that of their artisan contemporaries – of meeting in a public house.

Displaying the fruits of their labours in these varied civic settings became an integral part of field club practice. YNU members had always displayed their more spectacular finds at the end of an excursion, and from 1879 – beginning with a 'Grand Exhibition' in Leeds – the peripatetic annual general meetings of the union were followed by exhibitions of specimens and apparatus by the host society. These affairs were similar to the conversaciones of the lit and phils, and they blossomed into "a series of demonstrations and short lectures, and selections on the pianoforte" followed by "pneumatical experiments [and] demonstrations with the telephone and microphone", attended by the members, their families, and other townsfolk.³⁷ The mycologists of the YNU even staged a public 'show' at which some of the fungi they had collected were cooked and eaten.³⁸ Individual clubs also held conversaciones or exhibitions – usually in conjunction with other societies in the town, and often lasting several weeks –

³⁴ Roebuck, *Salient Features*.

³⁵ Lowe writes, "as a social activity, [natural history] remained well integrated in literate provincial culture". (Lowe, 'Locals and Cosmopolitans', 163.)

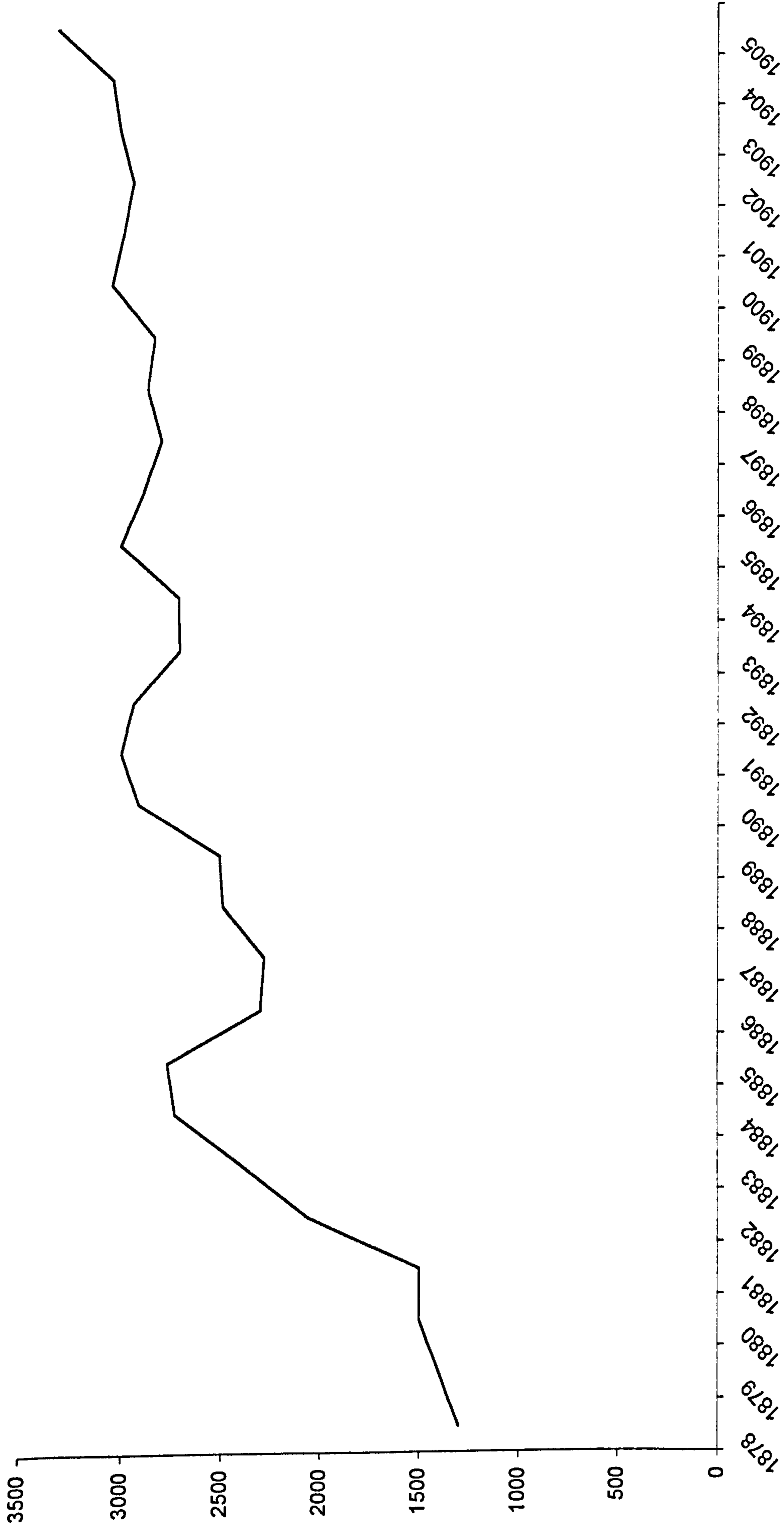
³⁶ The LNC ran a series of courses in the YCS laboratory; the Sheffield club held meetings in the physiological laboratory of the medical school; and the Huddersfield Naturalists rented a room for meetings in the HTC in 1901. The latter housed their library in the college, which the biology department were then permitted to use. The HNS held a seat on the HTC council. (HTC, *Building Sub-Committee Minute Book*.)

³⁷ *The Naturalist* 4 (1878–9), 127.

³⁸ Watling, 'The British Mycological Society'.

Figure 5.1: Total Members of the YNU, 1878-1905 (consituent societies and personal membership)

[Sources: *The Naturalist*; YNU, *Annual Reports*]



demonstrating to the town their vitality and the wonders of nature and science. The designers of Huddersfield's 'Grand Exhibition' hoped "that their present efforts may stimulate and encourage the study of Natural History; and they trust that many happy and profitable hours may be spent within the walls of the Exhibition [held in the Gymnasium Hall], in the admiration of the works of the Great Architect of the Universe".³⁹ These exhibitions diversified into flower shows, and in some towns they were made permanent as a botanical garden.⁴⁰ Few of these lasted, but their existence nevertheless demonstrates the impact of field clubs on civic life, and *vice versa*.

Townfolk of the middling sort would also have been familiar with the goings-on at their local naturalists' group through regular reports in their local press. Columns about the town's clubs appeared in the *Leeds Mercury* (Baines' paper included reports from outlying towns' clubs as well as from the LNC), the *Bradford Weekly Telegraph*, the *Wakefield Free Press*, the *Huddersfield Examiner* (penned by the untiring Seth Mosley), and the *Sheffield Independent* (whose proprietor, Robert Leader, was a pillar among the SNC, holding their early meetings in his home). These reports were often accompanied by similar items on the local lit and phil. They noted the papers delivered at the clubs' meetings (sometimes giving a précis), or recorded the interesting plants exhibited. Their aim, for the most part, was to boast about the accomplishments of this one facet of bourgeois civic culture, an essential component, as Davidoff and Hall argue, of the public accountability of voluntary associations.⁴¹ Their significance is further evidenced by the willingness of town worthies visibly to support the clubs' activities: mayors often chaired their meetings and opened their exhibitions, and officials such as medical officers of health gladly gave lectures. When the YNU came to town, corporations rolled out the red carpet and lavished official attention and hospitality upon the delegates. Union AGMs threatened to upstage even the mighty BAAS. The field clubs were as much a part of middle-class civic pride as the lit and phils, museums and colleges.

³⁹ HNS, *Catalogue of the Fifth Grand Exhibition*, 3. The Huddersfield Naturalists were staging exhibitions from 1862: the fifth exhibition, in 1873, was probably the last on such a scale. (Charlesworth and Ellis, *The History of a Society*.)

⁴⁰ As in Bradford and in Beaumont Park in Huddersfield. (Barker, 'The Educational Contributions of T.W. Woodhead'; Charlesworth and Ellis, *The History of a Society*; Maltby and Winter, *Fifty Years of Local Science*; Sheppard, *Yorkshire's Contribution to Science*, 13–90.)

⁴¹ Davidoff and Hall, *Family Fortunes*, 419–429.

5.2 Motives for Naturalising

I have established that significant numbers of middle-class persons in Yorkshire were engaged in natural history in this era; I have yet to outline what may have led them to do so. What drove hordes of townsfolk into the Dales day after day, and into club meetings week after week? By studying the history of natural history as a scientific discipline, we make tacit assumptions that naturalists were driven by the desire to advance or diffuse scientific knowledge. The records of the field clubs and the naturalists' accounts, however, suggest that this purpose was accompanied by many other rationales. As Cooter and Pumfrey write, "the analyst of popular science might choose to abandon the word 'science' as pre-determining the territory".⁴² Natural History was as much a leisure pursuit, a sport, as it was a science. Only by setting aside the traditional intellectualist preoccupations of the history of science can we approach natural history from the 'ground up'.⁴³

5.2.1 The Appeal the Countryside

Possibly the most common motive for the budding naturalist was the opportunity to appreciate the beauty of nature. J. Wainwright of the YNU extolled "the mysteries and marvels, and the beauties and grandeurs with which our world abounds", and found flowers to be "poor man's poetry".⁴⁴ Bendelack Hewetson of Leeds similarly marvelled at "the infinite loveliness and exquisite refinement of Nature", and John Sim felt that "all is beauty – all symmetry – from the towering Wellingtonia of the Californian forest, to the tiny Duckweed of our stagnant waters".⁴⁵ Many microscopists described their sections as 'beautiful', and lectures on subjects such as the 'beauty of microphotography' were common.⁴⁶ Microscopical societies explored another world, full of awe and wonder, continuing a discourse within natural history literature evident in the writings of Philip Gosse and earlier.⁴⁷ The aesthetic appeal of flora and fauna brought many artists to practice natural history: George Masee, the Scarborough naturalist who was to become chief mycologist at Kew, was educated at the York School of Art. Seth Mosley was a gifted painter of butterflies in his youth, and his illustrated handbooks helped to support his family after he gave up the decorating trade.⁴⁸

⁴² Cooter and Pumfrey, 'Separate Spheres and Public Places', 254.

⁴³ Jankovic, 'The Place of Nature and the Nature of Place'.

⁴⁴ Anonymous, 'West Riding Naturalists' Society', unpag.; *Yorkshire Naturalists' Recorder* 11 (1873), 173.

⁴⁵ Hewetson, 'The Yorkshire Naturalists' Union', 132; Sim, 'On the Study of Natural History', 22.

⁴⁶ SMS, *Minutes* (1895–6).

⁴⁷ Gosse, *The Romance of Natural History*.

⁴⁸ Mosley, 'Reminiscences', 'Autobiography'.

The countryside, of course, was a refreshing contrast to the urban sprawl. For William Fowler, like many others, there was nothing better than “to escape [...] from the smoke and dirt of thickly-populated districts [...] into our Yorkshire moorlands”.⁴⁹ The Sheffield Naturalists provided a vehicle for the middle-class idealisation of the countryside – a means of “leaving behind you the clatter and clink of the busy forge, the whirr and whish of the grindstone, and the bustle and din of the street, early on a bright June morning you step from under Sheffield’s grim canopy of smoke into the current of sweet fresh air flowing down from the hills”.⁵⁰ As Samuel Jefferson, naturalist-poet and president of the LNC, eloquently argued,

’Tis wrong, unnatural, that men should toil
 From early morn until the gloom of night,
 Amid the din of overcrowded towns!
 Far better they who till the fruitful soil,
 If they have eyes and ears and hearts to feel delight
 In flowery vales, or on the breezy downs.⁵¹

Natural history was morally as well as aesthetically appealing – naturalising, its apologists claimed, instilled patience, honesty, and reliability. The work of the field naturalist was often described as painstaking and laborious.⁵² “Investigate patiently,” advised Wainwright, “conclude slowly”.⁵³ Obituarists and eulogists of these naturalists never failed to connect their subjects with the stereotype of the solid, unaffected, honest Yorkshireman.⁵⁴ Natural history – a “soul-ennobling pursuit” – instilled in its practitioners a moral worth that facilitated trustworthiness.⁵⁵ Reliable observations were vital in field club practices, for example in the avifauna distribution surveys compiled by the Sheffield ornithologist Henry Seebohm.⁵⁶ Alexander Green, the paragon of the naturalist, was “straightforward and honourable”, and was among those whose moral character and skill singled them out to be referees for the various lists, the overall worth of which depended upon the reliability of the individual contributions.⁵⁷ This is to support Kuklick and Kohler’s argument, that from “the belief that outdoor physical activity builds moral

⁴⁹ Fowler, *Yorkshire Naturalists’ Union*, 3; Kuklick and Kohler, ‘Introduction [to *Science in the Field*]’; Meller, *Leisure and the Changing City*, 1–18; Wiener, *English Culture and the Decline of the Industrial Spirit*, 41–80.

⁵⁰ SNC, *Annual Report* (1895), 13.

⁵¹ Jefferson, *Sonnets on Nature and Science*, 18.

⁵² As for example in Roebuck’s description of William Talbot. (YNU Vertebrate Section, *Minute and Report Book*.)

⁵³ Anon., ‘West Riding Naturalists’ Society’.

⁵⁴ See for example Lees, ‘Thomas Hick’.

⁵⁵ Sim, ‘On the Study of Natural History’, 21; Fowler, *Yorkshire Naturalists’ Union*.

⁵⁶ Seebohm, *Address to the Yorkshire Naturalists’ Union*.

⁵⁷ [Harker], ‘Alexander Henry Green’, 114.

character, field scientists fashioned an epistemological touchstone: the rigors of the field inculcate the personal discipline necessary to make field-workers reliable witnesses and reporters”.⁵⁸

Reliability and trustworthiness were beneficial to individual naturalists and to their club’s projects: in other ways, the field clubs insisted, natural history was useful to society in general. Most YNU advocates supported Wainwright’s position:

It is said that the results of our labour are few and small, and that their practical value to the community, or even to ourselves, is inconsiderable [...]. The importance and value of our pursuits, even as to utility, might I think be easily demonstrated. They may be considered as a means of discipline, as a source of entertainment, and as a source [sic] of instruction.⁵⁹

Purported utilitarian benefits included those related to agriculture: keen to benefit Yorkshire farming, the YNU appointed a committee “to investigate the life history of *Puccinia graminis*, a fungus which causes the loss of several millions a year to the British farmer”.⁶⁰ Mosley, meanwhile, devoted himself to economic entomology.⁶¹ Naturalists often presented the microscope as a weapon in the war against disease. The Sheffield Microscopical Society, for example, often included industrial and medical applications of microscopy alongside natural history. A great many of Henry Sorby’s investigations were of a similarly utilitarian bent. It would seem, however, that he and the other utility-minded naturalists, however vocal, were in a minority.

5.2.2 Leisure and Sociability

Natural history for the vast majority of field club members was a hobby: they naturalised for pleasure. It is clear, therefore, that natural history should be considered as part of the history of leisure, and that the consolidation of middle-class ‘leisured society’ in the late nineteenth century (as outlined in chapter 1) was a major contributing factor in the field club ‘boom’. As Pang writes, “all amateur science could be looked on as a form of leisure”.⁶² Field club practices shade imperceptibly into sport and other recreations. There was no sharp distinction between botany and gardening, and horticultural groups – such as the Huddersfield Floral and Horticultural Society – and their practices were closely

⁵⁸ Kuklick and Kohler, ‘Introduction [to *Science in the Field*]’, 6.

⁵⁹ *Yorkshire Naturalists’ Recorder* 11 (1873), 173.

⁶⁰ *The Naturalist* 7 (1881–2), 156.

⁶¹ Mosley worked closely with Miss E.A. Omerod, economic entomology advisor to the British Board of Agriculture, remodelling the entomology collections of the Bethnal Green Museum and constructing cabinets for many other institutions. (Mosley, ‘Reminiscences’.)

⁶² Pang, ‘The Social Event of the Season’, 265.

interwoven with the those of the field clubs. The mid-Victorian ‘fads’ for aquaria and fern cases are still evident in the late century; and no doubt stimulated much interest in ichthyology and pterophytology.⁶³ There was no clear demarcation between geologist and the mountaineer or rambler; and the habit of wealthy collectors of hiring working-class boys as geological ‘caddies’ demonstrates the impress of sport upon natural history.⁶⁴ Until preservationist ethics became more evident later in the century, natural history was often indistinguishable from hunting and fishing. Many of the zoological collections served as much as a trophy cabinet as a faunal record.

The advent of tourism and the growth of seaside holidays, coincident with the boom in field clubs, were great fillips to the naturalist. Margaret Gatty, for example, first took up natural history while convalescing on the coast.⁶⁵ Natural history and travel, most commonly connected within histories of the grand globe-spanning voyages of great men of science, also intersected on a much humbler level.⁶⁶ In mid-century England, the excavations necessary for the rail and canal networks were a paleontologist’s playground. Later in the century, cheap rail fares, faster coaches, and better roads fuelled recreational natural history. “This is a great age of travel”, trumpeted Edwin Maule Cole, a prolific Yorkshire geologist, but “to make travel profitable, some acquaintance with the physical features and geology of the country we travel in, is essentially requisite.”⁶⁷ The attraction of YNU membership for many was the union’s deal with the rail companies for discount ticket prices on their field days. From the 1870s, the excursion trip became increasingly common as a form of middle-class leisure, and the clubs responded to this.⁶⁸

The natural history excursion, for many who attended, was essentially a jolly day out in the country. This was a cause for alarm for those in the club élites who fashioned themselves as ‘serious’ naturalists. Roebuck warned of “the danger of the pic-nic and sightseeing element being introduced”, and argued that the union’s conversaciones should fulfil such social functions.⁶⁹ “Pleasure and cheerfulness” were well and good, felt Porritt, but they should not interfere with “real observations”.⁷⁰ He scorned “those who make excursions so far as they are concerned, merely pleasurable jauntings and cheerful picnics in

⁶³ Allen, *The Victorian Fern Craze*, ‘Tastes and Crazes’; Barber, *The Heyday of Natural History*, 111–124.

⁶⁴ Allen, *The Naturalist in Britain*, 126–141; Hevly, ‘The Heroic Science of Glacier Motion’; Pang, ‘The Social Event of the Season’; Robbins, ‘Sport, Hegemony and the Middle Class’.

⁶⁵ Sheffield, *Revealing New Worlds*.

⁶⁶ Allen, *The Naturalist in Britain*, 202–219; Pang, ‘The Social Event of the Season’; Robbins, ‘Sport, Hegemony and the Middle Class’.

⁶⁷ From Cole’s *Geological Rambles in Yorkshire* (1883), cited in Lowe, ‘Locals and Cosmopolitans’, 63.

⁶⁸ Cunningham, *Leisure and the Industrial Revolution*, 151–178; Walvin, *Leisure and Society*, 18–33.

⁶⁹ Roebuck, *Salient Features*, 6.

⁷⁰ YNU, *Annual Report* (1900), 106.

the country”.⁷¹ W. Marsh of the Leeds Naturalists similarly “thought the picnic element was very strongly to be deprecated”.⁷² The situation was so extreme in the early years of the LNC as to prompt Roebuck to lament, “the number of real naturalists in our Association is, comparatively speaking, so small”, and as a remedy “there might, therefore, be organised at the various Associations and Branches, rambling clubs, whose members need not necessarily be thorough naturalists”.⁷³

The threat of the picnickers was also evident in other parts of the country, as Allen recognises in the case of the Leicester Literary and Philosophical Society outings.⁷⁴ Reverend J.D. la Touche of the Caradoc Field Club, Herefordshire, warned of the trip “when serious effort is virtually abandoned, and the so called Naturalist excursion becomes a mere pic-nic, pleasant and useful enough in its way, but having little in relation to the objects for which the club was started. [...] Not unfrequently have kind critics suggested a comparison between the proceedings of the Field club and those of the immortal Pickwick and his friends.”⁷⁵ In Edinburgh, Sir Walter Elliot decreed that field clubs were “liable to be diverted to purposes of pastime and amusement only” and were “apt to end in mere pleasure parties of picnics, especially, as often happens, where more than half the party at a field meeting are ladies”.⁷⁶ Barber’s claim that women were not admitted to clubs “on the strength of their scientific contribution, but rather as a sort of decorative backdrop to ‘double the enjoyment’ of the men”, is rather too strong, but their presence was a concern for the clubs’ leaders.⁷⁷ Flirtation was perhaps as dangerous as picnicking.

Despite the protestations of the sombre few, natural history continued to be a social activity, an opportunity to get fresh air in congenial company. To study natural history purely as a ‘science’ is to ignore the considerable proportion of its participants for whom it was a purely recreational pastime.

5.3 Sites and Activities

To cater for the various demands of their membership, the clubs and federations proffered a range of activities in a variety of locations. Just as the philosophical societies have been associated only with the lecture hall, and college biologists with the laboratory, so

⁷¹ Porritt, ‘Our Society, and its Work’, 7–8.

⁷² *Report of the Meeting of the British Society for the Advancement of Science* (1905), 44.

⁷³ Roebuck, *Scrapbooks* (1874).

⁷⁴ Allen, *The Naturalist in Britain*, 148–153.

⁷⁵ La Touche, ‘Naturalist Field Club excursions’, 249.

⁷⁶ From Elliot’s opening address to the Botanical Society of Edinburgh in 1873, cited in Lowe, ‘Locals and Cosmopolitans’, 178, 64.

naturalists' societies have mistakenly been treated as purely field-based groups. 'Field' clubs practised in many sites and in a variety of ways: in the field, alone or in a group; with microscopes; in lecture halls, classrooms and libraries; and through meetings, publications and collections. These latter, built-environment practices, I will argue, actually formed the backbone of the clubs' activities. Once again, the multiplicity of life science practices and sites is demonstrated.

5.3.1 Group Excursions

Although the individual societies ran excursion schedules, it was the field meetings of the YNU that were the best attended.⁷⁸ The union organised excursions five or six times a year, between April and October. They were originally on a Sunday, but – after Sabbatarian objections – Saturdays soon became the norm. The day of the excursion, which followed the same pattern as the trips of the constituent societies, began at a leisurely pace. In the early years, the member groups of the WRCNS were all situated within walking distance of each other, and members could hike to the excursion site, collecting on their way. From the 1870s, however, the union arranged special prices on trains to transport members from the further reaches of the county. Attendance varied over the decades, but weather permitting, a conveniently placed excursion attracted between 80 and 120 naturalists, many of whom were from the local society. The council expended considerable energies planning the routes, sending stalwarts such as Thomas Woodhead to walk the ground in advance, and consulting local naturalists as to the most profitable areas and what species were to be found. These particulars were printed in the excursion circulars, which also included detailed maps and references to published lists and guidebooks. More often than not, their trail took them through the grounds of the local landowner, and Roebuck perfected the skill of gaining permission for scores of naturalists to rampage across their grounds. (This privileged access was a prime attraction of joining the union.)

The members would gather at the appointed time and place and set off to collect, observe and record. Typically, "on arriving [...] the Excursionists divided into companies, rambling through lanes, fields, woods, parks and gardens &c., each collecting specimens of Natural History according to his taste".⁷⁹ At first, the groups were divided only according to preferred route, but later they were separated along specialist lines, usually with an

⁷⁷ Barber, *The Heyday of Natural History*, 132.

⁷⁸ The LNC at its peak ran an excursion every fortnight in the summer; the Bradford Naturalists organised six trips a year (which was considerably fewer than its predecessor had done); the Huddersfield society held rambles most summer Saturday afternoons.

appointed leader, usually a prominent member of the local club, often of advanced years, and always a man. He dictated the pace, pausing to illustrate salient features of the district.⁸⁰ Whether together or in groups, every aspect of local interest was covered, including archaeology and architecture. A visit to a local museum would often crown the day.

A sense of pleasure shines through the excursion accounts. The YNU members were “genial and jolly, full of spirits, rich in the glow of health, and merry as the sunshine”.⁸¹ Robust physical health would result from the often strenuous adventures of the naturalists. Naturalising offered the opportunity “to breathe pure air, to take pleasurable exercise”.⁸² This sometimes became rather arduous, however: one trip involved “climbing over three stone walls, and three gates specially spiked to tear one’s clothes. Then one had to stride over a waterfall and seizing hold of the end of a wall give a judicious swing to the other side, and drop a few feet to the bank of a merry gambolling brook. This had to be crossed by wading”. Often it became too much, and during one excursion “we began a short but steep ascent in order to reach the moors. It was tough work for the shoulders and knees, and many a one stopped—of course, not for rest—but to look at the beautiful landscape and to exclaim, or rather to sigh as well as their gasps would allow them, ‘What—a—splendid—view!’”⁸³

At 5 o’clock, after an afternoon’s collecting and recording, the excursionists would assemble – full bags in hand – at the appointed meeting place, usually the largest local inn (old habits died hard). The strenuous day made for a healthy appetite: Hewetson wrote of “a meal disposed of with relish, to which the fresh air and an enthusiasm known only to naturalists greatly contributes”.⁸⁴ After this substantial repast, much celebrated, they embarked upon the main business of the day, the identification and listing of species observed. The original method, when specimens “were brought together and arranged in the meeting room”, was inherited from that of the artisan botanical societies:

The Chairman called on some good botanist to play the part of Adam, and “name the plants.” The ‘namer’ then picked up the various species, and gave their names more or less rapidly for the benefit of the others, and in the case of plants of

⁷⁹ *Yorkshire Naturalists’ Recorder* 14 (1873), 221.

⁸⁰ The organisers were not short of volunteers: “I gather from the circular”, wrote Edwin Maule Cole to Roebuck, “that no one knows much about the neighbourhood [...] from a geological point of view. As I do, I will gladly come to the rescue + conduct a party”. (Cole, Letter to W.D. Roebuck, 15th April 1897.)

⁸¹ Anon., ‘With the Yorkshire Naturalists’, 1.

⁸² Fowler, *Yorkshire Naturalists’ Union*, 3.

⁸³ Anon., ‘With the Yorkshire Naturalists’, 6, 3.

⁸⁴ Hewetson, ‘The Yorkshire Naturalists’ Union’, 131–2.

special interest he gave such information as he thought advisable. Other members were in like manner asked to name the insects, the “shells,” the fossils, &c., and the ornithologists to report on what they had observed.⁸⁵

As the group became larger and more specialised through the years, this method became too time consuming, and it became regular practice for the sections to retreat separately to discuss the spoils of the day. The section secretary would laboriously list these finds and the chair and other experts named any unknown specimens.⁸⁶ (In the meeting, as in the field, the expertise of the few leaders was demonstrated and maintained.) At around 6.30, the general assembly was held, and the president called upon the section heads to outline their finds. They announced the number of species observed and collected, and pointed out any rare or interesting finds. The day was judged a success if many specimens had been collected (often) and the weather had been kind (less often).

5.3.2 Individual Fieldwork

Although the organised field meeting was an important point of contact and a vibrant social occasion, it is clear – and this point is easily overlooked in an institutional history – that the field club members carried out the bulk of their fieldwork in their own time, solo or in small groups. Their members’ propensity to naturalise alone, in fact, was a constant worry for the field clubs. Individual, uncoordinated naturalising threatened to mar the collective value of the amateur. The group excursions of the LNC were less successful than they might have been because “the members seemed to prefer making excursions individually instead of collectively”.⁸⁷ George Porritt was particularly disappointed by the failure, as he saw it, of the Huddersfield Naturalists’ excursions: “these were I believe originally among the prescribed objects of our Society, and although they have been tried over and over again, with more or less success, they have not by any means played the important part I think they ought to have done”.⁸⁸ Unlike the popular YNU trips, individual societies rarely rallied more than a score of naturalists for their field meetings. Their members preferred to take to the field alone.

A solo natural history excursion took many forms, ranging from a ten-minute stalk through the back garden of a friend (as Roebuck did on Christmas Day) to Henry

⁸⁵ Anon., ‘West Riding Naturalists’ Society’, unpag.; Roebuck, *Salient Features*, 5; Secord, ‘Science in the Pub’. Similar practices are documented in Leeds and Huddersfield. (LNC, *Minutes* (1870–3); HNS, *Monthly Circular* 54 (1894); Porritt, ‘Our Society, and its Work’.)

⁸⁶ YNU Vertebrate Section, *Minute and Report Book*.

⁸⁷ LNC, *Minutes* (1870–3), unpag. This sentiment is echoed in Britten, ‘The Local Field Clubs of Great Britain’.

⁸⁸ Porritt, ‘Our Society, and its Work’, 7.

Seebohm's year-long trips through the wilds of Siberia.⁸⁹ Natural history was a daily activity, and naturalists would make notes of their observations on a regular basis. Many naturalists used their vacations as collecting trips, and the accounts thereof were often to be found in the pages of *The Naturalist* and other field journals. While the clubs and federations became increasingly specialised, it is clear that individual naturalists did not. Leonard Doncaster, later professor of zoology in Liverpool, as a young man in Abbeydale would bird watch, keep meteorological records, stay up to examine the stars through his precious telescope, draw flowers, and collect shells, moths and eggs.⁹⁰ Seth Mosley, similarly, kept folios devoted respectively to spiders, butterflies, birds and minerals.⁹¹ They would make note of anything and everything that attracted their attention, and their field notebooks – the naturalists' most important tool – are testament to this tenacious eclecticism.⁹²

Collecting in small informal groups was common. Henry Seebohm and Charles Doncaster of the SNC shot birds together for many years, and James Needham the iron moulder and Charles Crossland, a master butcher, began their ecological studies as a collecting partnership. Middle-class enthusiasts often interacted with workingmen naturalists in this setting: Needham is a good example, and Albert Hall wrote of "Mr James Batty. 65 Fawcett St. Sheffield a grinder by trade, an excellent practical entomologist by nature, too fond of drink & a friend of mine gave me 28 larvae of this species which he took on the hedges".⁹³ In later years, infirmity prompted Hall to employ his coachman, David Cooper, to collect entomological specimens for him.

The famous trips of great men of science and the well-documented meetings of naturalists' groups together represent only the tip of the iceberg of natural history practices. Poorly-attended club field excursions do not necessarily indicate a decline in the importance of the field as a site for life science; besides which, solo field trips did not involve the potential dangers of flirtation and frivolity.

5.3.3 Meetings

While individual naturalising continued apace in the field, club practices flourished in the built environment. Meetings were generally held on a weeknight evening, once or twice a month, and would attract a dozen or more of the core members of the club. Members were encouraged to display their own findings, commonly those collected during the

⁸⁹ Roebuck, *Diary*; Hobson, *Henry Seebohm's Journal*.

⁹⁰ Doncaster, *Diaries*.

⁹¹ These folios are now in the Tolson Memorial Museum Archives, Huddersfield.

⁹² Larsen, 'Equipment for the Field'; Thornley, 'Equipment of a Field Naturalist'.

previous YNU field trip or club excursion. The meetings began with a short talk, followed by discussion and display of a number of different points. Take for example the LNC meeting of 17th February 1880, which nicely displays the eclecticism of the field clubs:

Short notes from Mr. Alfred Roberts [...] the subjects being – the fondness of animals (chimpanzee) for scent; the nesting of a kingfisher; the habits of the common bat; and an anecdote of a snake carrying off a starling's egg. Mr John Grassham exhibited a male golden-eye duck in full adult plumage, in which state it is but rarely met with; Mr Walter Raine, eggs of the ostrich, emu, and great bustard. Microscopic objects were shown [...] and an external parasite (unnamed) of the pig [...] Mr Washington Teasdale, F.R.M.S., showed a great number of iridescent diatoms from China, and various seeds and pollen grains. Mr J.R. Murdoch brought a number of diatoms from Calverley, and a variety of mosses and hepaticæ.⁹⁴

The meetings were an admixture of presentation, demonstration, exhibition, education, ramble reports and an opportunity to lend or borrow instruments, specimens, and books. The topics of discussion at these meetings grew more technical over the years, and when sections were formed, separate meetings were devoted to a particular speciality.

Microscopy, however, was popular in these meetings long before the clubs formed microscopical sections. As Thomas Armstrong trumpeted in *The Naturalist*, the microscopists' "course may be in the park and meadow, garden or lane, for everywhere we are surrounded with life, and wherever there is life, there the microscopist has material for his studies".⁹⁵ From this field-based use, microscopy became an integral part of the conversaciones (60 or 70 of the instruments were displayed at the YNU exhibition in 1879), the subject of many of the exhibits, and the focus of various 'social teas'. Most clubs bought collective instruments for loan to members: specialist microscopical societies owned dozens. The clubs used the microscope, as Gooday argues, as a *technology of transition* in order to justify their indoor activities – they brought the field in with them.⁹⁶

Microscopes were also deployed as a teaching and display aid for the lectures and classes arranged by the clubs. The natural history lecture, still going strong at the philosophical society and now supplemented by the formal instruction at the biology departments, was an enduring form of life science consumption. Often included in the original manifestos of the clubs – "diffusion of Knowledge in the various branches of

⁹³ Hall, *Larvae Notes*, 38.

⁹⁴ *The Naturalist* (1879–80), 127.

⁹⁵ Armstrong, 'The Pleasures of a Microscopist', 23.

⁹⁶ Gooday, 'Nature' in the Laboratory'.

Natural History” was a common goal – lecture schemes were introduced in earnest from the late 1870s, partly in response to the poor attendance at their field meetings.⁹⁷ These lectures were devoted to a variety topics, often of a practical nature, with specimens and diagrams, and illustrative experiments; and they, like the philosophical societies and the colleges, utilised the magic lantern. As Seth Mosley – popular as a lecturer across the West Riding – recorded, “when I got a lantern, and painted slides to illustrate the lectures they became more popular”.⁹⁸ The Huddersfield Naturalists bought their own lantern in 1896.⁹⁹ As well as the mixed-bag lecture schemes, many clubs also offered consistent courses natural history classes, engaging local educators from clubs, colleges and museums, such as Thomas Woodhead of Huddersfield, Henry Crowther of Leeds and William West of Bradford.¹⁰⁰ The various natural history groups in Yorkshire were inextricably linked.

Throughout this era, these meetings were the nerve centre of the clubs’ practices: however badly the excursions were attended, their meetings kept the clubs alive. Although it seems obvious to study field clubs in the field, to ignore their activities in the built environment is to see only one side of the coin.

5.3.4 Publications and Libraries

The production and collection of literary artefacts were vital to the practice and survival of the field clubs.¹⁰¹ “Excursions and Annual Meetings, large as they may loom in our minds”, argued Roebuck, “are but means of bringing us together [...] with the ultimate end of our publishing the results to which our investigations may lead us.”¹⁰² Lowe’s coverage on the publications of field clubs is so extensive that it is unnecessary to study them in great detail here.¹⁰³

Reports of the clubs tended to include accounts of excursions and meetings. In their transactions were to be found the results of their taxonomic projects: the Halifax Scientific Society produced the *Halifax Naturalist* (1896–1904) as a periodic vehicle for Crump and Crossland’s *Flora of Halifax* (published as a monograph in 1904), and the YNU

⁹⁷ Porritt, ‘Our Society, and its Work’, 1. There is documentary evidence of winter lecture schemes at Bradford, Halifax, Heckmondwike, Huddersfield, Hull, Leeds and Sheffield. (BPS, *Report* (1885–6); Woodhead, ‘Record of the Halifax Scientific Society’; Stuart, *The Humble Forms of Plant Life* (read to the Heckmondwike Naturalists’ Society); HNS, *Monthly Circulars* (1892–1894); HRI, *Annual Report* (1886); LNC, *Minutes* (1870–1904); SNC, *Annual Reports* (1882–1895).)

⁹⁸ Mosley, ‘Autobiography’, 34. (BPS, *Report* 12 (1886–7); Charlesworth and Ellis, *The History of a Society*; Woodhead, ‘Record of the Halifax Scientific Society’.) By 1912, Mosley boasted that he had delivered 5,000 lectures.

⁹⁹ Charlesworth and Ellis, *The History of a Society*.

¹⁰⁰ Stuart, *The Humble Forms of Plant Life*; Barker, ‘The Educational Contributions of T.W. Woodhead’; Porritt, ‘Our Society, and its Work’; Maltby and Winter, *Fifty Years of Local Science*.

¹⁰¹ Allen, ‘The Struggle for Specialist Journals’.

¹⁰² Roebuck, *Salient Features*, 8.

published John Gilbert Baker's *North Yorkshire* (1885–1891) in their *Transactions* (from 1877). Members of the clubs in the printing trade often volunteered their services to produce these publications, but even so many clubs could not afford to publish. Of the Yorkshire natural history periodicals that were published, the most widespread was *The Naturalist*. Although its editors tenuously claimed a pedigree from various earlier journals of that name, its manifestation as the regular vessel of the YNU began in 1875, edited from Huddersfield by George Porritt and Charles Hobkirk.¹⁰⁴ *The Naturalist* in this form sold more and survived longer than its counterparts from other regions such as the *Midland Naturalist* and the *South-Eastern Naturalist and Antiquary*.¹⁰⁵

Club members comprised the largest audience for the field club publications, but they were also read by other such societies around the county, country and even worldwide. Like the philosophical societies, most clubs participated in publication exchange systems, which formed the basis of their libraries. By 1902 the YNU exchanged publications with 77 societies, including clubs in America, Australia and Hungary, and their collection was bolstered by volumes sent for review in *The Naturalist*, and duplicate copies held by constituent societies.¹⁰⁶ Local club libraries were also stocked by donations from members and, finances allowing, purchases. They ranged in size from a few dozen to several hundred volumes, and were apparently “well used”.¹⁰⁷ Porritt was certainly a fierce advocate:

Probably the advancement of our members is a great deal more traceable to the influence of our Library than we at all realise. [...] Through it, members have been able to refer to, and work from the standard books of the best authorities [...]. Only by the study of the best books, along with one's own independent observations, can one know exactly what is known on any particular subject [...]. Besides buying the best books, I think a Naturalist's Society ought to 'take in,' as we express it in Yorkshire, the standard journals dealing with each branch of Natural Science.¹⁰⁸

Reading practices – *proper* reading practices, as defined by the society élites – constituted a vital part of field club activities. Although their libraries were dwarfed by those of the

¹⁰³ Lowe, 'Locals and Cosmopolitans'.

¹⁰⁴ Bayford, 'Some Notes on the History of *The Naturalist*', 'The Predecessors of *The Naturalist*'. Later editors included William Denison Roebuck and Thomas Sheppard.

¹⁰⁵ Lowe, 'Locals and Cosmopolitans'.

¹⁰⁶ In 1887, the collection was deposited in the Leeds Mechanics Institute, and in 1904 the Hull public library, probably at Thomas Sheppard's suggestion, bought the library outright.

¹⁰⁷ *The Naturalist* 2 (1876–7), 142. The HNS boasted a collection containing “upwards of 300 volumes”. (HNS, *Catalogue of the Fifth Grand Exhibition*, 3.)

¹⁰⁸ Porritt, *Our Society, and its Work*, 6–7.

philosophical societies and mechanics' institutes, these collections were important to the clubs nonetheless. As in many other ways, in establishing libraries the middle-class field clubs built and enlarged upon the tradition of the working-class botanical societies, who pooled their meagre fiscal resources in order to be able to loan books to their members.¹⁰⁹ The new field clubs, however, kept the library less out of economic necessity and more as a symbolic resource. Like their herbaria, they were seldom used for floristic studies, serving rather as a physical demonstration of the club's collective expertise.

5.4 Field Club Research and Ideology

Having outlined the multiplicity of motives and sites involved in the practices of the field clubs, in the rest of this chapter I will examine the developments in club practice that comprised what I have termed *amateurisation*. I turn first to the changes in field club research over the three decades in question. I chart their shift from traditional taxonomic ventures to projects involving new ecological concepts. The amateurs focussed on those areas in which they knew their contribution would remain vital, in part because of their detailed knowledge of local areas, but also thanks to the manpower at their disposal. Naturalists – or at least, some naturalists – altered their research goals in response to the rise of academic biology, seeking to ensure the continued co-operation between laboratory and field.

5.4.1 From Floristic Lists to Biogeographical Mapping

The original goals and many of the early publications of the YNU and its constituent societies were concerned with detailed floristic lists, that is, the painstaking record of every species of plant that appeared in the local area. The LNC set about:

the minute investigation of the Natural History (in all its branches) of the immediate neighbourhood of Leeds, and a more general investigation of the whole of the West Riding: the collection of information, whether at present on record or as yet unwritten; [...] and eventually the preparation of a comprehensive account of the Natural History of the district.¹¹⁰

They took rough notes in the field and jotted down at home in diaries, or recorded them at meetings in carefully indexed central sectional ledgers.¹¹¹ The primary objective of their excursions was to record as many species as possible, and wherever possible, to collect

¹⁰⁹ Secord, 'Science in the Pub'.

¹¹⁰ Roebuck, Scrapbook (1876).

¹¹¹ YNU, *Report Book*.

specimens, which were labelled, dated, and their locality, frequency, and captor recorded.¹¹² To further the club's ambition of a complete flora and fauna of the district, members were asked to submit as many records as possible, starting with specific genera such as *Lepidoptera*. Filled with such lists, editors hoped their *Transactions* might act as "storehouses filled with the material which future investigators may need for comparison and for reference".¹¹³ These works were highly detailed, massive (the *Fungus Flora* compiled by Charles Crossland contained nearly 17,000 records), and in many cases sumptuously illustrated.¹¹⁴ Although communal projects were rarely completed, individual efforts were published, such as William Eagle Clarke and Roebuck's *Vertebrate Fauna of Yorkshire* in 1881.

By the late century, however, some within the field clubs sought to augment this endless list compilation with new forms of study. (Roebuck asserted that *The Naturalist* was "not by any means intended to be devoted solely or even mainly to lists".¹¹⁵) Building upon the painstaking systematic tradition, and on the local expertise thereby gained, many within the clubs began to advocate biogeographical projects. As Franklin Parsons wrote in *The Naturalist*, "we may study [the specimens'] intrinsic characters, or we may concern ourselves with the circumstances under which they occur – their distribution in space".¹¹⁶ William Nelson of the Leeds Naturalists was concerned with the global distribution of land snails; the Huddersfield Society encouraged its members to plot distribution using Ordnance Survey maps; and Clarke and Roebuck carried out their cataloguing work with a view to biogeography.¹¹⁷ Inspired perhaps by Seebohm's adventures, the migration of birds was a popular subject of study. By collaborating with other clubs and by introducing more complete labelling and recording, broad surveys of distribution could be constructed. Porritt urged that the YNU collections should be catalogued as a standard of reference for the study of the distribution of flora and fauna, and Roebuck was shaping the *Transactions* and *The Naturalist* to provide just that.¹¹⁸ By the new century, Roebuck could proudly

¹¹² This had not always been the case. In the early years, Porritt remembered, "the collectors obtained their specimens and made a collection, and there was an end on it; in most cases no record even of the locality in the collectors' cabinet, much less in the Union's journal or record books for the benefit of fellow workers". (YNU, *Annual Report* (1900), 98.)

¹¹³ Roebuck, *Salient Features*, 14.

¹¹⁴ Sheppard, 'C. Crossland'.

¹¹⁵ *The Naturalist* (1896), preface.

¹¹⁶ Parsons, 'Hints on Natural History Collecting', 72.

¹¹⁷ "The most important requirements in the compilation of a local fauna are a careful definition of the true faunistic position occupied by each species, and of its distribution and relative numbers within the area treated of, together with some notice of its migratory movements." (Clarke and Roebuck, *Vertebrate Fauna of Yorkshire*, xi.)

¹¹⁸ YNU, *Annual Report* (1900).

announce, “in the study of geographical distribution and the influence of environment upon life and variation [...] our naturalists have been pre-eminently successful”.¹¹⁹

The zoological mode of study encouraged by the amateurisers – life histories – relied just as much on detailed local knowledge. Hence Alfred Thornley’s advice in *The Naturalist*: “the first thing [...] in the field naturalist’s thoughts should be ‘study’, not the mere amassment of material. It is better to know the life history of a single beetle than to possess the three and a half thousand species which the British list contains.”¹²⁰ Naturalists such as Charles Hobkirk, John W. Taylor, Albert Hall and especially William Nelson all carried out work of this kind, and life histories were a common topic on the programmes of the Sheffield Naturalists.¹²¹ This work was perfectly suited to the amateur’s strengths: patient attention to detail, day after day of careful recording and above all detailed knowledge of the behaviour and patterns of the local fauna.

Throughout all the floristic, biogeographical and life-history research there is evident an increasing insistence on the part of the amateurisers that the work be scientific, systematic and – above all – accurate. In 1882, Alfred Allen lamented that the public felt the Sheffield Naturalists’ Club (merely) collected: he exerted great effort during his two years of presidency encouraging the club to “pursue the higher aims of science”, and some months later he could proudly announce that “this year the club [has] done more *real scientific work* than in any previous year of its existence”.¹²² In the YNU, Roebuck criticised the original *après*-excursion system of naming all the specimens at a common table for “the want of scientific accuracy”; the subsequent formation of the sections precipitated “the rise of a new and more scientific race of naturalists [...] and of greater scientific accuracy in recording”.¹²³ Rather than random individual naturalising, in the 1880s the YNU council urged members to go about investigating “every nook and corner of our large county”.¹²⁴ By 1885 the “primary object of the Union [was] systematic and persistent investigation directed towards a sound and accurate knowledge of the natural history and physical features of the county”.¹²⁵ They aimed to “show the deficiencies in the knowledge of the fauna and flora of the district to be worked out”.¹²⁶ Only a countywide union could fulfil

¹¹⁹ Roebuck, *Salient Features*, 12.

¹²⁰ Thornley, ‘Equipment of the Field Naturalist’, 117.

¹²¹ Hall, Larvae Notes; Nelson, ‘Limnæa Peregra’; SNC, *Annual Report* (1894).

¹²² SNC, *Annual Report* (1882), 7, 31. Emphasis added.

¹²³ Roebuck, *Salient Features*, 5, 6.

¹²⁴ YNU, *Annual Report* (1900), 97.

¹²⁵ YNU, *Transactions* (1885), 144.

¹²⁶ *The Naturalist* 4 (1878–9), 192.

this function, and it did so through “systematic organisation” of its specialist sections.¹²⁷ The rhetoric of systematic accuracy was a crucial component in the amateurisation of natural history.

5.4.2 Plant Ecology in Yorkshire: The Amateur Perspective

The field club members’ experience with mapping projects and the long history of floristic studies in Yorkshire soon blossomed into ecological plant distribution studies, which were further strengthened through collaboration with the staff at the Yorkshire College and at Huddersfield Technical College (particularly, as discussed in section 4.6.2, William Smith and Thomas Woodhead). The discipline of plant ecology became an important field for collaboration between the professionals in the colleges and the field club amateurs.

Naturalists had long paid close attention to the *context* of the specimens they collected. H.F. Parsons wrote in *The Naturalist* in 1877, “our object in collecting specimens is not so much to study the characters of the kinds themselves as to ascertain the conditions of time and place under which they occur”, and Dallinger told the union, “locality and habitat are most important factors in our knowledge of the habits of an organism”.¹²⁸ Roebuck advised the members not only “to observe facts, closely and in detail, [but] to note their relationships to each other, and to place them on record exactly and methodically”; from the late 1860s he himself had been careful to record:

1. State of the Weather
2. What the specimen is
3. How many
4. How caught, (settled on the win[dow]?)
5. Where. Parish
6. Time of Day: forenoon, afternoon, &c.
7. If in a Pill Box, say so.¹²⁹

While it is anachronistic to claim that this mode of study “formed an admirable foundation for ecological study when it came”, it was these same practitioners who adeptly turned their collective hand to ecological approaches in the later century, with a wealth of systematic material from which to work.¹³⁰

Building on works such as John Gilbert Baker’s *North Yorkshire: Studies of its Botany, Geology, Climate and Physical Geography* (1885–1891), and through the auspices of the Yorkshire Botanical Survey Committee formed in 1893, many naturalists in Yorkshire

¹²⁷ YNU, *Annual Report* (1893), 9.

¹²⁸ Parsons, ‘Hints on Natural History Collecting’, 73; *The Naturalist* (1886), 157.

¹²⁹ Roebuck, *Salient Features*, 14; Roebuck, *Diary*, unpag.

participated in carefully planned botanical maps that noted the impact of the environment on different species. This form of study required considerable polymathy from the practitioners. Porritt felt that “one had to become interested in the geology, the botany, the dryness or moistness of the climate, the amount of sun, and a score of other things affecting the different areas”.¹³¹ By the turn of the century, Alfred Thornley was advising Yorkshire field clubbers:

the naturalist will never account that his study of an object is complete until he has seen it in contact with its proper environment, until he has traced out these numerous correlations upon which its very existence depends. Natural history is really the study of correlations – no animal or plant exists for itself, but for the good of the rest [...] for example, an ichneumon fly depends for its existence upon a certain caterpillar. The caterpillar in its turn depends on a supply of leaves of a certain tree, the tree depends on its roots being encased in a mantle consisting of the mycelium of a fungus. Destroy the last of these links and you destroy all.¹³²

This, then, was ecological mapping.

When Smith and Woodhead approached the YNU for assistance with their ecological projects in the 1890s (see 4.6.2), they were generally well received, and many naturalists embarked upon such travails, or continued their ecological studies with renewed vigour. Woodhead drummed up enthusiasm with his papers on the bilberry (delivered to the Halifax Naturalists);¹³³ Smith sought collaborators in his Yorkshire College classes, many of whom were active field club members, and published a scheme for field clubs to detail plant associations in *The Naturalist* in 1903. In this call to arms, which was also sent to the constituent societies of the YNU, he noted: “it has frequently been suggested [...], that the local Naturalists’ Societies should undertake regional surveys of this kind for their respective districts. [...] It seems natural that men familiar with a neighbourhood after years of observation should be useful colleagues in such a survey. They have already given most valuable aid both in Yorkshire and in Scotland.”¹³⁴ By 1904, Roebuck was pleased to report, “of late years, a new line of investigation has been entered upon in Botany, of which Dr. Wm. G. Smith is the leader, in which plants are studied in mass, and mapped according to their associations with each other, and good results have been attained”.¹³⁵ The source of this self-congratulation was the completion of two ecological charts, co-authored with

¹³⁰ Maltby and Winter, *Fifty Years of Local Science*, 5.

¹³¹ Porritt, ‘Our Society, and its Work’, 3.

¹³² Thornley, ‘Equipment of the Field Naturalist’, 119.

¹³³ Woodhead, ‘The Bilberry’.

¹³⁴ Smith, ‘Botanical Survey for Local Naturalists’ Societies’, 3.

Smith by the naturalists Charles E. Moss and William Munn Rankin.¹³⁶ William Crump and Charles Crossland also threw themselves whole-heartedly into ecological studies, and their *Flora of Halifax* (1904) was the first complete ecological local flora.¹³⁷

Despite resistance from stalwart systematic botanists such as Leeds' F. Arnold Lees, ecological studies were quickly taken up by other Yorkshire club members, and in the opening years of the new century Yorkshire became the focal point of English plant ecology. The subject was an effective vehicle for the active participation of amateurs. Necessarily field-based and yet characterised as modern, rigorous and (best of all) scientific, plant ecology was perfectly suited to the amateurised naturalists of the YNU and its constituent societies. Given the sheer volume of work required by such endeavours, the academics had no choice but to approach the clubs. This division of labour meant that the amateurs were then able to contribute to a rigorous, systematic enterprise, without threatening the authority of the academics in the built environment.¹³⁸

5.4.3 Preservation

Coincident with the popularity of botanical surveys and the rise of ecological studies, many factions within the field clubs grew as concerned with the preservation of local fauna and flora as with their collection or mapping. This sentiment was unrelated to the growth of plant ecology, and had little in common with twentieth-century environmentalist ideals.¹³⁹ Late Victorian naturalists were as much concerned with preserving nature for exploitation as they were for conservation.

A revulsion against collecting oddities – rare species and unusual varieties, “any strange aberration or variety of plant, animal or insect”, became increasingly evident.¹⁴⁰ The YNU was firm that although the naturalist might “guard for his own special delight some of [nature's] rarest gems[,] woe to him if in a weak moment he betrays the hiding place to a *mere plant-collector*, lest in future he should seek for his loved ones in vain”.¹⁴¹ Field groups were anxious about over-collecting by their thousands of members. Calls for moderation are evident nationwide from the 1830s, especially from botanists alarmed at the

¹³⁵ Roebuck, *Salient Features*, 9.

¹³⁶ Smith and Moss, ‘Geographical Distribution of Vegetation in Yorkshire’; Smith and Rankin, *Geographical Distribution of Vegetation in Yorkshire*.

¹³⁷ Crossland, ‘The Distribution and Association of the Mosses and Hepatics’; Crump, ‘The Wilting of Moorland Plants’; Crump and Crossland, *The Flora of the Parish of Halifax*; Lowe, ‘Yorkshire Naturalists and the History of Ecology’.

¹³⁸ [Tansley], ‘Research in British Ecology’.

¹³⁹ As recognised in Benson, ‘The Emergence of Ecology from Natural History’.

¹⁴⁰ Porritt, ‘Our Society, and its Work’, 8.

¹⁴¹ YNU, *Annual Report* (1900), 87. Emphasis added.

mid-century fern craze.¹⁴² “This has been the cry”, wrote Seth Mosley – a voracious collector himself – “and the cry has been well founded [...] that there are too many collectors”.¹⁴³ As the *Yorkshireman* noted dryly,

At a meeting of the Leeds Naturalists’ Club the other day, a pair of Pomerine Iknas were exhibited, which had been shot on the coast near Bridlington. These rare hawk-like birds have occurred in unusual numbers on the Yorkshire Coast this autumn, and the spare time of all true lovers of nature has been devoted to proving to survivors the folly of occurring again.¹⁴⁴

Rather, leading naturalists encouraged the study of common plants. “The rarer plants,” wrote Arnold Lees, “will take care of themselves [for] they are not in danger of being left unrecorded; but with the commoner plants it is otherwise”.¹⁴⁵ A tension was always evident: on the one hand, rarity hunters were criticised for being unsystematic, and yet rare specimens attracted most favourable comment at the excursions, and throughout the primary literature ‘rare’ was usually coupled with ‘interesting’. Professional collectors, whose search for rarities was frowned upon, nevertheless carried out a roaring trade amongst the clubs.

The combination of this rarity fetish, intensive collecting and the noticeable disappearance of local species prompted many a rhetorical flourish in the last decades of the century. Already in 1880 Bendelack Hewetson argued that the goal “of Natural History Societies must be based on the great principle of *protecting* as well as *observing* the objects of their study [...] not to be annihilating all that is rare or beautiful to satisfy a too-frequent craving for collecting”.¹⁴⁶ By the new century, Sheppard could confidently assert that “a Naturalist is essentially a preserver of the fauna and flora of his country [...] anyone in any way exterminating or destroying animal or plant life cannot claim that title”, and Roebuck insisted that the YNU’s outlook “has always been one of preservation, not destruction”.¹⁴⁷ Seth Mosley, whose reputation and early career had been based upon rare-species taxidermy, had a change of heart in the 1880s (associated with a religious revival) and henceforward condemned the murderous practices of his fellow naturalists:

During this time leading thoughts about Nature took a different turn, the old mania for collecting waned, and there seemed a desire for a new way of approaching the objects around us. My change in attitude towards religion had

¹⁴² Allen, ‘The Early History of Plant Conservation’.

¹⁴³ Mosley, ‘Where are the Insects?’, 85.

¹⁴⁴ Cited in Donnan, ‘The Leeds Naturalists’ Club’, 112.

¹⁴⁵ Lees, ‘Notes on West Riding Botany’, 37.

¹⁴⁶ Hewetson, ‘The Yorkshire Naturalists’ Union’, 133. Original emphasis.

brought me to a different state of mind, and I was quite prepared to be less sympathetic with wholesale slaughter.¹⁴⁸

He prefaced his *Birds of Huddersfield* (1915) with “regret that the book is a record of murder and plunder from beginning to end”.¹⁴⁹

Gradually a custom of civic protest became common among the field clubs. In 1879 the Leeds Naturalists persuaded the town council to suspend fishing in certain areas; the Bradford club successfully protested against a particularly destructive footpath planned next to Shipley Glen; the YNU organised a petition to protest the closure of Maltby common in 1880; and nearly all the field clubs expended considerable time and effort charting and attempting to account for the disappearance (and less often the re-appearance) of species throughout the county. In 1890, for example, a committee was formed to chart the disappearance of native plants, and there had been an early campaign to protect toads.¹⁵⁰ They were most successful, however, in their efforts to preserve birds and their eggs, building on a Yorkshire tradition that dated back to Charles Waterton’s early bird sanctuary in the grounds of his ancestral home, Walton Hall (near Wakefield).¹⁵¹

Their campaigns to protect fish and sea birds were motivated as much by the desire to exploit and study these resources in future as to save nature from man’s destructive influence. As Ritvo writes, the difference in the late century was that the “need to conquer through force had almost disappeared, leaving an urgent need to husband and manage, to protect and exploit”.¹⁵² The many movements seeking to preserve wild stretches of land were to ensure that future generations of naturalists could continue to benefit from them. These sentiments are visible across the country – George Brady told the Tyneside Naturalists:

If a botanist takes twenty specimens of a rare plant when he needs only half a dozen, or the owner of an aquarium decamps with two [or] three specimens of an *Actina* [sea anemone] which perhaps exists on our coasts only by scores [...], he is acting to the detriment of Science, and trespassing on the enjoyment of his fellow-

¹⁴⁷ *The Naturalist* (1903), 3; Roebuck, *Salient Features*, 14.

¹⁴⁸ Mosley, ‘Autobiography’, 25.

¹⁴⁹ Mosley and Mosley, *An Account of the Birds of the Huddersfield District*, dedication.

¹⁵⁰ *Yorkshire Naturalists’ Recorder* 8 (1873).

¹⁵¹ Barber, *The Heyday of Natural History*, 99–110; Edginton, *Charles Waterton*, 177–211; Larsen-Hollerbach, ‘Of Sangfroid and Sphinx Moths’; Mosley, ‘Where are the Insects?’; Rupke, ‘Pro-Vivisection in England’; Varty, *Yorkshire Naturalists’ Union Protection of Birds Committee*, [Wood], ‘The Home of a Naturalist’. I am grateful to Dr Gowan Dawson for the latter reference.

¹⁵² Ritvo, *The Animal Estate*, 288.

naturalists, not only now, but possibly to future generations.¹⁵³

Naturalists were keen to preserve nature for further exploitation in the name of natural history, rather than for nature's sake.¹⁵⁴ Until the late 1890s, the field clubs demonstrated little interest in issues such as pollution.¹⁵⁵ Only in the 1980s did 'ecology' become synonymous with 'environmentalism'. As Bowler writes, "the Green Movement has appropriated the term 'ecology' for its own purposes by pretending that anyone aware of the complexity of the interactions between species must be concerned to preserve the natural balance".¹⁵⁶ To claim a necessary link between ecology and environmentalism, as historians of ecology in the 1970s and 1980s tended to do, is an anachronism.¹⁵⁷ 'Preservation' is not only the actors' category, but has different implications than conservation. Plant ecology – "the topographical physiology of plants" – was far more significant in this era as a re-assertion of the importance of field research, a disciplinary site of amateur-professional interaction.¹⁵⁸

5.5 Networks and Specialisation

As well as shifting their research focus, the field club élites – capitalising on the massive numbers engaged in natural history in the late nineteenth century – built upon and extended the exchange trade and informal collaboration networks already operating in provincial Britain. Through collaboration with other groups throughout the county and beyond, the amateurisers reasoned, they could fashion a well-organised field army of collectors and recorders, whose efforts were institutionalised in the British Association Corresponding Societies Committee. In the first parts of this section I examine collaboration and exchange in natural history at the personal, institutional and national level. I then outline the changes in the very structure of these groups. The field club élites appointed recorders and organised specialised sections in their efforts to fashion a modern, systematic, fact-gathering army. Although Michael Foster told the union in 1898 that it was a bastion against that Babel-esque fragmentation in *fin-de-siècle* biology, specialisation was as

¹⁵³ Brady, 'Address to the Members of the Tyneside Naturalists' Field Club', 284. I am grateful to Professor Geoffrey Cantor for this reference.

¹⁵⁴ Allen, 'The Early History of Plant Conservation'.

¹⁵⁵ Here I am concerned only with attitudes within natural history practitioners: concerns about pollution had given rise to legislation much earlier. (Garwood, 'The British State and the Natural Environment'.)

¹⁵⁶ Bowler, *The Fontana History of the Environmental Sciences*, 362.

¹⁵⁷ For example, Worster, *Nature's Economy*.

¹⁵⁸ Tansley, 'The Problems of Ecology', 192.

evident in amateur natural history as it was in professional biology.¹⁵⁹ Like co-operation, it was an integral part of the amateurisation of natural history.

5.5.1 Exchange and Collaboration

The practice of bartering natural history specimens in person or through correspondence was evident throughout the century.¹⁶⁰ During the field club boom, however, these exchange systems came into their own. Professional collectors set up businesses selling specimens to naturalists up and down the country, and organisations such as the Postal Microscopical Society, the Botanical Exchange Club and the Moss Exchange Club were founded and thrived.¹⁶¹ Specimens hurtled around the country for identification and as gifts or for barter. When the Huddersfield Naturalists set up a Botanical Garden, they stocked it through exchange with other such groups, and went on to co-operate with gardens nationwide – including Kew – through lists of duplicate specimens and through seed exchange.¹⁶² Naturalists' diaries and field notebooks reveal the extent to which they relied on exchange and barter to extend their collections, and it was to further this mode of collaboration that many of the field clubs were established.¹⁶³ The YNU presented unrivalled opportunity for “interchange of specimens, opinions [and] experience”.¹⁶⁴ *The Naturalist* was an ideal vehicle for this: the editors' aimed “to afford a means of communication amongst all Natural History Societies, either within or outside the boundaries of the County of York, and of every individual member of such societies”.¹⁶⁵ *The Naturalist* was itself an artefact to be exchanged, as discussed above, within the periodical exchange system.

Specimen exchange, however, was only one of many forms of collaboration upon which the strength of the amateur contribution to natural history depended. The “combination and organisation of individual effort”, the club élites reasoned, was paramount.¹⁶⁶ A club could offer opportunities for collaboration at the personal level: the YNU facilitated co-operation between societies. The union's success as an “integrating

¹⁵⁹ Foster, 'Integration in Science'.

¹⁶⁰ Secord, 'Corresponding Interests'.

¹⁶¹ Allen, *The Naturalist in Britain*, 224–225; Blockeel, 'William Ingham'; Moore, 'Presidential Address'.

¹⁶² Woodhead proudly reported, “plants have been received from almost every part of Yorkshire, also from Lancashire, Cambridgeshire, Herefordshire,” and so on. (HNS *Annual Report* (1885), cited in Barker, 'The Educational Contributions of T.W. Woodhead', 63.)

¹⁶³ Hall, *Larvae Notes*. Hall exchanged specimens with clergymen, physicians and other naturalists up and down the country.

¹⁶⁴ YNU, *Annual Report* (1901), 143.

¹⁶⁵ *The Naturalist* 1 (1875–6), 2.

¹⁶⁶ *The Naturalist* 6 (1880–1), 65. Benjamin Holgate, President of the LNC, spoke of the “desirability of mutual association on the part of scientific students”, and Porritt rejoiced in the “great value of Field

machine", however, is open to question.¹⁶⁷ The WRCNS was originally run by a conference of delegates from each of the societies, which continued to wield authority even after an independent executive was formed. Later, each society elected local honorary secretaries whose official responsibilities were to "act as local representatives".¹⁶⁸ In fact, they made sure subscriptions flowed and that the whip line was kept so that "the Union and its objects [were] constantly in view, whether by way of enlisting new members or by keeping the Executive constantly informed as to local scientific occurrences".¹⁶⁹ The relationship between union and societies was sometimes strained, and the delegates were often concerned with "how the Union might help the societies, whilst prevailing opinion seemed to be that the societies could be of very little assistance to the Union".¹⁷⁰ A disgruntled member complained in 1902 that "the Societies care not a farthing for the welfare of the Union".¹⁷¹ The YNU, some argued, was too thinly spread, too cumbersome for its own good. Interaction between the YNU and other such unions, meanwhile, was somewhat more successful than its relationship with its own constituent societies. The union actively collaborated with many other such associations, holding joint excursions with the Nottinghamshire and Lincolnshire Naturalists and the Yorkshire Geological and Polytechnic Society, and organising a joint survey with the Durham Naturalists' Union.¹⁷²

At the root of the collaborative ethic evident in the YNU rhetoric was a vision of a hierarchical network of co-operation. "So long as the facts remain as mere isolated facts," John Gilbert Baker told the YNU, "they can only interest and be remembered by a limited number of specialists; but when our facts can be made to illustrate general laws, their value rises to a higher level".¹⁷³ Baker and others were trying to fashion the field clubs into a massive Baconian network. Field knowledge was to be synthesised into a larger whole by way of centralised collation. The individual members compiled lists, and sent them to the committee or section secretary, who added it to their records, and sometimes published them in their *Transactions*. As Baker later envisioned,

Meetings [viz.,] the much better opportunity they afford for friendly intercourse among members". (*The Naturalist* (1879–80), 126; Porritt, 'Our Society, and its Work', 8.)

¹⁶⁷ Foster, 'Integration in Science', 222.

¹⁶⁸ YNU, *Annual Report* (1900), 85.

¹⁶⁹ In 1903, when the financial state of the union became particularly troubling, a local treasurer was also appointed.

¹⁷⁰ YNU, *Annual Report* (1901), 125.

¹⁷¹ Gregson, Letter to E. Hawkesworth, 5th November 1902, unpag.

¹⁷² The YNU also co-operated with individuals across the country, assisting botanists such as Babington, Hooker and Balfour with classification, and receiving advice from George Busk in his capacity as Secretary of the Linnaean Society. (Allen, 'C.C. Babington'; Anon., 'A Working Man Botanist'; Barber, 'History & Progress of the WRCNS'.) The union's own surveys, such as Porritt's *List of Lepidoptera* (1883) were in turn compiled with the help of "kind friends all over the country". (YNU, *Entomological Transactions* (1883), 1.)

¹⁷³ Baker, 'On the Present State of our Knowledge', 130.

A good paper is published in a periodical or in the report or transactions of some society; the pith of it is soon absorbed into some general work: in Botany, into the flora of the island, like Hooker's or Babington's [...] or a record of localities into a county flora; these are again condensed into the general epitomes of the botany of the whole island. [...] It is these general books which isolated workers buy.¹⁷⁴

Individual fieldworkers were consoled by another president of the union, "be it ours, if not to receive a crown of renown, at least, to endeavour to obtain some little garland of triumph of our success".¹⁷⁵

The confidence of those who sought to harness the might of the field clubs lay in their sheer strength in numbers, bolstered by the persistent efforts of the union secretariat further to increase membership. Where the pub-based botanical groups counted their members in the dozens (except for the extraordinarily large society in Todmorden), some of the middle-class field clubs boasted hundreds on their books. At their peak in the 1880s, naturalists' groups in Leeds, Sheffield and Ripon all had between 200 and 300 members, and clubs in Huddersfield, Barnsley, Doncaster, Hull and Richmond were not far behind. Given that by the turn of the century there were barely a handful of salaried biologists and curators in Yorkshire, the combined might of the field clubs – around 3,000 in the constituent societies of the YNU alone – was a collecting and surveying force with which to be reckoned.

Despite the proclivity of the rank and file of this force to picnic and flirt (see section 5.2.3) Roebuck and others often presented the field clubs in martial terms. "We, and societies like ours," proclaimed Roebuck, "form the field army, the extended skirmish line, in which each individual worker is brought into close and intimate contact with the living facts of nature."¹⁷⁶ This mode of rhetoric was a neat way of plastering over the myriad objectives of the individual naturalists. By presenting the field clubs in military terms he implicitly invited comparison with centrally organised projects such as the Geological Survey. Whereas historians have typically imagined great metropolitan men of science "marshalling the forces of the provincial natural history societies", it is clear that naturalists within the field clubs themselves, in their efforts to refashion the amateur role in science, were fulfilling this role.¹⁷⁷

¹⁷⁴ YNU, *Transactions* (1884), 185–6.

¹⁷⁵ Anon., 'West Riding Naturalists' Society', unpag.

¹⁷⁶ Roebuck, *Salient Features*, 14.

¹⁷⁷ Rehbock, *The Philosophical Naturalists*, 131.

5.5.2 The BAAS Corresponding Societies

The magnitude of the field club movement did not go unnoticed by the great and the good. Academics sought amateur support for a number of projects through the BAAS Local Scientific Societies Committee, founded in the early 1880s. The committee was the realisation of various proposals made during the 1870s to establish a third tier of organisation in natural history, straddling the federations and the clubs. Although Lowe has discussed the efforts of the committee in detail, it is important to note here its role in the extension and formalisation of natural history networks in Yorkshire and across the county.¹⁷⁸ The reports of the conference clearly illustrate the variety of size and inclination of the clubs, and they demonstrate that amateurisation was not unique to Yorkshire: amateurs elsewhere in Britain were looking to eliminate the picnicking element and to standardise fieldwork methods.

Originally chaired by Francis Galton, the committee instituted an annual conference of delegates from around 40 affiliated amateur societies, amongst which Yorkshire was well represented. These 'Corresponding Societies' – of which there were 70 by the turn of the century – were intended to be local centres, who in turn co-ordinated the work of smaller groups in their region. The delegates sought to give a national voice to provincial societies; to provide a mode of communication between them; and to regulate and co-ordinate local research. The conference was intended to relay to the local societies the recommendations of the sections of the BAAS, and they encouraged geological, archaeological, anthropological and biological surveys. The field club officials responded enthusiastically, keen to have the work of their members utilised in broader schemes. Amateur and academic sat alongside each other at the conferences: that the amateur societies were not necessarily subordinate to the academics who initiated the scheme is evidenced by the tact with which the committee approached them. As Reverend J.O. Bevan of the Woolhope Naturalists stated in 1901, "the Conference will make it clear that there is no intention to dictate to the various Societies involved. The suggestions are tentatively put forth in the interests of scientific research, and in response to the demand frequently made by Delegates".¹⁷⁹ The impetus behind the projects came from both amateur and professional camps.

Although the objectives of the conference were never fully realised, the YNU was among the few groups to take up the cry in earnest, commissioning studies prompted by

¹⁷⁸ Lowe, 'Locals and Cosmopolitans', 'The British Association'. The BAAS had instituted a Sub-Committee on Local Scientific Societies a decade earlier.

¹⁷⁹ BAAS, *Report 71* (1901), 474.

BAAS directives and others besides. Their subject matters included marine zoology, fossil flora and the distribution of erratic boulders, and they were chaired respectively by Henry Sorby, William Crawford Williamson of Owen's College, Manchester, and Alexander Green of the Yorkshire College Geology Department. Regardless of the limited completion of many of its projects, the conference nevertheless provided for the more enthusiastic societies a further mode of co-operation, and a forum for amateur-professional collaboration.

5.5.3 Division of Labour

Initially, naturalists of all persuasions perambulated together, and met afterwards at a common table, creating a somewhat chaotic atmosphere at the field meetings:

Now it was a particular kind of moss that attracted the attention of Mr. C.P. Hobkirk, or a fern with a big long name that delighted Mr. Thomas Hick; or Mr. G.T. Porritt had fallen in love with a rare caterpillar; or Mr. Prince would tell the name of a bird, where it had come from, where it was going, and what its business was, while Mr. Conacher searched diligently for shells; so that hardly a stone or a bird, or a flower, or an insect was seen without its history, and its uses being talked about and discussed.¹⁸⁰

Gradually, however, those with similar interests graduated towards each other, which separation was formalised from the beginning of this era, when the clubs began to appoint 'recorders'. These experienced naturalists were responsible for different natural kingdoms or phyla, and were intended to regulate and collate the activities and research of the members interested in their particular division of natural history.¹⁸¹ (Woodhead, for example, was the HNS recorder for botany.) The clubs thereby aimed to establish their collections and publications as centralised banks of information. The governing bodies and the recorders then divided up the region covered by the society into manageable areas, allotting members or small groups to be responsible for them. Roebuck, as secretary of the YNU, split Yorkshire itself into five districts, within which the constituent societies were allotted specific areas: the Bradford club, for example, took the swathe of land from the Aire basin up through the Dales to Sedbergh.¹⁸² The aim of this division was to ensure that surveys and lists were carried out systematically over the entire county, to facilitate rigorous and thorough lists, and to encourage "the study of hitherto-neglected groups of animals

¹⁸⁰ Anon., 'With the Yorkshire Naturalists', 3.

¹⁸¹ Charlesworth and Ellis, *The History of a Society*, Maltby and Winter, *Fifty Years of Local Science*.

¹⁸² Maltby and Winter, *Fifty Years of Local Science*.

and plants".¹⁸³ The whole of Yorkshire was to be covered, and every class and genus of the natural world: the results were to be contributed to national enterprises.

Specialisation soon followed in the very structure of the clubs and the YNU. Partly as a method of separating the 'serious' from the 'social' members, the leaders of the LNC recommended the formation of "rambling clubs, whose members need not necessarily be thorough naturalists".¹⁸⁴ The Sheffield Naturalists used the same tactic for a different purpose: they formed a specialist 'Ramble Section' "in connection with the Club, for the purpose of compiling a record of the local fauna and flora", which included the more experienced naturalists.¹⁸⁵ Field clubs also segregated into sections devoted to particular areas of study, a pattern that was mirrored in the organisation in the YNU.¹⁸⁶ Typically, a club would include distinct groups for the study of vertebrate zoology (or commonly ornithology), conchology, entomology, microscopy, botany, and geology. They tended to separate into sections on field trips, and some even held meetings on different nights. While such segregation was not always popular – for example, because in some groups there were areas that were inevitably under-represented – in 1895, F.W. Branson of the Leeds Naturalists maintained that "to-day specialisation is absolutely necessary".¹⁸⁷

From 1886, emulating the British Association, the YNU formed a series of more exclusive committees in order to supervise specific research endeavours.¹⁸⁸ The committees comprised the most experienced and senior naturalists (and included – on their books at least – many of the academics involved with the union).¹⁸⁹ They held considerable sway over the sites and routes of the general excursions, and organised their own field trips. Like the sections, their principal function was the administration of surveys and lists, which were published in the *Transactions* (although rarely completed). The subjects of the committees reflected the changing research interest of the members of the union: the 'Disappearance of Native Plants' committee demonstrated their dedication to preservation, and the 'Botanical Survey' committee led by Smith illustrated the prevalence of ecological study. They varied enormously in their output: the Boulder Committee was very prolific

¹⁸³ *The Naturalist* 2 (1876–7), 159.

¹⁸⁴ Roebuck, Scrapbooks.

¹⁸⁵ SNC, *Annual Report* (1894), 3.

¹⁸⁶ By 1879 there were sections devoted to geology, entomology, conchology, micro-zoology and micro-botany, and cryptogamic and phanerogamic botany.

¹⁸⁷ LNC, *Minutes* (1895).

¹⁸⁸ Between 1886 and 1904 committees were created devoted to the distribution and mapping of erratic boulders; the marine zoology of the Yorkshire Coast; fossil flora; the erosion of Yorkshire coasts; the disappearance of native plants; geological photography; cryptogamic flora and invertebrate fauna; the protection of wild birds' eggs; bryology; coleoptera; botanical surveys; and mycology.

¹⁸⁹ Green and Miall sat on the Boulder Committee, and Sorby and Williamson were founder members of the Marine Zoology and Fossil Flora groups respectively.

(the British Association hailed it as an exemplar), whereas the Microscopical and Marine Zoology committees – always weak areas in the YNU – accomplished very little. The council admitted, “the committee system has its weak places. It tends to draft off many active naturalists into companies, each with its own plan of campaign”. In 1904, in order to encourage the various groups all to march to the same tune, a Committee of Suggestions for Research was established, to consist of representatives from each committee, whose “chief object [was] to promote co-operation of members in dealing with questions involving knowledge of several branches of science”.¹⁹⁰ The Committee of Suggestions was perhaps the most visible institution dedicated to amateurisation of Yorkshire natural history.

The extent to which naturalists thrived in specialised organisation in Yorkshire is reflected in the various national-scale specialised societies that grew out of the county, and from the active members of the research committees in particular. The Conchological Society of Great Britain emerged from the ‘The Conchological Club, Leeds’, formed by Roebuck, William Nelson, John Taylor and Henry Crowther in 1876.¹⁹¹ The British Mycological Society’s roots are in the YNU, whose ‘fungus forays’ outshone even those of the Woolehope Naturalists, who were famous for mycological field meetings followed by banquets of edible fungi. Alfred Clarke, Charles Crossland, George Masee, William Fowler and James Needham were among the small group who met in Huddersfield and formed a national society for the study of fungi in 1895.¹⁹² Crossland was also on the fringes of the group who went on to form the British Ecological Society (see 4.6.2).

5.6 Conclusion

Three broad conclusions can be drawn from this detailed examination of the practices of natural history societies in Yorkshire: that natural history was firmly embedded in middle-class civic culture; that the clubs displayed a wide variety of motives, sites and practices; and that natural history thrived rather than withered in the face of laboratory biology. It has also become clear that Yorkshire was home to an especially strong natural history community.

The middle classes, still in the process of establishing their place in Victorian cultural and social life, swarmed into the field in order to fill their newly-found leisure

¹⁹⁰ Kendal et al., ‘Committee of Suggestion for Research’, 137, 138.

¹⁹¹ Norris, ‘The Conchological Society of Great Britain’.

¹⁹² English, ‘Mordecai Cubitt Cooke’; Watling, ‘The British Mycological Society’.

hours with such a morally acceptable, healthy pursuit as natural history. Of this there is little doubt: what is disputed is their impact upon natural history. Allen is somewhat unkind about these new participants: bored and boorish masses, “swarming book-buyers”, who “compared with the naturalists of the 1820s and 1830s [were] sloppier, less intelligent and more given to hysteria”.¹⁹³ Barber positions the end of her ‘heyday of natural history’ in 1870, precisely at the peak of the growth in middle-class field clubs.¹⁹⁴ I hope to have shown that instead, the middle-class naturalist had a significant role in the growth and survival of natural history, both as a scientific discipline and a recreational pursuit.

What has also become clear in this brief survey is the extent to which the field clubs and similar groups such as microscopical societies and scientific associations were interconnected (as they were to the philosophical societies, museums and colleges discussed in earlier chapters). They all shared a common structure: the middle-class civic voluntary association. Groups spawned groups, sections split from a parent society, and amalgamation and affiliation were rife. The elaborate names of many of the societies speak volumes about their genealogy: take for example the Ripon Naturalists’ Club and (Literary and) Scientific Association. On closer examination, the extent to which the membership of these groups overlapped is striking. The field club élites were often found on the councils or committees of the local scientific association, microscopical group and philosophical society, and many offered privileges to each others’ membership. Attempting to study any single group in isolation from the organism of the Victorian town would be a futile task.

In this chapter I have presented once again the variety of natural history practitioners and of sites. Even within its predominantly middle-class membership, the field club was by no means an homogeneous social entity. The presidents of the YNU, exclaimed Thomas Woodhead, “are drawn from every class and calling, Bankers and Butchers, Doctors and Drapers, Civil Servants and Chemists, Printers and Parson, both church and dissent—including Bishops—Manufacturers and Merchants, Professors and Teachers, and even Museum Curators! [presumably a jibe at Thomas Sheppard] not to mention Lords, Baronets and Knights”.¹⁹⁵ They included among their ranks nearly all the active participants of the groups I examined in earlier chapters: those members of philosophical societies whose interests lay in the life sciences; museum curators such as Henry Crowther; and – significantly – *all* the staff of the college biology departments. And just as these biologists practised life sciences in a number of sites besides the laboratory, so

¹⁹³ Allen, *The Naturalist in Britain*, 124, 122.

¹⁹⁴ Barber, *The Heyday of Natural History*.

¹⁹⁵ Woodhead, ‘Botanical Survey and Ecology’, 97.

too the 'field' clubs' practices relied on the built environment: although I have focussed on the fieldwork practices of the members of these clubs, the lectures, classes and meetings were perhaps more important to the running and continued survival of the clubs than the excursions. This does not imply that fieldwork was any less popular or significant a practice for individual naturalists: simply that natural history *institutions*, the unit of analysis in my study, relied on the built environment for communication and collaboration.

Some historians have contended that amateurs turned away from natural history in the late nineteenth century, demoralised by the advances in academic biology.¹⁹⁶ It is clear that few amateurs turned away from natural history, which remained popular both as a pastime and a scientific field. There can be no doubt about the durability of natural history traditions: they endured into the twentieth century, their centres of authority shifted and their goals transformed. Roebuck and others in the core of the YNU, far from demonstrating dismay at the changes in professional biology, shook off the 'fungus-hunter' image, presenting instead an efficient, unified, collecting force. This effort, this *amateurisation*, was furthered by the shift in field club research away from floristic lists; by an increasing emphasis on accuracy; by the extension and formalisation of natural history networks; and the increasing specialisation within the clubs. The clubs may have been largely composed of part-time naturalists: but they were distinct from "the ranks of amateurs and spectators" outside their auspices.¹⁹⁷ Although those 'picnickers' among the members no doubt continued to use the excursion as a social occasion, Roebuck and others ensured that the active naturalists were not hindered by them. Just as the biologists constructed a laboratory-based élite in the colleges, so the amateurisers within the clubs and the YNU constructed a network of naturalists with authority over the field.

¹⁹⁶ One reason behind the endurance of 'demoralised amateur' narrative is the use of one particular passage of pessimistic rhetoric from one particular book review (Grove, 'The Happy Fungus-Hunter', 161, cited in Allen, *The Naturalist in Britain*, 174, and Gooday, 'Nature' in the Laboratory', 317). When a wider variety of sources from other regions are considered, as Allen does in his later work, it becomes apparent that such pessimism was not necessarily universal. (Allen, 'On Parallel Lines'.)

¹⁹⁷ *The Naturalist* 1 (1875-6), 1.

Chapter 6: Discussion

This final chapter consists of two distinct parts. The first brings together a number of issues that span all of the chapters above, largely concerning the construction of professional identities. I return to Miall's criticism of field clubs, and taking into consideration the issues explored since I presented them in chapter 1, I offer an interpretation of his attitude, and contrast his professionalising tactics with those of Henry Clifton Sorby. The first section, then, is a further exploration of one of the stories I began in earlier chapters. In the second part I present my general conclusions: as well as the results of my examination of amateurs and professionals, I bring together my other central themes of science and society, field, laboratory and museum.

6.1 Miall and Sorby Revisited

I began the present work with Miall's virulent criticism of amateur practices. This criticism I have shown to be highly partisan, given the extent to which amateurs and professionals often practised in similar ways. I shall explore this further now, in a final act that will bring together the cast from chapters 4 and 5. Miall's apparently ill-informed condemnation of field clubs was part of his construction of rhetorical boundaries around his branch of professional science. These distinctions were not only between his new, laboratory-based community and the amateur field clubs, but also between laboratory and museum. Miall was establishing a professional community that was very much based around laboratory teaching; Sorby, by contrast, sought to further a professional ideal through laboratory research, and in the closing part of this section I outline his efforts to this effect. I also discuss the apparent contradiction between Sorby's amateur status and his professional ideals.

6.1.1 Standardisation of Practices

When examining the construction of a professional community, I have shown that it is essential to explore in detail the state of play within the bustling amateur community extant in the town, county or nation in question. In chapter 4 this approach bore fruit, by uncovering the extent to which amateur clubs and local learned societies lobbied for the inclusion of biology on college syllabuses, and then served to supply the fledgling departments with students and demonstrators. Miall needed to further this interaction, and to continue to enlist the clubs as an audience. Provincial men of science worked hard to

seek out and enrol legitimating audiences in field clubs, philosophical societies and other associations. Through the visible display of expertise, such audiences were crucial in the construction of authority.

Despite considerable motivational and theoretical differences across (and within) the range of groups, certain practices in common facilitated the interaction between club and college; and a mode of collaboration emerged, similar to that which Star and Griesemer have dubbed 'standardisation of methods'.¹ We should remember that nearly all the academic biologists were members of field clubs: Miall's assistants Alfred Denny and Harold Wager were active club participants at various times; Thomas Woodhead was a stalwart of the Huddersfield Naturalists, and of the Yorkshire Naturalists' Union; and in Sheffield, Denny was involved in both the microscopical society, and alongside his father-in-law Edward Birks, botany lecturer at the Sheffield Medical School, he was resident botanical consultant at the Sheffield Naturalists' Club.

Miall joined the Leeds Naturalists in 1873, proposed by William Roebuck, and over the next decade he delivered papers, sat on council, and led excursions; all of which served to encourage commonality of practice between club and college.² Miall was elected president of the club for the 1887 to 1889 sessions, at the peak of the club's membership; and during this time he and his staff ran a well-attended monthly class in practical microscopy for the club at the Leeds School of Medicine. These sessions included subject matter similar to the Yorkshire College syllabus, such as embryology and detailed structural morphology. The Leeds Naturalists' council felt it proper to congratulate the club "on the marked increase of practical natural history work among its members, both in the field *and the laboratory*".³ Both club members and college staff enthusiastically engaged in the study of life histories, and they continued to collaborate on these projects beyond Miall's presidency. In 1897, Miall proposed "that out of the members of the Local Societies situated within convenient distance of the city of Leeds, where I have my laboratory, twelve should agree to assemble [in the Yorkshire College laboratory] and take up the [life-history] work I have proposed".⁴ Type-studies served a similar purpose as life-histories. In 1895, the club announced that "the study of well-selected types and practical demonstrations have been substituted for the foregoing [wider study], and during the next season, under the very able guidance of Messrs. H. Wager and N. Walker, a series of botanical types will

¹ Star and Griesemer, 'Institutional Ecology, 'Translations' and Boundary Objects'. I outlined their model in chapter 1.

² LNC, *Syllabus of Lectures and Excursions*.

³ LNC, *Minutes* (1887), unpag. Emphasis added.

⁴ Miall, 'The Study of Life-Histories', 107.

be studied”.⁵ Wager and Walker were staff of the college, offering Huxleyan teaching-by-types to the club members.

Miall and the other biologists were seeking to enrol naturalists, under their terms, in their space. They encouraged amateurs to subscribe to the ‘new biology’, with the laboratory as the centre of expertise. The clubs, of course, were not inert, spellbound by the grand professoriate. The élite within the societies were keen to offer their members advanced education and the opportunity for detailed research. In many cases, the clubs had already been following modes of study such as life histories, which approaches were then reinforced through collaboration with the college faculty. The professionals’ desire to enlist the support and co-operation of the clubs coincided with the club leaders’ amateurising goals; a happy consonance that was facilitated by this standardisation of methods, this commonality of practices.

6.1.2 Boundary Construction

All this serves to render Miall’s criticism of club practice even more perplexing. And yet critical he was. “There are those who doubt the utility, in a scientific point of view, of amateur collecting; for instance, our friend Mr Miall”, who, reported Franklyn Parsons bitterly in *The Naturalist*, “considers that we have had enough, and more than enough, of unintelligent collection”.⁶ Admittedly, this was in 1877, perhaps before Miall had the opportunity to rectify the situation. But in the new century he still argued that the transactions of natural history societies “are hardly ever worth the paper they are printed on”, and that “long and dry, wretchedly delivered papers [...] form the staple of the average literary or scientific society”.⁷ He denounced papers read at naturalists’ meetings, for “upon the listeners the effect is melancholy beyond the power of words to describe”.⁸ For this reason, “the express ground of want of sympathy + agreement with the Union’s work”, he declined the presidency of the Yorkshire Naturalists’ Union.⁹

Miall was fully aware of the vitality of clubs and societies in Yorkshire; indeed it was this tradition that he tapped into to establish professional biology in the county. While involved in amateur activities on the one side, he was proclaiming the difference between field club and college laboratory on the other. Why, then, this apparent *volte-face*? Baker and Bayliss – whose call for a close analysis of the activities of Yorkshire natural history clubs I have attempted to answer – posit that Miall was “perhaps too busy to be anything

⁵ LNC, *Minutes* (1895).

⁶ Parsons, ‘Hints on Natural History Collecting’, 69.

⁷ Miall, *House, Garden and Field*, 81; YCS, *Gryphon* 3 (1900), 55.

⁸ Miall, *House, Garden and Field*, 81.

other than a figure-head" of the Leeds Naturalists.¹⁰ Rather, I would suggest that from the 1870s onwards, Miall was constructing rhetorical boundaries between his professional biology and other groups. Using Gieryn's cartographic analogy, Miall's biology was bordered on one side by amateurs, and on the other by museum professionals.¹¹

Miall worked hard to establish and then police these borders. He needed the field clubs, but he also needed to differentiate himself from them. Hence Miall, whose first major publication was a floristic list, was later so critical of this mode of study;¹² Miall, who had himself delivered field lectures, damned such presentations; Miall, who had given papers at naturalists' meetings, criticised them; and Miall, himself a president of a field club, reprimanded field clubs. Just as metropolitan professionals such as Joseph Hooker antithetically constructed a colonial, parochial, 'amateur', so did Miall in the provinces.¹³

Miall, the curator, was similarly critical of museum practice and pedagogy. Although he believed the museum to be "a time-honoured resource in the teaching of natural history", he complained in 1897 that, "our notions as to adequate provision for [such museums] are at present distinctly narrow".¹⁴ As far as the exhibits were concerned, in 1904 he still felt that "few of our public museums are effective for the purpose of popular instruction". A museum could never be as beneficial a pedagogic tool as the field or the laboratory:

The usefulness of the museum as a means of popular instruction may be increased, but not indefinitely; it can never take the place of the class-lesson. Nature Study must rely on methods which work *by* the pupil, exercising his eyes, hands, judgement, independent observation [...] rather than on the lecture or the museum, which work *for* him, and chiefly exercise his memory.¹⁵

And of course he did "not expect great results from lectures delivered in front of the museum-cases".¹⁶

Appropriately, it was Thomas Sheppard, curator of the Hull Museum and editor of *The Naturalist*, who leapt to the defence of amateur naturalists in the face of Miall's withering attacks. "It must be remembered", retorted the irascible curator, that Miall's views were "those of a Professor of Biology and cannot be accepted as those of a field

⁹ YNU, *Memoranda for Secretary's Information*, unpag.

¹⁰ Baker and Bayliss, 'The Amateur and Professional Scientist', 144.

¹¹ Gieryn, *Cultural Boundaries of Science*, 1–35.

¹² Carrington and Miall, *The Flora of the West Riding*.

¹³ Endersby, 'Putting Plants in their Place'.

¹⁴ Miall, *House, Garden and Field*, 287; *Thirty Years of Teaching*, 139.

¹⁵ Miall, *Thirty Years of Teaching*, 290, 292. Original emphasis.

¹⁶ Miall, *House, Garden and Field*, 291.

naturalist.”¹⁷ Miall was not the only life science practitioner constructing a professional identity. Sheppard, in common with other curators, was also seeking to secure his institution as the authoritative space for life science. It was often the case in natural history, wrote Sheppard, that only “a careful study at the museum” would suffice.¹⁸ Sheppard crafted the museum as the hegemonic pedagogical site; others presented the ‘new museum’ as a research centre; and still other curators formed the Museums Association in order to elevate the status of the keeper. Boundary construction was not confined to laboratory biologists. Just as Miall was critical of amateurs, so too was William White at the Ruskin Museum:

It may, indeed, be doubted whether private individuals are, at all generally, capable of exercising discretion in their collecting, with sufficient judgement and authority, unless really better experts than they supposed themselves to be, to claim any right to public attention; and in the majority of cases we know that there is most certainly, among amateurs, an equal lack of both knowledge and opportunity.¹⁹

And the BAAS museums committee blamed the haphazard character of local museums on “the consequence of trusting to amateur collecting and of the want of a definite ideal to work up to”.²⁰

Miall, despite his commitment to the new museum idea, and despite his long career in the Leeds Museum, still contrasted his professional identity with that of the curator; partially, no doubt, in response to the professionalising tactics of those potential rivals in museums. Miall defined his laboratory life science against amateurs on one side, and museum professionals on the other. And yet, as we have seen, curators were also seeking to establish the authority of professional men of science in Victorian society; and, as epitomised by Sorby, so were amateurs.

6.1.3 Sorby and the Endowment of Research

Henry Sorby, who has appeared periodically in this thesis since chapter 2, was apparently the archetypal gentleman amateur. And yet he, too, contributed to the construction of professional science, both through his involvement with Firth College in Sheffield and through his contribution to the campaign for the endowment of research. On the very first board of trustees for the college in 1879, he was elected vice-president in 1881, and, upon the death of Mark Firth the following year, Sorby became president. He sat on almost all

¹⁷ Sheppard, ‘Nature Study’, 25.

¹⁸ Sheppard, ‘Natural History as a Hobby’, 4.

¹⁹ White, ‘The Individuality of Museums’, 118–9.

²⁰ BAAS, *Report 57* (1887), 124.

of the college committees; he chaired the technical committee for its first six years; he regularly subscribed to the various appeals for more funds; and in 1903 he bought a sizeable plot of land for college building work. He was actively involved in running the college, attended innumerable administrative meetings, and gave regular lectures on a variety of subjects.

Sorby was thereby directly involved in the construction of a professional academic science community in Sheffield. He also contributed on a national scale, through his involvement in the endowment for research movement. In particular, Sorby contributed to the *Essays on the Endowment of Research* (1876). This volume was a rare united rallying cry of the Oxford wing of a disparate movement pushing for more financial backing of pure research, and for public recognition of science, led by the X-Club in London, uneasily wed with a group of university reformers in Oxford led by C.E. Appleton, don and editor of the *Academy*.²¹ The movement had its roots in the fear of the decline of British science, relative to that of continental Europe; and it thrived in the wake of the Royal Commission on Scientific Instruction (the 'Devonshire Commission', 1870 to 1875).

The essayists presented various arguments for governmental and university support of scientific investigation. The researcher, argued Sorby in the collection, should not be hindered by another vocation, even teaching. Pedagogy was valuable, he wrote, but scientific investigation should be unencumbered, for "original research can be carried on in a satisfactory manner only when an investigator has an abundance of time for work, and freedom from those cares which interfere with reflection". His dedication to the diffusion of science had been displayed in his work at the People's College, the Church of England Institute, the Sheffield Mechanics' Institution and the Sheffield Lit and Phil. And yet Sorby made it clear that although he valued teaching, *discoveries* were the hard currency. Other financial support was therefore vital. Sorby continued, "I do not for one moment wish it to be thought that I do not value and appreciate a useful and active life of every kind. All that I contend for is that, for the general advantage of a civilised community, it is essential that there should also be some who can devote themselves completely and exclusively to the discovery of new truths."²² Even writing for a public audience was obstructive to effective research. Sorby was working to differentiate professional science production from its dissemination.

²¹ Appleton, *Essays on the Endowment of Research*; Engel, *From Clergyman to Don*, 129–155; Macleod, 'The Support of Victorian Science'. The other contributors to the volume were the Oxford dons Mark Pattison, Henry Nettleship, Thomas Cheyne, James Cotton and Archibald Sayce, and the Kew botanist William T. Thiselton-Dyer. (Foster, *Alumni Oxonienses*.)

²² Sorby, 'Unencumbered Research', 150, 171.

The difference between Sorby's situation and that of most of his fellow essayists, was that the Oxford researchers were fighting for a share of existing endowments, whereas Sorby was contemplating how to generate endowments, and how to go about endowing positions himself. Although he did not supply details of a governmental scheme by which research should be funded, he offered an alternative, creating a non-teaching chair for research at the University of Sheffield, through the Royal Society.²³ Whereas Berman blames gentlemen amateurs for inhibiting the growth of a professional community, Sorby's case shows that it was possible for them to propagate and subscribe to a professional ideal.²⁴ Sorby valued research where Miall advocated teaching, but they were both seeking to further professional science.

6.2 Conclusions

We have seen, then, the extent to which laboratory biologist, museum curator and gentleman amateur alike sought to construct distinct professional communities, often in contrast to each other, and despite the considerable interaction between these groups. Issues concerning amateurs and professionals, however, comprise only one sector of a wider range of issues with which I have engaged. Over the last four chapters, we have gained insights not only into issues concerning amateurs and professionals; but also into the role of science in civic society, and the endurance of different sites for natural history and biology. The emphasis on the study of the space of science has proved fruitful; I have reiterated the ways in which the architecture of scientific institutions shaped disciplines, and I have touched upon the significance of the physical environment of the lecture room, upon lecturers and audiences alike.

Although this has been a local study in one area of science – and notwithstanding my emphasis on disciplinary and geographic contingency – many of the conclusions I draw can be applied to other regions and disciplines. The extent to which natural history was embedded in civic culture also applies to, say, chemistry (we need think only of the elaborate chemical lectures at the lit and phils); and a similar configuration of amateurs and professionals is evident in far-off California.²⁵ As with any project, I left a number of areas for future exploration. A nuanced macro-account of professionals and amateurs in this period is sorely needed. Expanding a study such as this to a national scale would provide

²³ Higham, *A Very Scientific Gentleman*, 141–147; Edyvean, 'Henry Clifton Sorby's Role'.

²⁴ Berman, 'Hegemony' and the Amateur Tradition'.

²⁵ Benson, 'Natural History and Biology'.

an invaluable tool for the reassessment of life science in Victorian Britain. I have presented only the tip of the iceberg of science in the industrial city: institutions such as YMCAs, Athenaeums and church-run institutes cry out for further study. A further exploration of the role of 'popularisation' in the amateur-professional matrix is also wanted.

6.2.1 Field, Lab and Museum

What has been striking from the outset is the sheer volume and diversity of life science-related activities in later Victorian Yorkshire. In a study of just one county over three decades, there were almost too many even to list. Glancing through the appendices below gives a glimpse of this medley of practices, individuals and institutions. From my twin focus on practice and place, coincident stories of variety and commonality between spaces have emerged.

Although my chapters are ostensibly concerned with lecture hall, museum, laboratory and field, respectively, it is apparent that this structure serves a heuristic purpose only. Within each of these institutions, naturalists, biologists and curators practised life science in a variety of spaces. Philosophical societies shared their space with libraries (and baths); college professors taught in museums and ran field courses; lecture theatres and laboratories were to be found in museums; and field clubs were based in the built environment. (In the wings throughout this drama have been libraries, botanic gardens and zoos; and their role in civic life deserves to be studied in greater depth.²⁶) Within these heterogeneous spaces, society, museum, college and field club each exhibited a range of practices, for a variety of reasons. Lecturers and curators played to a number of audiences, from schoolchild to mayor to artisan. Biologists appealed to different markets for support, principally medical education, industry, teacher training or campaigns university status. Club members ventured into the field for many diverse motives: for their health, to flirt, to picnic or to further the production of life science. These activities were often indistinguishable from other cultural practices: art in museums, sport in the field, theatre in the lecture hall. Audiences responded to lectures, classes and exhibitions in their own ways, utilising such knowledge for their own reasons.

Such variety notwithstanding, the sites for life science exhibited many characteristics in common. I discussed above the extent to which club and college displayed similar modes of study; all over Yorkshire, similar practices were exhibited in many different spaces for science. As practitioners moved between the different sites for life science, they took their techniques and approaches with them. *Conversaciones*, as

discussed below, were evident in all the sites studied herein. Technologies of display – the prime example of which, in this era, was the magic lantern – spread from the philosophical society hall into classroom, club meeting and college lecture room. Miall took a technique that had been emblematic of entertainment and employed it as a tool for education. Periodical exchange and specimen loan schemes linked society, museum and college; binding them together in a common web that spread from Yorkshire to other provinces, to the capital, and to the colonies.

Membership lists reveal the massive overlaps in personnel between different institutions. Take Miall, philosophical society curator, college lecturer and field club president; or Seth Mosley, active in the Huddersfield Naturalists, private dealer and technical college keeper. Professors taught curators, who helped field clubs with their collections, who in turn provided the colleges with assistants; a dynamic cycle of training, dissemination and appropriation. Only when a combination of biographical, prosopographical and institutional histories are integrated does the complexity of this web of practitioners become apparent.

This study, then, has demonstrated the danger in attributing a distinct or homogeneous set of practices to any site for natural history or biology. I have also shown the extent to which other sites for life science continued to be important, despite the purported rise of the laboratory in the late nineteenth century. Field trips may have declined in college biology teaching over this period; but for research projects such as plant ecology and biogeographical mapping, the field remained a vital site. There can be no doubt about the durability of natural history traditions: they endured into the twentieth century, albeit with their centres of authority shifted and their goals transformed. It is clear that few amateurs turned away from natural history, which remained popular both as a pastime and as a scientific field. The extent to which natural history was a hobby, part of the rise of leisure, has been reinforced in this thesis. For many, it was as much a sport as it was a science, and this broad cultural appeal fuelled the persistence of natural history into the twentieth century.

Museum spaces also retained their prominence through the turn of the century, although with different curating objectives – public and educational rather than private or commercial. From the hegemonic research site for natural history at the beginning of the century, curators transformed their museums into vital spaces for elementary education through intra- and extra-mural school schemes. Their trajectory thereby described the

²⁶ Kohlstedt, 'Reflections on Zoo History'; Lustig, 'Cultivating Knowledge'; Ritvo, 'The Order of Nature'.

reverse of the colleges'; which began with basic education, and by the time they were awarded charters shortly after the turn of the century, offered only advanced education. The sheer size of the visitor figures speak for themselves: museums remained an important site for natural history consumption and display.

The philosophical society lecture hall, meanwhile, gradually grew emptier, whether because of competition from other forms of civic display, or because of the 'popularisation' of their lecture content. Lit and phils in the North, nonetheless, survived much longer into the nineteenth century than their coverage by historians to date implies. And even their dwindling audiences should not be interpreted as the decline of the lecture in general: mechanics' institutes remained vibrant, and much of the biology taught in colleges was in the lecture hall. Edwardian life science, although markedly different, exhibited as diverse a range of practices and sites as mid-Victorian natural history and biology.

6.2.2 Science and Society

Over the course of this thesis, thanks to close attention to the ecology of civic institutions, it has become clear how far life science was enmeshed within the complex of cultural and educational institutions that made up middle-class civic life. The groups I have studied operated alongside, and interconnected with, the wide range of voluntary associations that were central to urban culture. Only when these interconnections have been studied in detail will we be able to appreciate fully the contingent character of life science practices.

Perhaps the most colourful illustration of this integration was the exhibition or *conversazione*, where scientific apparatus and natural specimens were to be found alongside the products of literature and fine and industrial art. This practice was common to all the sites of life science studied here, as it was to civic life in general. Naturalists worked long and hard upon the display of their collections in civic forums, and natural history relied upon this culture of display for its continued popularity. The exhibition was not merely the public face of life science: it was an integral part of practice. Many of the practises detailed herein were carried out in this way, under the public gaze. Although not to the same extent as philanthropic acts, cultural activity was still very much part of civic duty, part of the Gladstonian 'rule of ought': a good upstanding citizen needed to be *seen* to be participating in civic activities; to be visibly present at concerts, in museums, at literary and philosophical society meetings.²⁷ Middle-class men were bound to personify idealised notions of citizenship: rational, philanthropic, self-improving and valuing knowledge in the

arts and sciences. Just as science had been part of the coffee-house culture and the culture of display in the eighteenth century, so in the nineteenth century, through lectures and museums and exhibitions, natural history operated in the public sphere. And while natural history proclaimed its prominence in bourgeois society through grand buildings, so the middle-class élite displayed themselves – or their likenesses – within sites for science. Museums were adorned with busts of local dignitaries, staring sombrely down at the visitors and exhibits; the Yorkshire College bore the name of Baines, literally carved in stone.

Situating science within Victorian civic life in this way has thrown up two general conclusions. Firstly, that the middle classes perpetuated the popularity and growth of natural history in the late nineteenth century. The field club ‘boom’ was fuelled by a mass mobilisation of bourgeois naturalists filling their leisure hours with a healthy, morally acceptable outdoor pursuit; the middle classes populated the philosophical societies and mechanics’ institutes, providing audiences for local and national lecturers; they filled the lecture halls of the civic colleges and they flocked to museums. This much is relatively obvious, and has been noted before. My second, stronger argument, is the inverse of this: while the middle classes propagated natural history, so life science was part of the consolidation of middle-class identity and cultural authority.

In the sections above I have re-visited Miall’s manipulation of these middle-class networks in his efforts to establish professional biology in Yorkshire, and in chapter 4 I detailed similar efforts on the parts of Denny and Woodhead. Industrial dissent, so crucial to educational schemes across the country, was particularly important in the West Riding.²⁸ The Congregationalist élite, however, were using Miall as much as he was using them. They were keen, we can infer, to have their members in positions of authority – even lapsed dissenters such as Miall – and would gain reflected kudos from his position. Like the Baineses and the Salts, the Mialls assured their prominence in civic life through prominent roles within cultural and educational associations. This was one of a range of ways that the middle-class élite used life science to assert cultural authority within Yorkshire’s towns. Natural history, and particularly the display thereof, was a symbolic resource, utilised by the civic élite to promote their own town within the county, and their own social class within the town. In museums, for example, the donor retained symbolic ownership of the specimen; and extensive acquisition networks demonstrate how important a well-stocked civic museum was to the urban élite. The middle classes were

²⁷ Briggs, *A Social History of England*, 266–291.

gaining in wealth and status: they wanted this symbolic capital to accompany them. Lectures, museums, libraries and galleries, Meller argues, comprised “a social force to unite the burgeoning middle classes”, and to civilise the cities.²⁹ Hill claims that museums helped to create and then to stabilise middle-class identity; I have consolidated her argument, and extended it to other sites for science.³⁰ Through membership of clubs and societies, and through the educational schemes of various institutions, they asserted bourgeois ideals and sought to impose them on other sectors of society.

Many scientific practices, like other middle-class cultural forms and voluntary association activities, can be seen as manifestations of the bourgeois attempts to dominate urban society.³¹ As Thackray writes, voluntary associations were in the business of the “social legitimation of marginal men”.³² Middle-class authority was neither ubiquitous, homogeneous nor uncontested. The minority middling sort, and specific groups within it, were constantly reasserting their presence, their taste and their authority. Towns were the source of social power for the *bourgeoisie*; they had to wait longer for any significant presence on the national arena. Civic institutions and buildings consolidated their identity. This thesis, then, in Thackray’s words, is concerned with “the adoption of science as the mode of cultural self-expression by a new [or, by my era, maturing] social class”.³³ The assertion of middle-class identity was subject to constant re-negotiation, and the efforts of those detailed herein to control and populate the sites for natural history aided this quest for hegemony.

The middle classes controlled life science institutions during the mid-century corporation parsimony, when civic pride prompted civic worthies to fund cultural enterprises. As Hill and Meller show, and I corroborate, they retained this control after the late-century municipalisation of these institutions.³⁴ The *haute bourgeoisie* still held the purse strings, albeit through corporation committees rather than through subscription lists. The shift in environment from the voluntary realm to the public sphere altered the character of middle-class control, but it did little to lessen this grip. Access policies, while less explicit, were still in play. The dissenting, liberal public sphere of urban Yorkshire shaped the

²⁸ Desmond, ‘Redefining the X Axis’.

²⁹ Meller, *Leisure and the Changing City*, 40.

³⁰ Hill, ‘Municipal Museums in the North-West’.

³¹ Green, ‘In Search of Bourgeois Civilisation’; Gunn, ‘The ‘Failure’ of the Victorian Middle Class’; Hill, ‘Thoroughly Embued with the Spirit of Ancient Greece’; Morris, ‘The Middle Class and British Towns’.

³² Thackray, ‘Natural Knowledge in Cultural Context’, 678.

³³ Thackray, ‘Natural Knowledge in Cultural Context’, 678.

³⁴ Hill, ‘Municipal Museums in the North-West’; Meller, *Leisure and the Changing City*, 65–71.

practices and place of life science in the county, which in turn was an integral part of civic culture.

6.2.3 Amateurs and Professionals

Finally, to return to my ongoing discussion of the contemporaneous construction of amateur and professional identities. Already in this chapter I have explored how different groups sought professional status. I have presented professionalisation as a set of occupational strategies that serve to construct a particular kind of *élite*, in contrast with a number of other groups. The establishment of academic posts did not necessarily entail professionalisation; but in Yorkshire the two endeavours coincided. The establishment of biology departments in urban Yorkshire in the 1870s and 80s was one important step in the construction of a professional identity, rather than its culmination: the springboard for professionalisation, perhaps. Miall built upon his lit and phil lecturing career, which brought him authority and county-wide audiences; and once in position at the Yorkshire College, he established a number of imbricated privileges for other biologists in Yorkshire. He worked to secure status, positions, security, opportunities for advancement, and career structures for laboratory biologists. In short, the establishment of an exclusive expert *élite* of middle-class men. As well as courses and salaried positions, qualifications were an important part of this establishment. Woodhead and Smith were among the first of the Yorkshire biologists to obtain Ph.D.s. Significantly, however, they both had to travel to the continent for their training (the University of Munich awarded Smith a doctorate in 1894, and Woodhead gained his from Zurich in 1906). Miall had to content himself with an honorary doctorate from the new University of Leeds in 1904 (the only degree he held). Steadily, the staff of the colleges became more qualified.³⁵

Professionalisation should not be treated as a historiographical meta-narrative: the construction of professional identities was a fragmented, historically and geographically contingent endeavour. Miall staked out his territory according to local resources, utilising the Congregationalist network and drawing upon civic pride. The growth of a new professional life science community in urban Yorkshire had been facilitated by the support of lit and phil audiences, amateur groups, nonconformist networks, and gentleman amateurs such as Sorby. Despite this, Miall presented an identity in opposition to a particular type of amateur. To secure an authoritative position in civic life, he stressed the novelty of his enterprise, advocating the 'new' biology of Huxley, while still offering

³⁵ [Woodhead], 'William Gardner Smith'; Barker, 'The Educational Contributions of T.W. Woodhead'; Baker and Bayliss, 'Louis Compton Miall'.

courses in natural history. Huxley saw the chance to export his new biology to the North; Miall saw a key patron and a pedagogical scheme that he could appropriate in order to fashion a professional identity. To a considerable degree, Miall applied the same methods in his teaching and research as Huxley; and in contrast to the situation in London and Cambridge, where Huxleyan ideals were applied to existing departments, Miall and Denny could build pedagogical and research schemes from scratch. The very construction of 'biology', as advocated by Huxley and others, was part and parcel of the movement to establish professional science. Zoology and botany were brought together not only to facilitate the study of life in all its forms, but also to establish a novel area that new professionals could colonise. Discipline formation and professionalisation go hand in hand; as well as studying the construction of professional science in the local, geographical context, we should be aware of the differences *between* the sciences.

Elsewhere in the county, professional museum curators presented the museum as the authoritative site, either for research (through the new museum idea) or for education (through nature study). Career curators at the new municipal museums distanced themselves from amateur honoraries at philosophical society collections. The Museums Association lobbied for them, and sought to regulate the industry through standardised practice. Following the incorporation of museums, the potential audience became more inclusive, while Thomas Sheppard and others crafted a more exclusive staff. Elijah Howarth gathered around him in Sheffield a cohort of qualified, efficient assistants, building up career structures and carving out a space in the municipal structure for his institution. Curators, too, tapped the rich vein of civic pride that ran through urban Yorkshire.

The much-maligned amateur, from humble field club member to élite researcher such as Sorby, played an important role in the construction of professional identities. Meanwhile, there were those among their ranks who sought to effect a similar process, *amateurisation*. Just as Miall worked to secure expertise and authority within the laboratory, so amateurs in Yorkshire, conscious of the increasing prestige of the laboratory and of the practitioners therein, secured a role in the growth of knowledge and reasserted their authority over the field. In the provinces, where professionals were far more diffuse than in London or even Manchester, there were *thousands* of amateur naturalists practising in late nineteenth-century Yorkshire; dwarfing the academic biologists and their students combined. Taking advantage of this, naturalists such as William Roebuck and George Porritt wanted to ensure that the advancement of scientific knowledge was the primary aim

of their peers, engulfing or indeed eclipsing many other objectives. Like the professionals, they set up essential passage points between other practitioners and particular kinds of knowledge about a particular area. The professionalising biologists wanted to replace an out-dated identity with a new, efficient professional one; amateurs sought to replace the image of the lone naturalist collecting for aesthetic or other unsuitable ends, with a new, rigorous, collective identity.

Just as the biologists offered more advanced courses as their departments became established, so the structure of amateur life science became similarly more specialised, as their associations split into sections and ran committees. Specialisation was not confined to the academic community, and was evident in philosophical society and field club alike. And just as specialisation brought about, one might say, vertical divisions within the amateur community, so federations such as the Yorkshire Naturalists' Union, and organisational enterprises such as the BAAS Corresponding Societies Conference, instilled a tiered horizontal structure. Building on Lowe's work in this respect, I have assessed the very social structure of amateur natural history.³⁶ I am confident that upon further study of amateur naturalists' organisations in other parts of the country, and indeed the English-speaking world, similar changes will be evident in this period.³⁷ Amateurs were not lambs looking on in perplexity as the lupine professionals stole away life science. Rather, field naturalists adapted, and ran with their own pack on their own terms.

In constructing their new élites, new professionals and new amateurs alike worked to exclude women. Ladies were often in the audience at philosophical society lectures, but were rarely admitted to the inner sanctums of the societies, making do with 'associate' membership. Likewise, backstage at the museums was almost exclusively a male space, and Howarth was evidently strongly against women in curatorial posts. The laboratory biologists, although happy to teach women, were nonetheless constructing a masculine preserve. I have detailed the efforts of amateurisers to discourage flirtation and picnicking, which, they held, were the inevitable results of the presence of ladies at excursions. The relative absence of women from this thesis reflects the exclusionary efforts of professional and amateur.

The changes in the social structure and outlook of both professional and amateur brought about a transformation in their relationship. Given the wide variety of communities and practices, there were, no doubt, quarters in which amateur and

³⁶ Lowe, 'Locals and Cosmopolitans'.

³⁷ Benson, 'American Natural History and Biology'; Kohlstedt, 'The Nineteenth-Century Amateur Tradition'; Star and Griesemer, 'Institutional Ecology, 'Translations' and Boundary Objects'.

professional viewed each other with distrust and at a distance, as some previous scholarship suggests. Those groups I examined above in detail, however, exhibited a continuing collaborative relationship, in spite of Miall's vicious attacks. On the one hand, the new professionals could only construct identities, and carve out a space in Victorian urban life, with the help of amateur naturalists; and on the other, the amateurs – actively seeking new roles – welcomed academic biologists into their associations, and robed in a new identity, continued to co-operate with them into the new century. Through broad-scale surveys, the new discipline of plant ecology and nature study in schools and museums, amateur and professional worked hand in hand well into the new century.

The 'rift' between laboratory biologist and field naturalist was largely a retrospective construction by two groups: firstly, the new professionals, defining themselves against the 'fungus-hunters'; and later, those who chronicled the biologists' history. There is a seductive see-saw symmetry inherent in this historiography, in which the professionals ascend as the amateurs plummet; but this was not the case in Yorkshire. An assessment of the relationship between amateur and professional requires geographical sensitivity and an appreciation of the multiplicity of identities and practices. In tracing the history of natural history from the standpoint of amateurs *and* professionals, the members of all of these myriad groups retain agency. An account of amateurs and professionals in *fin-de-siècle* Britain must engage both the wide variety of amateur and professional practices, and the dynamic character of the continued collaboration of these multiple groups. During the last decades of Victoria's reign, both amateur and professional were redefining their roles in science and in society, often in response to each other. This has been a story of endurance and of transformation. I have shifted our historical gaze from the metropolis to a vast northern county with vibrant and varied cultures of natural history.

Appendix 1: A Biographical Survey of Naturalists in Victorian Yorkshire

This list is intended to be a guide to the text above; it is not comprehensive. Similarly, not all of the individuals listed herein appear in the text, but are included in order to demonstrate the variety of practitioners in Victorian Yorkshire. Each entry includes known details relating to: life span; town(s) of residence in the late nineteenth century; occupation(s); life science interests; pertinent family connections; education and training; those institutions with which the individual was particularly connected; significant book-length publications and journals edited; and the most helpful biographical reference known to me. Where a reference is not listed, the information was gleaned from the card catalogue compiled by David Spalding in the archives of the Sheffield Public Museum, and from files kept in the office of Derek Whiteley, natural history curator of the Sheffield Public Museum.

Abbott, James (fl. 1870s)

Leeds; chemist; biology; Leeds Naturalists' Club, demonstrator in biology at the Yorkshire College. (Donnan, 'The Leeds Naturalists' Club'.)

Allen, Alfred H. (fl. 1880s)

Sheffield; city analyst; Sheffield Naturalists' Club, taught chemistry at Firth College.

Baggaley, Joseph William (1886–1963)

Sheffield; curator; pupil assistant at the Sheffield Public Museum.

Baker, John Gilbert (1834–1920)

Thirsk; botany; Thirsk Natural History Society, Yorkshire Naturalists' Union; *North Yorkshire: Studies of its Botany, Geology, Climate and Physical Geography* (1885–1891). (DSB.)

Barber, J.M. (d. c. 1884)

Heckmondwike; natural history; Heckmondwike Naturalists' Society, Yorkshire Naturalists' Union. (Barber, 'History and Progress of the WRCNS'.)

Birks, Edward (d. 1899)

Sheffield; banker; botany; father-in-law of Alfred Denny; People's College, Sheffield, Sheffield Naturalists' Club, Sheffield Literary and Philosophical Society, Sheffield Medical School, Firth College.

Blayden, John Alfred (fl. 1884)

Sheffield; palaeontology; Sheffield Naturalists' Club, sold fossils to the Sheffield Public Museum. (*The Naturalist* (1884–5), 161.)

- Bradshaw, Charles (1860–1917)**
Sheffield; curator; geology; attended courses of the Science and Art Department in South Kensington; Sheffield Naturalists' Club, Yorkshire Naturalists' Union; assistant curator at the Sheffield Public Museum. (Riley et al., 'Sheffield City Museums'.)
- Bragge, William (fl. 1870s)**
Sheffield; alderman; Sheffield Public Museum. (Riley et al., 'Sheffield City Museums'.)
- Brierley, Haley Gordon (fl. 1880s)**
Huddersfield; photography, microscopy; Huddersfield Naturalists' Society. (Charlesworth and Ellis, *The History of a Society*.)
- Callaway, Charles (1838–1915)**
Bradford, Sheffield; curator; Bradford Philosophical Society, Sheffield Public Museum. (Riley, 'Callaway, Charles').
- Carr, Amos (c. 1829–1884)**
Sheffield; postman, boot-maker; bryology; Sheffield Naturalists' Club, donated to the Sheffield Public Museum. (Blockeel, 'The Early Bryologists of South West Yorkshire'.)
- Carter, John (c. 1825–1894)**
Keighley; nurseryman; father of John William Carter; Bradford Natural History and Microscopical Society. (Desmond, *Dictionary of British and Irish Botanists*.)
- Carter, John William (1852–1920)**
Bradford; son of John Carter; Bradford Natural History and Microscopical Society. (*The Naturalist* (1921), 103–106.)
- Clark, John (1844–1896)**
Sheffield; taxidermy, conchology, entomology; donated to the Sheffield Public Museum.
- Clarke, Alfred C. (1848–1925)**
Huddersfield; consulting chemist; mycology; studied at Huddersfield Mechanics' Institute; Rastrick and Brighouse Natural History Society, Huddersfield and District Botanical Society, Huddersfield Naturalists' Society. (*The Naturalist* (1925), 79–83.)
- Clarke, William Eagle (fl. 1880s)**
Leeds; curator; ornithology; Yorkshire Naturalists' Union; with Roebuck, *Handbook of the Vertebrate Fauna of Yorkshire* (1881), co-editor of *The Naturalist*. (Allen, *The Naturalist in Britain*.)
- Cole, Edwin Maule (fl. 1880s)**
Geology; *Geological Rambles in Yorkshire* (1883). (Cole, Letter to William Denison Roebuck.)

Crossland, Charles (1844–1916)

Halifax; butcher; ecology, mycology; Halifax Scientific Society; with William Crump, *Flora of Halifax* (1904). (Sheppard, 'C. Crossland'.)

Crowther, Henry (1848–1937)

Leeds; curator; conchology; lecturer in botany at the Leeds Mechanics Institute, curator of the Leeds Philosophical and Literary Society Museum, founder member of the Conchological Society. (*Who Was Who*.)

Crump, William Bunting (1868–1950)

Halifax; teacher, cinema proprietor; ecology; with Charles Crossland, *Flora of Halifax* (1904), edited the *Halifax Naturalist*. (*The Naturalist* (1950), 68–70.)

Dallinger, William Henry (1842–1909)¹

Sheffield; Methodist minister; microscopy; Firth College, People's College, Yorkshire Naturalists' Union. (Haas, 'The Reverend Dr William Henry Dallinger'.)

Denny, Alfred (fl. 1880s–1920s)

Leeds, Sheffield; lecturer; entomology; son of Henry Denny, son-in-law of Edward Birks; Leeds Philosophical and Literary Society Museum, Firth College; with Miall, *The Structure and Life-History of the Cockroach* (1886). (Chapman, *The Story of a Modern University*.)

Denny, Henry (1803–1871)

Leeds; curator; father of Alfred Denny; Leeds Philosophical and Literary Society Museum. (Brears and Davis, *Treasures for the People*.)

Doncaster, Leonard (1877–1920)

Abbeydale, Liverpool; ornithology; studied at Kings Colleges, Cambridge; Derby Professor of Zoology, Liverpool. (Doncaster, *Diaries*.)

Eden, Horatia K. F. (1846–1945)

Ecclesfield; editor; natural history; daughter of Margaret Gatty; edited *Aunt Judy's Magazine*; donated Gatty's collection to the Sheffield Public Museum. (Maxwell, *Mrs Gatty and Mrs Ewing*.)

Ewing, Juliana (1841–1885)

Ecclesfield; writer; natural history; daughter of Margaret Gatty; edited *Aunt Judy's Magazine*. (Maxwell, *Mrs Gatty and Mrs Ewing*.)

Firth, John (d. 1885)

Heckmondwike, Bradford; Clayton West Naturalists' Society, Bradford Natural History and Microscopical Society. (Maltby and Winter, *Fifty Years of Local Science*.)

Fowler, William Weekes (1835–1912)

Winterton, Lincolnshire; cleric; mycology; Yorkshire Naturalists' Union. (*The Naturalist* (1912), 121–123.)

¹ I am grateful to Dr Jack Haas and Professor James Strick for biographical information concerning Dallinger.

- Gatty, Margaret (1809–1873)**
Ecclesfield; writer; phycology; mother of Juliana Ewing and Horatia Eden; *History of British Seaweeds* (1863). (Sheffield, *Revealing New Worlds*.)
- Gibbs, Thomas (1865–1919)**
Sheffield; mycology, lepidoptery, conchology; collections now in the Sheffield Public Museum. (*The Naturalist* (1919), 177–180.)
- Green, Alexander Henry (1832–1897)**
Leeds; professor; geology; studied at Caius College, Cambridge; Yorkshire Naturalists' Union, Geological Survey, Yorkshire College, Oxford University. ([Alfred Harker], 'Alexander Henry Green'.)
- Hall, Albert Ernest (fl. 1880s)**
Sheffield; entomologist; Sheffield Naturalists' Club (Hall, Entomological Diary.)
- Hewetson, H. Bendelack (d.1899)**
Leeds; surgeon; Leeds Naturalists' Club.
- Hick, Thomas (1840–1896)²**
Leeds, Bradford; mill-worker, teacher, lecturer; botany; attended South Kensington Summer course, BSc (London); Leeds Naturalists' Club, Leeds Mechanics' Institute, Bradford Mechanics' Institute, Owen's College, Manchester. (Cash, 'Thomas Hick'.)
- Hicks, William (1850–1934)**
Sheffield; physicist; microscopy; attended St John's College, Cambridge, Cavendish Laboratory; Sheffield Literary and Philosophical Society, principal of Firth College. (Milner, 'William Mitchinson Hicks'.)
- Hime, Thomas Whiteside (fl. 1880s)**
Bradford, Sheffield; Sheffield Literary and Philosophical Society. (Hime, Letters to Henry Clifton Sorby.)
- Hobkirk, Charles P. (1837–1902)**
Huddersfield, Dewsbury; banker; bryology; Yorkshire Naturalists' Union; *Huddersfield: Its History and Natural History* (1859), *Synopsis of British Mosses* (1873), co-edited *The Naturalist*. (Anon., 'Charles P. Hobkirk'.)
- Holgate, Benjamin (1838–1915)**
Leeds; engineer; geology; Leeds Naturalists' Club. (Sheppard, 'Benjamin Holgate'.)
- Howarth, Elijah (1854–1939)**
Sheffield; curator; Sheffield Public Museum. (Riley et al., 'Sheffield City Museums'.)
- Jefferson, Samuel (c. 1839–1919)**
Leeds; poet, lecturer; Leeds Naturalists' Club; *Sonnets on Nature and Science* (1886). (Donnan, 'The Leeds Naturalists' Club'.)

² I am grateful to Dr Bernard Thomason for biographical information and references concerning Hick.

Kearton, Richard (1862–1928)

Swaledale; photographer, writer, lecturer; Bradford Philosophical Society; with Cherry Kearton, *With Nature and a Camera, Being the Adventures and Observations of a Field Naturalist and an Animal Photographer* (1902). (*Who Was Who*.)

Keeping, Walter (1854–1888)

York; professor, curator; geology; son of Henry Keeping, curator of the Sedgwick Museum; studied at Christ's College Cambridge; University College, Wales, York Museum. (Pyrah, *The History of the Yorkshire Museum*.)

Kendall, Percy (fl. 1890s)

Leeds; professor; geology; Yorkshire College, Yorkshire Naturalists' Union. (Shimmin, *The University of Leeds*.)

King, T.S. (fl. 1870s)

Sheffield; cleric; Sheffield Naturalists' Club, Sheffield Microscopical Society.

Lees, Frederick Arnold (1847–1921)

Leeds; physician; botany; Botanical Record Club, Yorkshire Naturalists' Union; *Flora of West Yorkshire* (1888). (Anon., 'F. Arnold Lees'.)

Lister, Thomas (d. 1882)

Barnsley; Barnsley Naturalists' and Scientific Society.

Marnock, Robert (1800–1889)

Wakefield, London; landscape gardener; Bretton Hall, Wakefield, Sheffield Botanic Gardens, designed Weston Park, Sheffield; edited *Floricultural Magazine*. (Desmond, *Dictionary of British and Irish Botanists*.)

Massee, George Edward (1850–1917)

Scarborough; mycology; attended York School of Art; studied at the University of Cambridge (allegedly sent down for throwing a professor in the Cam); Scarborough Field Club, Yorkshire Naturalists' Union, Kew; *Diseases of Cultivated Plants and Trees* (1910). ([Crowther], 'George Massee'.)

Miall, Louis Compton (1842–1921)

Leeds; professor; entomology; father-in-law of Harold Wager; attended Silicoates School, Wakefield; Bradford Philosophical Society, Leeds Philosophical and Literary Society, Leeds Naturalists' Club, Yorkshire College; with Alfred Denny, *The Structure and Life-History of the Cockroach* (1886). (Baker and Bayliss, 'Louis Compton Miall'.)

Moore, Henry (1845–1924)

Rotherham; curator; Clifton Park Museum, Sheffield Microscopical Society. (*The Naturalist* (1924), 144.)

Mosley, Charles (1875–1933)

Lockwood; printer, curator; son of Seth Lister Mosley; Tolson Museum, Wakefield Museum. (Desmond, *Dictionary of British and Irish Botanists*.)

Mosley, Frederick Ormond (fl. 1910s)

Huddersfield, Reading; ornithology; son of Seth Lister Mosley; Huddersfield Technical College, University College, Reading; with Seth Lister Mosley, *An Account of the Birds of the Huddersfield District* (1915). (Davies, 'The Making of a Municipal Museum'.)

Mosley, Seth Lister (1848–1929)

Huddersfield; painter, curator; ornithology, lepidoptery; father of Charles and Frederick Mosley; studied at the Huddersfield Mechanics' Institute; Beaumont Park Museum, Huddersfield Technical College, Tolson Museum, Huddersfield Naturalists' Society; co-edited the *Young Naturalist*, the *Naturalists' Journal*. (Davies, 'The Making of a Municipal Museum'.)

Moss, Charles Edward (1870–1930)

Halifax, Cambridge, Johannesburg; teacher, professor; ecology; trained at Yorkshire College; Halifax Scientific Society, Yorkshire Naturalists' Union, curator of Cambridge University Herbarium, professor of botany in Johannesburg; ([Crump], 'Charles Edward Moss'.)

Needham, James (1849–1913)

Hebden Bridge; iron-moulder; mycology, bryology; Hebden Bridge Co-operative Society, Hebden Bridge Literary and Scientific Society, Halifax Scientific Society, British Mycological Society. (Crossland, 'James Needham'.)

Nelson, William (1835–1906)

Leeds; carrier; conchology; Conchological Society. (Roebuck, 'William Nelson'.)

Parsons, Henry Franklin (1846–1913)

Goole; physician; bryology. (Blockeel, 'The Early Bryologists of South West Yorkshire'.)

Platnauer, Henry Maurice (1857–1939)

York; curator, soldier; geology; studied in London; York Museum. (Pyrah, *The History of the Yorkshire Museum*.)

Porritt, George Taylor (1848–1927)

Huddersfield; wool merchant; entomology; studied at Huddersfield College; Huddersfield Naturalists' Society, Yorkshire Naturalists' Union; co-edited *The Naturalist*. ([Bayford], 'George Taylor Porritt'.)

Rankin, William Munn (1878–1951)

Skipton, Portsmouth; trained at Yorkshire College, Owen's College; lecturer at Portsmouth Technical College; with William Smith, *Geographical Distribution of Vegetation in Yorkshire* (1903). (Desmond, *Dictionary of British and Irish Botanists*.)

Reed, William (1810–1892)

York; surgeon; geology; trained at the Royal College of Surgeons; York Museum. (Pyrah, *The History of the Yorkshire Museum*.)

Roebuck, William Denison (1851–1919)

Leeds; company secretary, bookmaker; conchology, vertebrate zoology; Leeds Naturalists' Club, Yorkshire Naturalists' Union, Lincolnshire Naturalists' Union, Conchological Society; edited *The Naturalist*, with William Eagle Clarke, *A Handbook of the Vertebrate Fauna of Yorkshire* (1881). (Taylor, 'William Denison Roebuck'.)

Salt, Jonathan (1759–1815)

Sheffield; table-knife manufacturer; botany; specimens formed the basis of the Sheffield Literary and Philosophical Society collections. (Ellis, 'Mr. Jonathan Salt'.)

Seebohm, Henry (1832–1895)

Sheffield; steel manufacturer; ornithology; attended Friend's School, York; Sheffield Literary and Philosophical Society, Sheffield Naturalists' Club, Sheffield Microscopical Society, Sheffield Public Museum, Firth College, Yorkshire Naturalists' Union; *Birds of Siberia* (1901). (Odom, *Hallamshire Worthies*.)

Shackleton, Abraham (1830–1916)

Keighley; printer; bryology. (Blockeel, 'The Early Bryologists of South West Yorkshire'.)

Sheppard, Thomas (1876–1945)

Hull; curator; geology; Hull Scientific and Field Naturalists' Club, Hull Museum, Yorkshire Naturalists' Union; *Yorkshire's Contribution to Science* (1916), co-edited *The Naturalist*. (Schadla-Hall, *Tom Sheppard*.)

Simpson, Martin (1800–1892)

Wakefield, Whitby; furniture-maker, teacher, lecturer, curator; geology; studied at the University of Edinburgh; Wakefield Literary and Philosophical Society, Whitby Literary and Philosophical Society Museum. (Hemmingway, 'Martin Simpson'.)

Smith, William Gardner (1866–1928)

Leeds; lecturer; ecology; trained in Munich; brother of Thomas Smith; Yorkshire College, Yorkshire Naturalists' Union, British Ecological Society; with William Munn Rankin, *Geographical Distribution of Vegetation in Yorkshire* (1903). ([Woodhead], 'William Gardner Smith'.)

Snelgrove, Edward (1859–1934)

Sheffield; teacher; botany; Sheffield Naturalists' Club, Sheffield Microscopical Society; *Object Lessons in Botany* (1891). (Desmond, *Dictionary of British and Irish Botanists*.)

Soppitt, Henry Thomas (1858–1899)

Bradford, Halifax; entomology, mycology; conducted free botany class in Saltaire, Bradford Natural History Society. (*The Naturalist* (1899), 157–160.)

Sorby, Henry Clifton (1826–1908)

Sheffield; steel manufacturer; geology, marine biology; Sheffield Literary and Philosophical Society, Sheffield Naturalists' Club, Sheffield Microscopical Society, Yorkshire Naturalists' Union, Firth College. (Higham, *A Very Scientific Gentleman*.)

Talbot, William (d. 1882)

Wakefield; entomology, ornithology; Yorkshire Naturalists' Union. (*The Naturalist* 1882–3, 11.)

Taylor, John William (1845–1931)

Leeds; printer; Leeds Naturalists' Club, Conchological Society, Yorkshire Naturalists' Union, donated shells to the Sheffield Public Museum; *Land and Freshwater Mollusca of the British Isles* (1894–1919), edited *Quarterly Journal of Conchology*. (Wroot, 'John William Taylor'.)

Tinker, Jethro (1788–1871)

Stalybridge, Cheshire; shepherd, weaver, mill manager, shopkeeper, publican, gardener; botany, entomology; acted as umpire in pub natural history meetings, inspired formation of the Huddersfield Naturalists' Society. (Charlesworth and Ellis, *The History of a Society*.)

Vine, George Robert (1825–1893)

Sheffield; microscopic geology; Sheffield Naturalists' Club, Sheffield Microscopical Society, collection at the Sheffield Public Museum.

Waite, Edgar (b. 1866)

Leeds, Sydney; curator; ornithology; studied at Owen's College, Manchester; Leeds Philosophical and Literary Society Museum; co-editor of *The Naturalist*. (Brears, *Of Curiosities and Rare Things*.)

Waterton, Charles (1782–1865)

Wakefield; traveller, landowner; zoology, taxidermy; created a nature reserve at his estate (Walton Hall); *Wanderings in South America* (1825). (Edginton, *Charles Waterton*.)

West, William (1848–1914)

Leeds, Bradford; chemist, lecturer; phycology; father of G.S. West; Bradford Natural History Society, lectured at Bradford Technical College, Yorkshire Naturalists' Union. (*The Naturalist* (1914), 227–230, 257–260)

Woodhead, Thomas William (1863–1940)

Huddersfield; professor, curator; ecology; trained at the Yorkshire College and in Zurich; Halifax Scientific Society, Huddersfield Naturalists' Society, Huddersfield Technical College, Yorkshire Naturalists' Union, British Ecological Society, Tolson Museum; *Ecology of Woodland Plants* (1906), co-edited *The Naturalist*. (Barker, 'The Educational Contributions of T.W. Woodhead'.)

Appendix 2: Museums in Later Victorian Yorkshire¹

Sources: Addison, *The Bradford Museums, Brears and Davies, Treasures for the People, Greenwood, Art Galleries and Museums*, the *Museums Journal*, *The Naturalist* (1889), 45–51; *Report of the British Association for the Advancement of Science* 57 (1887), 100–113.

| | Est. | Society | Accommodation | Admission | Known Curators | Support | Strengths |
|---------------------------------------|-------------|---|--|-----------------------|--------------------------------|------------------------|--------------------------------------|
| Museum Isurianum, Aldborough | Before 1887 | N/A | Aldborough Manor | Free | A. S. Lawson [owner] | Private | Archaeology |
| Bradford Free Library and Art Museum | 1879 | N/A | Darley Street | Free | B. Wood | Rates | Loan from South Kensington |
| Dewsbury Museum | 1897 | N/A | Crows' Nest Mansion | Unknown | Honorary curators and trustees | Unknown | Unknown |
| Giggleswick School Museum | 1887 | Giggleswick School | Giggleswick School | Free | Rev. G. Style [headteacher] | School | Local geology |
| Halifax Museum (Belle Vue) | 1831 | Halifax Literary and Philosophical Society; to town, 1896 | From 1834, Philosophical Hall; after 1896, Belle Vue | 1d | J. W. Davis; W. B. Crump | Society/admission | Unknown |
| Davis' Museum, Halifax | Before 1887 | N/A | Chevinedge | Free (by appointment) | J. W. Davis | Private | Geology |
| Winter Garden, Harrogate | Unknown | N/A | Winter Garden | Unknown | Mr Wheatear [owner] | Private | 'Small collection' |
| Beaumont Park Museum, Huddersfield | 1880 | Huddersfield Naturalists' Society | Woodside Road | 1d | S. L. Mosley [owner] | Private | Zoology, geology economic entomology |
| Technical School Museum, Huddersfield | 1896 | Huddersfield Literary and Scientific Society | Technical School and Mechanics' Institute | 1d | A. Keen; S. L. Mosley (3 days) | Technical school/rates | Industrial art, zoology |

¹ There were also museums at Barnsley, Bradford, Brighouse, Cawthorne, Kirkleatham, Morley, Pontefract, Selby, and Shipley. Few records survive.

| Hull Museum | 1823 | Hull Literary and Philosophical Society; to town, 1900 | Various rented rooms; after 1854, Hull Royal Institution | Unknown | T. Sheppard | Rates | Antiquities, natural history |
|--|--------------|---|--|--------------|--|--------------------------|---------------------------------|
| Ilkley Museum | 1892 | Ilkley Museum and Antiquarian Society; to town, 1907 | Own building | Unknown | F. Hall [clerk of district council] | Society; rates/admission | Natural history, archaeology |
| Keighley Museum and Art Gallery | 1899 | Keighley Scientific and Literary Society; to town, 1899 | From 1899: Victoria Park Museum | Free | S. L. Mosley (3 days) | Rates | Natural history |
| Corporation Museum, Leeds | 1884 | N/A | Municipal buildings | Free | J. Yates [librarian] | Rates | Art; loan from South Kensington |
| Leeds Museum | 1822 | Leeds Philosophical and Literary Society | Philosophical Hall | 1d | H. Denny; L. C. Miall; H. Crowther | Society/admission | Unknown |
| Yorkshire College Medical Museum, Leeds | Un-known | Yorkshire College | Yorkshire College | Students | E. H. Jacob | Yorkshire College | Pathology, anatomy |
| Yorkshire College Zoological Museum, Leeds | 1875 | Yorkshire College | Yorkshire College | Students | L. C. Miall | Yorkshire College | Zoology |
| Museum of the Architectural Society, Leeds | 1882 | Leeds Architectural Society | Infirmiry buildings | Free | L. F. Hicks | Exhibitor's rents | Building appliances |
| Calvert's Museum, Leeds ('Old Museum') | 1827; 1872-4 | N/A | Commercial Street | 1s | J. Calvert Senior; J. Calvert Junior, [owners] | Private | Ornithology, entomology |
| Victoria Museum, Leeds | 1865-1880 | N/A | Beckett Street | Unknown | R. Cundall [owner] | Sales | Natural history (curiosities) |
| Malton Museum | 1827 or 1880 | Malton Field Naturalists' and Scientific Society | Yorkersgate | Free | S. Chadwick | Society | Geology, zoology |
| Dorman Memorial Museum, Middlesbrough | 1887 | To town, 1904 | Zetland Road | Unknown | W. Y. Veitch | Rates | Natural history: mostly geology |
| Richmond Museum | 1885 | Richmond Naturalists' Field Club | Castle Hill | Small charge | W. D. Benson | Society/admission | Geology, zoology |
| Ripon Museum | 1883 | Ripon Naturalists' Field Club | Park Street | 2d | B. M. Smith | Society/admission | Natural history, archaeology |

| Clifton Park Museum, Rotherham | 1893 | Rotherham Naturalists' Society | Clifton Park Mansion | Unknown | H. Moore | Rates | Art, natural history |
|------------------------------------|-----------------|---|---|-------------|--|-----------------------|--|
| Scarborough Museum | 1829 | Scarborough Philosophical and Archaeological Society | Rotunda | 3d | J. H. Phillips [honorary secretary]; by 1905, none | Society/ admission | Ornithology |
| Ruskin Museum, Sheffield | 1875 | Guild of St George | Walkley; after 1890, Meersbrook Hall | Unknown | H. Swan; G. Parker; E. Howarth | Private; rates | Unknown |
| School of Art Museum, Sheffield | <i>fl.</i> 1879 | Sheffield School of Art | Sheffield School of Art | Unknown | Unknown | Unknown | Includes some natural history |
| Weston Park Museum, Sheffield | 1875 | Sheffield Literary and Philosophical Society | Weston House; branch at High Hazels House | Free | E. Howarth | Rates | Unknown |
| Wakefield Museum | late 1880s | Wakefield Naturalists' Society | Westgate | Rarely open | W. Rushforth | Society | Natural history |
| Whitby Museum | 1823 | Whitby Literary and Philosophical Society | Rented rooms; after 1827, the Pier | 6d | M. Simpson | Society/ admission | Natural history, archaeology |
| Yorkshire Museum | 1823 | Yorkshire Philosophical Society | From 1823, Lower Ousegate; after 1827, Museum Gardens | 1s | W. Keeping; H. M. Platnauer; O. Grabham | Society/ admission | Natural history, archaeology, anthropology |

Appendix 3: Natural History Societies in Later Victorian Yorkshire

This is as comprehensive a list of nineteenth-century natural history societies in Yorkshire to my knowledge produced to date. Where known, details listed include: date of establishment; changes in title, amalgamations, affiliations; selected membership sizes; publications; meeting places. Those societies for which only the title is known (as for many pub groups) are still included, to demonstrate the sheer number and diversity of groups.¹ Further research may recover more details about these societies. I have not included geological associations. (Sources: Allen, *The Naturalist in Britain*; Britten, 'The Local Field Clubs of Great Britain', 'List of Scientific Societies'; Lowe, 'Locals and Cosmopolitans'; MacLeod, Friday and Gregor, *The Corresponding Societies of the British Association for the Advancement of Science*; Morrell and Sarjeant, 'Geological Societies'; *The Naturalist*, the *Naturalist's Journal*; Roebuck, *Salient Features*; Sheppard, *Yorkshire's Contribution to Science*; Sigsworth, 'Modern York'; *Year-Book of Scientific and Learned Societies*; Ward, 'The History of the Sorby Society'; and the card catalogue compiled by David Spalding in the Archives of the Sheffield Public Museum.)

Ackworth School Natural History Society: 70 members in 1903; *Reports*.

Barnsley Naturalists' and Scientific Society: est. 1867; originally Barnsley Naturalists' Society; 47 members in 1873; 196 members in 1884; 140 members in 1905; quarterly *Transactions*; met in the town hall.

Barnsley Natural History Society: est. 1856 (short-lived).

Berry Brow Botanical Society: est. 1891; pub group.

Beverley Field Naturalists' and Scientific Society: 80 members in 1884.

Birkby Naturalists' Society: est. 1873.

Bootham School Natural History Club: 38 members in 1905.

Bradford Children's Natural History Rambling Club: est. 1885; conducted by members of the Bradford Natural History Society.

Bradford Field Naturalists' Society: became Bradford Philosophical Society Natural History Section in 1866.

¹ This policy follows that of MacLeod, Friday and Gregor, *The Corresponding Societies of the British Association for the Advancement of Science*.

Bradford Microscopical Society: est. 1882; amalgamated with Bradford Natural Society in 1888 to become the Bradford Natural History and Microscopical Society; originally met in the Grammar School.

Bradford Natural History Society: est. 1875; affiliated with the Bradford Philosophical Society, amalgamated with Bradford Microscopical Society in 1888 to become the Bradford Natural History and Microscopical Society; 97 members in 1879; 41 members in 1884; 66 members in 1903; *Annual Reports*; met in Bradford Grammar School.

Bradford Practical Naturalists' Society: est. 1883; 148 members in 1884; the *Practical Naturalist*; based in Great Horton.

Bradford Scientific Association est 1875. affiliated with the Bradford Philosophical Society in the 1880s, linked with the Bradford Natural History and Microscopical Society; 217 members in 1903; *Bradford Scientific Journal*.

British Field Club, Huddersfield: 260 members in 1898.

Clayton West Naturalists' Society: est. 1862; 24 members in 1873; 11 members in 1903.

Cleveland Naturalists' Field Club: est. 1881, from Middlesbrough Athenaeum Field Club; 86 members in 1884; 110 members in 1905; met at the Cleveland Literary and Philosophical Hall, Middlesbrough.

Craven Naturalists' (and Scientific) Association: 98 members in 1903.

Crosshills and District Naturalists' Association: *fz.* 1904.

Darlington and Teesdale Naturalists' Field Club: 61 members in 1903.

Doncaster Microscopical and Natural History Society: est. 1880; predecessor of the Doncaster Scientific Society; 80 members in 1884; 152 members in 1905.

East End Naturalists' Society, Leeds: est. 1862; predecessor of the Leeds Naturalists' Club.

Elland Naturalists' Society: 26 members in 1903.

Frizinghall Union Jack Field Club: *fz.* 1880s.

Golcar Botanical Society: pub group.

Goole Scientific Society: est. 1875; 40 members in the late 1870s; 70 members in 1884; 30 members in 1905.

Greetland and West Vale Naturalists' Society: 21 members in 1905.

Halifax Geologists' Field Club: est. 1873 as a result of the University Extension Lectures; predecessor of the Halifax Scientific Society.

- Halifax Scientific Society:** est. 1874; 148 members in 1903; *Halifax Naturalist*; met in the Halifax Literary and Philosophical Society lecture theatre.
- Harrogate and District Naturalists' Society:** *fl.* 1886.
- Hebden Bridge Co-operative Society:** *fl.* 1885.
- Heckmondwike Naturalists' Society:** est. 1861; 36 members in 1873; 30 members in 1903.
- Holmfirth [Naturalists' Field Club]:** est. 1855.
- Holmfirth Naturalists' Society:** est. 1871.
- Honley Botanical Society:** est. 1875; pub group.
- Huddersfield and District Botanical Society:** *fl.* 1883; pub group.
- Huddersfield Floral and Horticultural Society:** *fl.* 1898–1900.
- Huddersfield Museum Field Club:** *fl.* 1860s.
- Huddersfield Naturalists' Society:** est. 1847 or 1850; amalgamated with the Huddersfield Photographic Society in 1893 to become the Huddersfield Naturalists' and Photographic Society; 160 members in 1870; 125 members in 1873; 100 members in 1884; 132 members in 1903; 158 members in 1905; *Annual Reports*, monthly *Circulars*; met in the Victoria Hall.
- Huddersfield Scientific Club:** *fl.* 1879.
- Hull Co-operative Field Naturalists' Club:** 26 members in 1905.
- Hull Field Naturalists' Society:** est. 1880; affiliated to the Hull Literary and Philosophical Society, predecessor of the Hull Scientific and Field Naturalists' Club; 46 members in 1884; met in the Hull Royal Institution.
- Hull Geological Society:** est. 1888 or 1889; 60 members in 1894, 76 members in 1903; *Transactions*; met in the Hull Royal Institution.
- Hull Junior Naturalists' Society:** *fl.* 1900–1910
- Hull Micro-Philosophical Society:** est. c. 1853; predecessor of the Hull Natural History and Microscopic Society.
- Hull (Scientific and) Field Naturalists' Club:** est. 1880; amalgamates with the Hull Scientific Society in 1886; 177 members in 1903; *Transactions*; met at the Young People's Institute.
- Hull Society of Natural Science:** est. 1904; originally the junior section of the Hull (Scientific and) Field Naturalists' Club.

- Ilkley Scientific Club:** est. 1882.
- Keighley Naturalists' Society:** est. 1869.
- Kirkheaton Botanical Society:** pub group.
- Lepton Botanical Society:** pub group.
- Leeds Conchological Club:** est. 1876; predecessor of the Conchological Society of Great Britain and Ireland.
- Leeds Co-operative Naturalists' Field Club:** 75 members in 1903.
- Leeds Natural History Society:** est. 1862; 61 members in 1873.
- Leeds Naturalists' Club and Scientific Association:** est. 1870; 30 members in 1870; 217 members in 1883; 92 members in 1903; *Annual Reports, Transactions*; met at the Philosophical Hall, Leeds.
- Lindley Mechanics' Naturalists' Society:** *fl.* 1898; affiliated with the British Field Club.
- Lindley Naturalist and Photographic Society:** 65 members in 1905.
- Liversedge Naturalists' Society:** est. 1872.
- Local Naturalists' Association:** 1879–1885; involved societies from the Bradford-Huddersfield area.
- Malton Field Naturalists' and Scientific Society:** est. 1880; 92 members in 1903; *Naturalists' Notes, North and East Yorkshire Science Notes*.
- Middlesbrough Athenaeum Field Club:** est. before 1870; predecessor of the Cleveland Naturalists' Field Club.
- Milnsbridge Botanical Society:** pub group.
- Milnsbridge Naturalists' Society:** 150 members in 1903.
- Morley Naturalists' Society:** 13 members in 1873.
- Norland Naturalists' Society:** est. 1863; 17 members in 1873.
- Ovendon Naturalists' Society:** est. 1865; 36 members in 1873.
- Priestley Club:** est. 1875; *List of Papers*; based at the Philosophical Hall, Leeds.
- Primrose Hill Botanical Society:** pub group.
- Rastrick and Brighouse Natural History Society:** *fl.* 1877.
- Ravensthorpe Naturalists' Society:** 43 members in 1903.

Richmond and North Riding Naturalists' Field Club: est. 1863 or 1865; 147 members in 1873; 75 members in 1884; based at Castle Hill Museum.

Richmond Scientific Society: *fl.* 1884.

Ripon Naturalists' Club and (Literary and) Scientific Association: est. 1882; 209 members in 1884; 61 members in 1903; met at the Park Street Museum.

Ripon Scientific Society: est. 1862; 50 members in 1873.

Ripponden Naturalists' Society: est. 1871.

Rostrick Naturalists' Society: est. 1873.

Rotherham Naturalists' Society: est. 1880; 21 members in 1903; *Records and Observations*, based at St George's Hall.

Scarborough Field Club: est. 1882.

Scarborough Field Naturalists' Society: est. 1889; 83 members in 1903.

Scarborough Ornithological Society: *fl.* 1884.

Scarborough Scientific Society: *fl.* 1884.

Scarborough Union Jack Field Club: *fl.* 1881.

Selby Naturalists' Society: est. 1875; 75 members in 1884; met at Selby Mechanic's Institute.

Sheffield and Hallamshire Field Naturalists' Society: *fl.* 1884; met at the Grey Hare Inn, High Street.

Sheffield Entomological Society: *fl.* 1857; *Entomologists Annual*.

Sheffield Entomological Club: *fl.* 1893.

Sheffield Field Naturalists' Society: est. 1862; possibly a predecessor of the Sheffield Naturalists' Club.

Sheffield Naturalists' Club: est. 1870 or 1872; 15 members in 1872; 84 members in 1889; 176 members in 1902; *Annual Reports*, met at the house of Robert Leader, and in the Sheffield Public Museum.

Sheffield Microscopical Society: est. 1877.

Shelley Botanical Society: pub group.

Slaithwaite Botanical Society: pub group.

Slaithwaite Naturalists' Society: 53 members in 1905.

South-West Yorkshire Entomological Society: est. 1902 or 1903.

Stainland Naturalists' Society: est. 1868.

Thirsk and District (Naturalists') Field Club: 63 members in 1903.

Thirsk Natural History Society: *f.l.* 1860s; possibly predecessor of the Thirsk and District Naturalists' Field Club.

Todmorden Botanical Society: est. 1852; 207 members in 1869.

University College Sheffield Students' Biological Society: est. 1897.

Wakefield (Field) Naturalists Society: est. 1858; 34 members in 1903; *Annuals Reports*.

Wakefield Scientific Society: est. 1851; became Wakefield Naturalists' and Philosophical Society in 1853.

Wakefield Naturalists' Society: est. 1871.

West Vale Naturalists' Society: 52 members in 1903.

Whitby Field Club: *f.l.* 1880s.

York and District Field Naturalists' Society: *est.* 1874; 97 members in 1905; met at the Yorkshire Museum.

York Entomological Society: est. 1862.

York School Natural History and Polytechnic Society: est. c. 1861; predecessor of the Bootham School (York) Natural History, Literary and Polytechnic Society.

Yorkshire Naturalists' Club: est. 1849; 98 members in 1873; 70 members in 1884; based in York.

Archive List

Each archive or library in which I consulted unique or limited circulation^{material} is listed, together with the institutions and individuals whose records or publications are to be found there. Details of specific items can be found in the bibliographies that follow. By 'records' I mean unpublished material relating to an institution (minute books, for example).

Bradford Central Library

Bradford Philosophical Society records and publications

Edinburgh University Library

Henry Seebohm publications

Halifax Public Library

Belle Vue Museum newspaper clippings

Halifax Literary and Philosophical Society records and publications

Huddersfield Central Library

Heckmondwike Naturalists' Society records and publications

Huddersfield Mechanics' Institution records and publications

Huddersfield Naturalist and Photographic Society publications

Huddersfield Naturalists' Society records and publications

Huddersfield Technical College records and publications

Huddersfield Technical School and Mechanics' Institution records and publications

Hull Local Studies Library (in Hull Public Library)

Hull Municipal Museum records and publications

Hull Royal Institution publications

Imperial College Archives

Thomas Henry Huxley correspondence

Leeds University Archives

Yorkshire College correspondence, records and publications

Leeds University Brotherton Library

Halifax Scientific Society publications

Hull Museum publications

Leeds Institute of Science, Art and Literature publications

Leeds Philosophical and Literary Society publications

Leeds University publications

Yorkshire Naturalists' Union publications

Yorkshire Philosophical Society publications

Yorkshire Union of Mechanics' Institutes publications

Leeds University Edward Boyle Library

Yorkshire Geological Society publications

Yorkshire Naturalists' Union publications

Leeds University Special Collections (in Leeds University Brotherton Library)

Hull Literary and Philosophical Society publications

Leeds Philosophical and Literary Society records and publications

Leicester Literary and Philosophical Society publications

Lincolnshire Naturalists' Union publications

Priestley Club publications

Thomas Sheppard publications

Victoria Museum publications

Yorkshire Philosophical Society publications

Miall Family Collection (in the possession of Leonard and Roger Miall)

Lawrence Miall correspondence

Louis Compton Miall correspondence, manuscript biography and manuscript autobiography

Stephen Miall correspondence

Sheffield City Archives

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Edward M. Gibbs, Architect, drawings

Ruskin Museum correspondence, records and publications

Sheffield Botanical Gardens records and publications

Sheffield Literary and Philosophical Society records and publications

Sheffield Mechanics' Institution records and publications

Sheffield Microscopical Society records

Sheffield Public Museum newspaper clippings

Henry Clifton Sorby correspondence

Sheffield Local Studies Library (in Sheffield Public Library)
Sheffield Field Naturalists' Society publications
Sheffield Literary and Philosophical Society publications
Sheffield Naturalists' Club publications

Sheffield Public Museum Archives
Leonard Doncaster diaries
Albert Hall diaries and notebooks
Museums Association publications
Henry Seebohm journal
Sheffield Public Museum records and publications

Sheffield University Archives (in Sheffield University Library)
Firth College, Sheffield records and publications
Henry Clifton Sorby diaries, correspondence and publications
University College, Sheffield records and publications

Sheffield University Heritage Office
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Henry Clifton Sorby publications

Sheffield University Library
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Tolson Memorial Museum newspaper clippings
Thomas William Woodhead correspondence, certificates, notebooks, diaries and publications

West Yorkshire Archives, Sheepscar
Leeds Naturalists' (Field) Club and Scientific Association records and publications
William Denison Roebuck correspondence, diary, scrapbooks, publications
Yorkshire Naturalists' Union correspondence and records

Primary (Pre-1922) Bibliography

This section of the bibliography contains all material up to 1921 (the year of Louis Miall's death), whether published or manuscript. For unique material and those items of limited circulation, the archive or library is listed following each entry. For runs of periodical publications – which are included if the run begins before 1922 – dates listed are of those volumes consulted.

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