

PART TWO: UNIVERSAL WISDOM

Chapter Four

Paying for Pansophy

'The Pansophical Vndertaking is of mighty importance. For what can bee almost greater then to have All knowledge. If it were with the addition to have All love also it were perfection' - Joachim Hübner, cited in *Ephemerides* 1639, HP 30/4/12A.

4:1 Origins of the Pansophic Project

From Moriaen's first surviving letter to Hartlib, it is evident that when he arrived in Amsterdam he was already deeply, indeed missionarily, committed to his friend's project to fund and publicise Pansophy, the vision of universal wisdom whose most famous formulation was being worked out by the Moravian theologian and pedagogue Jan Amos Komensky, or Comenius.¹ This scheme

1 The secondary literature on Comenius is enormous. The fullest biographical account is Milada Blekastad's *Comenius: Versuch eines Umrisses von Leben, Werk und Schicksal des Jan Amos Komensky* (Oslo and Prague, 1969), which despite its modest title is a detailed and exhaustive account of his life and work, based heavily and usefully (though at times somewhat uncritically) on Comenius's correspondence and autobiographical writings. Still valuable are the many studies written nearly a century ago by Jan Kvačala, particularly *Die Pädagogische Reform des Comenius in Deutschland bis zum Ausgange des XVII Jahrhunderts* (*Monumenta Germaniae Pädagogica* XVII (Berlin, 1903) and XXII (Berlin, 1904)). The standard English sources are Turnbull, *HDC* part 3 (342-464), Webster, *Great Instauration* and 'Introduction' to *Samuel Hartlib and the Advancement of Learning* (Cambridge, 1970), and Hugh Trevor-Roper's rather dismissive and anglocentric 'Three Foreigners: The Philosophers of the Puritan Revolution', in *Religion, the Reformation and Social Change* (London, 1967), 237-293 (on Hartlib, Dury and Comenius and their impact in England). Wilhelmus Rood's *Comenius and the Low Countries: Some Aspects of the Life and Work of a Czech Exile in the Seventeenth*

was the main preoccupation of both men in the first few years of their correspondence. Moriaen repeatedly expressed his commitment to it in fervent and explicitly religious terms: it was

das werck, dz ich nach Gottes schickung auf mich genommen vnd nun mehr mein ganzes werck davon mache zum gemeinen besten [...] ich hab mich gleichsam darzu abgesondert vnd devotiret (no. 16)

Their expectations were spectacularly high. Moriaen approvingly quoted back to Hartlib the latter's conviction that

der welt nie nichts nuzlichers seye angetragen worden als eben diß werckh als dardurch die Schulen vnd vermittelst derselben Ecclesia respublica mundus reformirt werden sollen vnd können (no. 67).

Before a detailed account is given of the project and Moriaen's involvement in it, some analysis is called for

Century (Amsterdam, 1970) contains useful material on his stay in the Netherlands and his relations with the de Geer family (discussed later in this chapter). There are vast numbers of articles on more specific aspects of his life, thought and publishing history in the journals *Monatshefte der Comeniusgesellschaft*, *Acta Comeniana* and *Studia Comeniana et Historica*. See also Dagmar Capková, 'Comenius and his Ideals: Escape from the Labyrinth', *SHUR*, 75-92, and, on the background to his thought, Howard Hotson, *Johann Heinrich Alsted: Encyclopedism, Millenarianism and the Second Reformation in Germany* (PhD thesis, Oxford, 1991), summarised in 'Philosophical Pedagogy in Reformed Central Europe between Ramus and Comenius: a survey of the continental background of the "Three Foreigners"', *SHUR*, 29-50. A critical and very stimulating account of Comenius's concept of education in the context of his millenarian Utopianism forms a major strand of James Holstun's *A Rational Millennium: Puritan Utopias of Seventeenth-Century England and America* (New York and Oxford, 1987).

of what it was that was being promoted, and how it came to be seen as of such epochal significance.

Born in 1592, Comenius studied at the Reformed academy of Herborn, before spending a year at the more traditional University of Heidelberg.² Herborn was among the many higher educational establishments founded in the late sixteenth century by Reformed German princes in which a new educational ethos was being forged.³ In most cases of the 'conversion' of small German states to the Reformed religion there was a signal lack of enthusiasm for the new faith among the general populace, and the leaders bent on persuading them saw education - through school, academy and pulpit - as a powerful tool for doing so. As the confessional divisions within Protestantism widened and took on clearer definition, such rulers benefited from an influx of Reformed preachers and educationalists evicted for their beliefs from their posts in Lutheran territories within the Empire, as well as the exodus from Switzerland, the Netherlands and England.⁴ A further stimulus to Protestant educational reformers of all stripes was provided by the undisputed

2 Blekastad, *Comenius*, 23-48. He was at Herborn from 1611-13, at Heidelberg from 1613-14. Moriaen had almost certainly left Heidelberg by this time.

3 Cf. the illuminating study of German higher education at this period that forms the introduction to Howard Hotson's thesis on Johann Heinrich Alsted: 'From its inception, the Second Reformation included a prominent educational dimension and one which was developed with a remarkable degree of optimism and imagination' (p.23).

4 See Hotson, *op. cit.*, 17-20.

success of the Jesuit colleges, with their relatively traditional curricula, founded in the latter half of the sixteenth century.⁵ As J.A. Poehmer observed to Hartlib,

Ich wundere mich offtmahl vber der Iesuiten
industriam fatalem [...] diese hetten wan sie
sich die inquisition der natur so sehr
angelegen sein laßen alß den dominium in
conscientias, vill guts thun können.⁶

Deploring the lack of support for Hartlib's educational projects, Dury observed bitterly that 'If he was among the Iesuites, they would find him both worke & meanes to follow it out, but wee are dead in things of such a nature'.⁷

Howard Hotson argues powerfully that the Reformed educational tradition - or, one should perhaps say, new departure - played a crucial role in shaping the thought of Comenius, as of Hartlib and Dury (both educated in Elblag (Elbing), the Eastern outpost of the Second Reformation). In particular he stresses the influence of one of Comenius's teachers at Herborn, the encyclopedist Johann Heinrich Alsted. It should be emphasised that an encyclopedia, in Alsted's terms, was not merely a

5 See Peter Dear, 'The Church and the New Philosophy', *Science, Culture and Popular Belief in the Renaissance*, ed. Stephen Pumfrey, Paolo L. Rossi and Maurice Slawinski (Manchester and New York, 1991), 119-139, 133-4. The curriculum covered (in order) Greek and Latin grammar and rhetoric, logic, ethics, mathematics (including optics and astronomy), physics and metaphysics. The prominent place of mathematics was a novelty, but in other respects this is very close to the standard university curriculum.

6 Pöhmer to Hartlib, 25 March 1638, HP 59/10/7A.

7 Dury to ?, 26 Nov. 1635, HP 3/4/37B.

comprehensive list of facts and references (or at least was not supposed to be): it was, as the word implies, a unified whole, and a major part of Alsted's project was to work out the arrangement of his compendium of knowledge in a logical, coherent and harmonious fashion such that the student could proceed through the work in sequence, progressing always from the known to the unknown and from the general to the particular. It was not merely a reference source, it was a text book of universal learning. Comenius worked as Alsted's amanuensis while in Herborn, and the master composed a Greek poem lauding his student's love of universal wisdom.⁸

Such knowledge was not only to be compendious, it was above all to be 'useful'. 'Useful knowledge' became something of a catchphrase for the Hartlib circle and other 'Second Reformation' thinkers. It should not be misinterpreted as mere utilitarianism. For knowledge to be 'useful' or 'practical' did not simply mean that it would enable people to move around faster or increase crops or build better bridges - though all such things could be useful, provided they were directed to the right ends. It meant above all that it would have an application in the ethical and religious ordering of daily life. What increasingly came to be seen as the

⁸ Reproduced in *KK II*, 234; see Blekastad, *Comenius*, 33-35.

empty, abstract, semantic disputations of the scholastic tradition were to be replaced by knowledge that was of practical relevance to the behaviour and beliefs of the individual. 'Practical divinity' in particular, an especial enthusiasm of both Alsted and Hartlib, might not grow more turnips, but was emphatically regarded as 'useful'. 'Usefulness' lay not in the private gain of one individual at the expense of another, but in the mutual profit derived from enhanced social interaction, a profit which in turn redounded to the glory of the Creator whose last and perhaps most important commandment to his creatures was that they should love one another as themselves.

But it should be stressed that if the growing vogue for a curriculum grounded in the practical rather than the theoretical can be described as an important and characteristic feature of the 'Second Reformation' ethos, it was certainly not denominationally exclusive. Like Alsted before him, Comenius drew on a very disparate range of sources, some of them apparently mutually exclusive: on Aristotelians as well as Ramists, hermetic mystics as well as rationalists, and thinkers of every shade of Christian, or indeed non-Christian, confessional allegiance.⁹ After the loss of his library in the sack

9 Cf. Comenius, *Pansophiæ Prodromus* (London, 1639), translated either by or by command of Hartlib, together with the *Conatuum Pansophicorum Dilucidatio* (London, 1639), as *A Reformation of Schooles* (London, 1642): 'Let

of Leszno in 1656, he himself singled out, as the authors whose works he most needed to recover in order to proceed with his work, Francis Bacon, Juan Luís Vives and Tomasso Campanella¹⁰ - an Anglican and two Catholics. Nor was it only among the Reformed that he found acceptance. One of his warmest admirers in Germany was the Lutheran pastor Johann Valentin Andreae. Andreae's depiction of an ideal educational system, which occupies over a quarter of his Utopian novel *Christianopolis*,¹¹ foreshadows many of

even the Gentiles, and Arabians therefore be admitted to furnish us with such ornaments, as they are able for the beauty of this house of God' (p.33).

10 Comenius to [Hartlib?], 3 Aug. 1656, HP 7/99/1A: 'opus erit reparari jacturam eorum Authorum qui mihi adhuc erunt consulendi [...] Verulamii opera intelligo, & L. Vivis, & Campanellæ omnia, etc'. Vives (1492-1540) was one of the leading humanist scholars of his day and a favourite pupil of Erasmus: he particularly concerned himself with education and foreshadowed many of the ideas of Alsted, Bacon and Comenius, such as pre-school education, education of women, the primacy of sense impressions over intellect, the dignity of the vernacular and above all the importance of rendering learning applicable to life both practically and ethically. See Foster Watson, *Vives on Education* (Cambridge, 1913). Campanella (1568-1639) combined an idiosyncratic Neo-Platonism and a fascination with the Renaissance Art of Memory with impassioned championship of new experimental science. See Luigi Firpo's *Introduction to Campanella, La Cité du Soleil* (tr. Arnaud Tripet, Geneva, 1972) for a succinct but incisive account of his life and thought; also Frances Yates, *Giordano Bruno and the Hermetic Tradition* (London, 1964) and *The Art of Memory* (London, 1966), and Paolo Rossi, *Clavis Universalis* (Bologna, 1983). On Campanella's reception among Comenians, see Martin Mulsow, 'Sociabilitas. Zu einem Kontext der Campanella-Rezeption im 17. Jahrhundert', *Studia Bruniana et Campanelliana*, forthcoming. My thanks to Dr Mulsow for supplying me with an advance copy of this very detailed and interesting study. On Bacon and Comenius, see below.

11 *Reipublicæ Christianopolitanæ descriptio* (Straßburg, 1619). Of the hundred short chapters of this work, ch. 51-78 are devoted exclusively to describing the

Comenius's educational ideas, such as universal infant education irrespective of gender or social status, appreciation of the fact that learning begins at birth if not before, the encouragement of enquiry rather than the inculcation of received wisdom, teaching in the vernacular rather than Latin, and the imparting of ideas through images and demonstrations rather than merely through words. Similar ideas are to be found in Campanella's *Civitas Solis*, debatably the inspiration for *Christianopolis*.¹² A number of German thinkers, particularly in Protestant territories, were pursuing reforms of the same sort. Among these was Elias Bodinus, whose influence Comenius later acknowledged, and whom Moriaen visited, together with Alsted's son-in-law Johann Heinrich Bisterfeld, in order to assess the spectacular claims he made for his image-based 'Art of Memory'.¹³ Another such was Wolfgang Ratke or Ratich, whose method earned him an encomium from the great natural philosopher

Christianopolitan education system, while more general educational ideas are discussed throughout. Andreæ translated a work of Vives on poor relief, *De subventionem pauperum*, as *Johann Ludwig Vives von Versorgung der Armen* (Durlach, 1627).

12 Campanella, *Civitas Solis* (1623, but written c.1602.

13 Nos. 5 and 6. On Bodinus's ideas, see W. Toischer, 'Die Didaktik des Elias Bodinus', *Mitteilungen der Gesellschaft für deutsche Erziehungs- und Schulgeschichte* IX (1899), 209-229. It was his *Bericht von der Natur- und Vernunftmessigen Didactica oder Lehr-Kunst* (Hamburg, 1621) that gave Comenius the idea of composing the original Czech version of his *Didactica magna* (ODO I, 3). The work bears the very proto-Comenian motto 'Omnia facilia facit Ratio, Ordo et Modus' ('Everything is made easier by Reason, Order and Method'). See also no. 5, nn.6 and 7.

and pedagogue Joachim Jungius (another devout Lutheran).¹⁴ A collection of didactic writings assembled by Ratke, including the report on his own method drawn up by Jungius and his friend Helvich, bore the epigraph 'Per inductionem et experimentum omnia' ('All things by induction and experiment').¹⁵ This in turn is a phrase forcefully reminiscent of the terms used in Bacon's great manifesto for educational reform, *The Advancement of Learning* (1605). In all these works, the stress was on ways of making education practical, relevant to daily life, and compendious. Pansophy was not the product of any particular denominational allegiance, though it is true that the particular circumstances of the Reformed German principalities provided the most fruitful ground for putting such ideas into practice (or at least trying to), while elsewhere they tended to remain at the level of theory, manifesto or Utopian fiction.

The reformation of educational theory was crucial to the very notion of Pansophy. Universal knowledge could be attained only by an education that was itself universal, in the fullest sense of the word, teaching 'all things to all people in all ways'.¹⁶ Just as

14 On Ratke, and the reactions to him of both Comenius and Jungius, see G.E. Guhrauer, *Joachim Jungius und sein Zeitalter* (Stuttgart and Tübingen, 1850), 23-43.

15 *Methodus institutionis nova quadruplex* (Leipzig, 1617).

16 *A Reformation of Schools*, 77. Cf. the subtitle of the *Didactica Magna* (Amsterdam, 1657, but written 1637-8): the work claims to exhibit 'Universale Omnes Omnia

Bacon's *Advancement of Learning* was intended as a trail-blazer for the 'Instauratio Magna', the reformation of all science and knowledge, and just as Alsted's (supposedly) all-encompassing *Encyclopædia* grew out of a practical teaching course,¹⁷ so all Comenius's educational work was conceived as so many steps on the path to the ultimate synthesis of Pansophy. Hartlib, significantly, had his *Prodromus Pansophiæ* (1639) translated as *A Reformation of Schooles* (1642).

It was as a pedagogue rather than a Pansophist that Comenius first came to the attention of the European intelligentsia. He achieved considerable international fame through his educational writings, principally the *Janua linguarum reserata* (*The Gateway of Languages Unlocked*) (1631) long before he became popularly associated with the notion of Pansophy. At this time, Comenius was living in exile in the Polish town of Leszno, he and his co-religionists in the *Unitas Fratrum* (Unity of Brethren)¹⁸ having been driven out of their native Bohemia and Moravia by the occupying forces of Emperor Ferdinand II. Here, Comenius took charge of teaching Latin and music at the Unity's 'Gymnasium

docendi artificium' ('the universal art of teaching all things to all people').

17 See Hotson, *Alsted*, 91-158 on the genesis of the *Encyclopædia*.

18 This church is also sometimes referred to, confusingly, as the Czech Brethren, the Bohemian Brethren or the Moravian Brethren.

Illustre', and the *Janua Linguarum* came about as a direct result of his teaching activity, in response to the paucity of teaching material and the unimaginativeness of the teaching methods he encountered at the Gymnasium. From the outset, the work was designed as more than merely a language course. It aimed to exemplify the principle that language education should be an integral part of the broader curriculum rather than a separate discipline, and that the teaching of words should be - and could best be - effected *through* the teaching of 'things', not alongside it. Instead of memorising irrelevant and uncomprehended phrases and grammatical rules, pupils might far more readily and far more profitably absorb new structures and terminology - either in their own language or in another - in the context of following an intrinsically interesting and useful course. And this course was to be, true to the ideals Comenius had imbibed at Herborn, practical, ethical, and encyclopedic.¹⁹

Others at the school were highly impressed with Comenius's tentative first draft and persuaded him to publish it on the Unity's press. In a remarkably short time, the work achieved a colossal international success,

19 See Blekastad, *Comenius*, 170-176 for a fuller account of the genesis and ethos of the *Janua*, which Blekastad describes as being - in the Alstedian sense - 'eine kleine Enzyklopädie' (173). See also Comenius's own account, *Självsbiografi*, 144-6.

appearing the same year in German, French and English versions.²⁰ Comenius, to his own mild alarm, suddenly found himself a celebrated figure among the educationalists of Europe, bombarded with congratulations, eager enquiries and expressions of interest.²¹

Encouraged as well as intimidated by this surge of interest, he found himself contemplating an extension of his project to make it still more practical and compendious. As he later described his thoughts:

I came to this point in my thoughts: if it seemed good that the words of a language should be learnt through the guidance of things, it were better that things themselves should be taught through the guidance of words already known. That is, that, when by the help of my *Janua Linguarum* youth had learnt to distinguish things from outside, it should thence become accustomed to explore that which is within things, and to comprehend what each thing is in its essence.²²

20 Blekastad, *Comenius*, 200-203. As she argues, it was almost certainly the work's efficacy as a pedagogical tool that recommended it to the majority of teachers, rather than its philosophical underpinning.

21 Comenius, *Continuatio admonitionis fraternæ de temperando charitate zelo [...] ad S. Maresium* (Amsterdam, 1670), English translation by Agneta Lunggren in Milada Blekastad (ed.), *Comenius' Självbiografi* (Stockholm, 1975), 145-147. This is Comenius's most important autobiographical work. The section dealing with his visit to England also exists in English translation in R.F. Young, *Comenius in England* (Oxford and London, 1932), 25-51. Despite its somewhat mannered archaism, Young's translation is stylistically far superior to Lunggren's, which it is painfully obvious was never checked by a native speaker. However, Lunggren's is more literal and includes the whole text, and is furnished with excellent notes.

22 Comenius' *Självbiografi*, 147.

Herein lay the germ of his 'Pansophy': 'a general book [...] exhibiting in it all necessary things so that all shameful ignorance would be excluded'.²³ Such a work would be called, on the model of the *Janua Linguarum*, the *Janua Rerum* or Gateway of Things. Like Alsted before him, he found what had initially been intended merely as a school book developing under its own momentum into a vision of universal learning.

It was the *Janua Linguarum* that brought Comenius to Hartlib's attention, and in about 1632 he began to correspond with and subsidise the Moravian.²⁴ Hartlib was greatly enthused by the idea of the *Janua Rerum*. He urged Comenius to send him a plan of the proposed work, and was rewarded, in 1637, with a rough draft outline in manuscript.

Hartlib had moved to England almost a decade earlier, in 1628, full of zeal to further the educational plans of the secret quasi-Rosicrucian society 'Antilia' he had been involved with in Elblag, which sought nothing less than the reformation of the world. Quite how it

23 *Själviografi*, 148 (cf. Young, *Comenius in England*, 31). See also *A Reformation of Schooles*, 46-7.

24 See Comenius to Hartlib, 26 Jan. 1638, in O. Odložilík, *Casopis Matice Moravské* LII (1928), 164; condensed German translation by Blekastad, *Comenius*, 255-6. Comenius mentioned in this letter that he and Hartlib had been in touch for six years. Their first contact (a letter from Hartlib with a financial contribution) is described in *Själviografi*, 149, but no exact date is given.

intended to bring this about, or whether indeed it had any clearly formulated programme for doing so, will probably never be known, but it is clear that it proposed to start by reforming education. Part of Hartlib's mission was to perform 'ettwas sonderliches' in this field.²⁵ The academy he founded in Chichester shortly after his arrival in England, 'for the Education of the Gentry of this Nation, to advance Piety, Learning, Morality, and other Exercises of Industry, not usual then in common schools', was surely his first attempt at accomplishing this mission, and its almost immediate failure must have been a bitter disappointment to him.²⁶ Comenius's programme provided a fresh opportunity to make a contribution in his appointed field, not this time as an instigator, but in the role he was to excel in throughout his subsequent career, as a promoter and populariser of other people's schemes. He took it upon himself to act as catalyst in the development of Comenius's ideas, not only in intellectual but in strictly practical terms.

25 Johann Fridwald, Hartlib's main contact in Antilia, wrote to him on 10 Feb. 1628 'das es in causa Antiliana dahin beschloßen das man institutionem puerorum vorauß treiben vnd alß ein fundament zu diesem legen müste'. J.A. Pömer, another leading figure in the society, hoped to speak to Hartlib in person about the subject before the latter left for England, 'weill der H. hierinnen ettwas sonderliches præstiret' (HP 27/34/1A). See Turnbull, 'John Hall's Letters to Samuel Hartlib', *Review of English Studies* New Series 4 (1953), 221-33.

26 *HDC*, 16-19, 36-39.

Perhaps his most important contribution was to publish the manuscript Comenius had sent him as the *Conatuum Comenianorum Præludia* (Oxford, 1637). He published it, or so he claimed in the preface, because it had aroused so much interest that he had not had scribes enough to produce the requisite copies. Typically enough, it had not occurred to him to ask Comenius's permission to do this, and it was a considerable shock for the Moravian when he suddenly received an unsolicited copy of a book by himself which he was quite unaware had gone to press. As he told Hartlib in the above-mentioned letter of January 1638, the printing had been undertaken without his knowledge and against his will: had he been asked, he would never have allowed the work to appear in this imperfect form. At the same time, however, he was evidently flattered and encouraged: he thanked Hartlib for his interest and support, and observed that if his Pansophy ever came to light, it would be due to Hartlib's incitement. And since the work was out, the best thing he could do was to rework it and have it republished in a more satisfactory form as the *Prodromus pansophiæ*, also published by Hartlib but this time with Comenius's authorisation, in 1639. Hartlib having thus set the wheels in motion, Comenius was to spend the rest of his life labouring to produce the book of universal wisdom he had proposed in this sketch. Hartlib for his part, together with like-minded friends such as Dury, Haak,

Hübner and Moriaen, devoted himself single-mindedly throughout the 1630s to raising funds for Comenius, to disseminating his work, and above all to his great goal of attracting Comenius himself to England to supervise the 'great instauration' of learning he believed was about to take place there.

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4:2 *The Notion of Pansophy: Beyond Bacon and Alsted*

Comenius repeatedly cited Bacon as an exemplar and an inspiration to him. As has been mentioned, Bacon was one of the three authors he most wished to recover after the loss of his library in 1656. Just before his visit to England in 1641,²⁷ he wrote to Hartlib in passionate terms that this was the time for the great Verulam's plans to be put into effect, and even suggested that Hartlib adapt Bacon's supplication to James I in Book II of *De Augmentis Scientiarum* to be addressed to Charles I.²⁸ Hugh Trevor-Roper, indeed, goes so far as to see Bacon as the primary influence on the thought of all the 'Three Foreigners' (Hartlib, Dury and Comenius), though he also maintains they completely misunderstood their hero.²⁹ He avuncularly describes the thought of the

27 Described in detail in section 5 of this chapter.

28 Comenius to Hartlib, 17 Feb. 1641, in two scribal copies at HP 7/84/1B-3B and 7/84/6A-8A; English summary in *HDC*, 350.

29 Trevor-Roper, 'Three Foreigners', *passim*.

Hartlibians (or Comenians) as 'vulgar Baconianism':³⁰ a somewhat frantic, disordered assembling of scraps of knowledge, with a lowbrow Puritan emphasis on practical utility and a constant worry that the job might not be finished in time for the Apocalypse:

Bacon's great philosophical synthesis had been fragmented: his 'experiments of light' had been transformed into inflamed apocalyptic speculations, his 'experiments of fruit' into the uncontrolled elaboration of gadgets. Still, it was Baconianism of a kind, and the men of the country party took it seriously.³¹

This is not the place to venture an analysis of the full range of Bacon's multi-faceted thought and the even more various interpretations that have been put upon it.³² But it should be pointed out that the fact that

30 Trevor-Roper is very fond of this expression: cf. 'Three Foreigners', 258 and 289; 'Introduction' to Margery Purver, *The Royal Society: Concept and Creation* (London, 1967), xv and xvi.

31 'Three Foreigners', 258. This line of argument is taken furthest by Margery Purver, who sees the Royal Society as having resurrected pure, genuine Baconianism from the fragmented and trivialised form of it propagated by the likes of Hartlib and Haak. She sets out to remove this 'vulgar' stain from the Society's pedigree by denying they had any influence on its genesis at all: see her *The Royal Society: Concept and Creation* (London, 1967), especially Part Two, chapter 4, 'The Royal Society and "Pansophia"', 193-234. See also Webster's devastating essay review of the book, 'The Origins of the Royal Society', *History of Science* VI (1967), 106-128.

32 Good introductions to Bacon's thought are Paolo Rossi, *Francis Bacon: From Magic to Science* (trans. Sacha Rabinovitch, Chicago, 1968), and Lisa Jardine, *Francis Bacon and the Art of Discourse* (Cambridge, 1974). On his particular influence on the Hartlib circle, see the works already cited: Webster, *Great Instauration*, Trevor-Roper, 'Three Foreigners', and Margery Purver, *The Royal Society: Concept and Creation*. As will be apparent, I disagree fundamentally with the analysis of the latter two. His impact on the exponents of rationalist

many of the Hartlib circle took a lively interest in Bacon does not mean they followed him (or their conception of him) slavishly or uncritically. In Moriaen's case, there is no firm evidence he had read Bacon at all, and nothing to suggest he set much store by him if he had. The only mention of him in all the surviving letters is a less than ecstatic reaction to a catalogue Hartlib had sent him of Bacon's extant manuscripts: 'vnder des Verulamij nachgelaßenen schrifften werden ohne zweiffel viel treffliche sachen sein'.³³ Furthermore, I would suggest that there are elements in the pansophic programme that are not so much misunderstandings of Bacon's views as conscious adaptation of or even reaction against them.

What is particularly relevant here is that in at least one important respect Baconian inductivism was the antithesis of Pansophic universality. Inductivism, by definition, proceeds from the particular to the general, requiring long and diligent labour in what Bacon called

scientific thought in later seventeenth-century England is vividly conveyed in Thomas Sprat's *History of the Royal Society* (London, 1667), though this is much more a document of Bacon's reception than an analysis of his work and thought per se. Julian Martin's challenging but (in my view) overstated 'Natural History and its Public Concerns', *Science, Culture and Popular Belief in the Renaissance*, ed. Stephen Pumfrey, Paolo L. Rossi and Maurice Slawinsky (Manchester, 1991), 100-118, aligns Bacon's natural philosophy more closely to his political concerns - indeed, virtually subordinates it to them. 33 No. 15, and see n.1 there.

the 'inclosures of particularity'³⁴ before proceeding to establish more general axioms. It is true that, in speaking of the ultimate goal of his preliminary *Natural Histories*, Bacon made promises as grandly universal as any of the claims of Pansophy:

let such a history be once provided and well set forth, and let there be added to it such auxiliary and light-giving experiments as in the very course of interpretation will present themselves or will have to be found out; and the investigation of nature and of all sciences will be the work of a few years.³⁵

Yet after all the enthusiasm of his descriptions of data-collection and experimentation, the 'investigation of nature and of all sciences' in 'a few years' sounds here oddly perfunctory, almost an anti-climax. Bacon is more convincing when presenting his method as a quest never to be concluded, 'an endless progress or proficiencie'.³⁶ Even if it is apocryphal, Aubrey's story that Bacon caught his death of cold while trying to refrigerate a chicken is a fitting tribute to the man's devotion to experimental minutiae.³⁷ In any case, for the purposes of the comparison I am drawing here, it is irrelevant whether Bacon saw the achievement of such an overarching synthesis as a grand culmination of his programme or as a

34 *Of the Proficiencie and Advancement of Learning Human and Divine, Works, III, 359.*

35 Bacon, *Preparative Towards a Natural and Experimental History (Parasceve), Works IV, 252.*

36 *Advancement of Learning, 268.*

37 Andrew Clark (ed.), *'Brief Lives,' chiefly of Contemporaries, set down by John Aubrey, between the Years 1669 and 1696 (Oxford, 1898), I, 75-6.*

distant and not very interesting prospect. In either case, his agenda for the foreseeable future involved a slow, meticulous and cautious progress through particularities that was wholly at odds with the intellectual climate of the 1630s.

Among Hartlib's papers is an anonymous catalogue of natural creatures and phenomena, set out in what is clearly supposed to be a typological sequence, preparatory no doubt to something approaching a Baconian Natural History, bearing the appealingly self-deprecatory title, 'An imperfect Enumeration of natural thinges'.³⁸ No 'Natural History', however well conducted, could aspire to higher status. There will always be more to know, and any inductively established rule can only be accounted a hypothesis not yet disproven: once an exception to it is discovered it loses its validity, or at least its universality. Bacon, it has been argued, was more optimistic than this, and genuinely did expect his method to attain ultimately to a standard of absolute verification.³⁹ This claim, however, met with considerable scepticism from many of the thinkers under discussion here, to whom inductivism seemed a highly unsatisfactory tool for uncovering ultimate, absolute and universal truths. Comenius, for instance, specifically remarked in the *Prodromus* that Bacon's proposals, though

38 HP 22/6/2A-5B, undated.

39 See Purver and (especially) Jardine, *ops. cit.*

laudable, were inadequate for the project he had in mind.

Bacon's inductive method

requireth the continuall industry of many men, and ages, and so is not onely laborious, but seemeth also to be uncertaine in the event and successe thereof [...] it is of no great use, or advantage towards our designe of Pansophy, because [...] it is onely intended for the discovery of the secrets of Nature, but wee drive and aime at the whole universality of things.⁴⁰

Inductivism (by this analysis at least) starts at the bottom, in the realm of raw data, and works its way up tentatively and speculatively to more general rules that can never be more than provisional. This will seem to some an over-simplification of Bacon's ideas, to others a valid critique of their ability to deliver what they promised. In either case, it was the view Comenius took, and that is the point at issue here. What Pansophy set out to do was to discern *from the outset* a pattern whereby the lineaments of infinity might be conceptualised, and to grasp (insofar as human capacity permitted) the principles according to which the universe is ordered. This of course presupposes a conviction that the universe *is* ordered, and my contention is that the mounting (though still largely unformulated) sense that the explosion of information and technology was beginning to undermine that conviction, or that article of faith, was the challenge that made the reassurance of Pansophy

40 *A Reformation of Schooles*, 35.

seem so urgently necessary. The question raised by much reading of Pansophic texts is: if these people are so confident of universal harmony and order, why do they reaffirm it so insistently?

The amount of knowledge available to the scholar was increasing at an unprecedented rate, thanks to the rapid advances in the technology both of scientific investigation itself and of its dissemination in print. Acceptance of the Copernican-Galilean model of the universe did away with the notion of a bounded, and hence potentially knowable, sub-lunary sphere. (Comenius himself throughout his life stubbornly refused to accept the evidence for heliocentricity.) Meanwhile, exploration and microscopy were revealing a hitherto unimagined wealth of subjects for investigation and a hitherto unimagined complexity in what had previously seemed simple and comprehensible organisms. Above all, the enormous increase in the output of literature was making it, for the first time in history, impossible for an educated and tolerably wealthy individual to keep broadly abreast of the current state of knowledge on all subjects in the known world. It was the consequent rise of specialisation, and the increasingly clear demarcations drawn perforce between different branches of knowledge, that led to this sense of losing a grip on the

totality, coherence and fundamental unity of Creation.

As Comenius put it in the *Prodromus*,

Good God! what vast volumes are compiled almost of every matter, which if they were laid together, would raise such heapes, that many millions of years would be required to peruse them? [...] Hence comes that (so commonly used) parcelling and tearing of learning into peeces, that men making their choyce of this, or that Art, or Science, take no care so much, as to looke into any of the rest.

Who knowes not that this is so? and who sees not, that this distribution, and sharing of Arts, and Sciences, proceeds from this supposition, That it is not possible for the wit of one man to attaine the knowledge of them all?⁴¹

J.V. Andreae, an acknowledged inspiration to and keen supporter of Comenius, was similarly distressed by the sheer quantity of information humankind was confronted with, and lamented (to cite another Hartlib-sponsored translation):

Now in the worlds weaknesse, most humane affairs are committed to Learning, the masse whereof is become infinite, which fills not the world so much with truth as falsehood, not so much with solidity as curiosity.⁴²

41 *A Reformation of Schooles*, 6.

42 Johann Valentin Andreae (trans. John Hall), *A Modell of a Christian Society*, (original Latin *Societas Christianae imago*, Tübingen 1620, translation London 1647), reprinted by George Turnbull in *Zeitschrift für deutsche Philologie* 74 (1955), 151-161, 155. The original, preserved in a single printed copy in Wolfenbüttel and two manuscript copies in the Hartlib Papers reads: 'Nam cum hoc Mundi senio omnia propemodum humana, literis concredita sint, quarum moles in immensum excrevit, & non tam veritate quam falsitate, soliditate quam Vanitate Orbem adimplevit' (HP 55/19/5B).

There was, for some Pansophists at least, altogether too much 'curiosity' in the inductive method championed by Bacon: too much emphasis on data and not enough on the broader and nobler vistas promised by their conception of 'right method'. He was, as it were, looking through the wrong end of the telescope. Bacon had emphasised that no detail should be omitted from the Natural Histories, specifically prescribing the inclusion of

things the most ordinary, such as it might be thought superfluous to record in writing [...] things mean, illiberal, filthy [...] things trifling and childish [...] and lastly, things which seem over subtle, because they are in themselves of no use.⁴³

At least one proponent of 'vulgar Baconianism' found this concern for 'things mean, illiberal, filthy' too vulgar to take:

To mangle tyrannise etc over the Creatures for to trie experiments or to bee imploied so filthily about them as to weigh pisse etc as Verul. prescribes is a meere drudgery curiosity and Impiety and no necessity for it.⁴⁴

The same commentator, who I strongly suspect is Hübner,⁴⁵ pursued this criticism of Bacon's excessive zeal for detail:

43 *Preparative Towards a Natural and Experimental History, Works, IV, 258-9*. What is under discussion here, it should perhaps be stressed, is the description Bacon gave in this work of what the Natural Histories should be, not the content of the Natural Histories he himself actually produced, which hardly meet his own specifications.

44 *Eph 40, HP 30/4/54A*.

45 Hübner is much the most frequently cited source in the *Ephemerides* of 1639 and 40, something like half the

It is sufficient if we had a true History out of every country of the meere outward shapes operations etc. and so of all Mechanical things and their several manners of working [...] This would not require a sæculum as Verul. projects but within 10. years come to a very great perfection if it were set down by every Country.⁴⁶

There is a suggestion of urgency, or at least of hurry, in this which points up another important ingredient in the positively missionary fervour with which Pansophy was preached, and that is the idea of preparing the way of the Lord. It is important to avoid over-generalisation. Not all Pansophists were millenarians and not all millenarians were Pansophists. Comenius, like Alsted, certainly did hold millennarian views, but that does not mean everyone who supported his overall programme agreed with him on this particular point. As has already been argued, it is not possible to determine what stance either Hartlib or Moriaen took on this subject, and the same can be said of Hübner. It was not, however, necessary to accept any particular exegesis of Biblical prophecy to share a widespread sense that some sort of culmination of human history impended - especially not for men whose homeland was experiencing what was at the time the most destructive war in European history. It was a political and intellectual atmosphere

entries being attributed him. The opinion and the blunt, slightly truculent manner of its expression are consistent with Hübner's original writings.

46 Eph 40, HP 30/4/54B.

that provided a constant reminder to all readers of Scripture to guard against the error of the foolish virgins of Matthew 25, who were not prepared for the moment of the Bridegroom's arrival, and were shut out from the wedding.⁴⁷ Even if, as is conceivable, Moriaen did not identify the Bridegroom with any manifestation of the historical Jesus,⁴⁸ the intensely religious terms in which both he and Hübner discussed Pansophy strongly suggest that they viewed it as an essential part of the required preparation. We cannot be sure, and cannot be sure they were sure, what exactly they were preparing for or when exactly they expected it to happen. But we can be fairly sure they thought such preparation incumbent upon them as a matter of some urgency.

A 'sæculum', therefore, could seem an uncomfortably long time. Bacon's choice of a motto from Daniel - 'many shall run to and fro, and knowledge shall be increased'⁴⁹ - took on for many of his admirers in the next generation a resonance barely intended by him, for this increase of knowledge was to take place in 'the last days'. Comenius in the *Prodromus* refers twice to the same citation, with

47 Matthew 25:12.

48 See Chapter Two.

49 Daniel 12:4, Authorised Version. Luther, interestingly, gives a completely different reading: 'So werden viel drüber kommen [ie. über diese Schrift] vnd grossen verstand finden': I am advised that the Authorised Version is the more literal (my thanks to the members of Sheffield University's Classical Hebrew Dictionary Project).

much more obviously millenarian implications.⁵⁰ For those convinced that the last days were already upon them, or might well be, the leisurely time spans envisaged by Bacon for the accomplishment of his research programme were simply not available.

The mere amassing of knowledge, then, was only part of the task in hand: more fundamental, and far more urgent than the inductive method allowed for, was the arrangement of it in such a fashion that the parts might contribute to the comprehension of a whole that was more than their sum. Hence the obsession with 'right order', 'true Logick' and so forth.⁵¹ The aim of Pansophy, however much its proponents might disagree about the means, was to discern the divine pattern governing Creation, to gain access to the heavenly architect's blueprint.

Again, this runs directly counter to the spirit of Bacon, who, with regard to the study of 'the book of God's word' (the Bible) and 'the book of God's works' (Nature), exhorted men to beware that 'they do not unwisely mingle these things together'.⁵² Indeed, this

50 *A Reformation of Schooles*, 4 and 29. Cf. Popkin, 'The Third Force', 43-5, on the importance of this passage for the influential Millenarian William Twisse, whose *Doubting Conscience Resolved* (1652) was written for and published by Hartlib.

51 Cf. Stephen Clucas, 'In Search of the "True Logick": methodological eclecticism among the "Baconian reformers"', *SHUR*, 51-74.

52 *Advancement of Learning, Works*, III, 268.

was precisely the objection to the *Præludia* made by Hieronim Broniewski, a lay elder of the *Unitas Fratrum*, against which Comenius had to defend himself before the synod of the Brethren in 1638 and 39.⁵³ But for the pansophists, the dangerous presumption of too many thinkers was precisely to leave God out. Comenius's objection to the *Pansophia* of Peter Lauremberg (Rostock, 1633) was that it 'contained nothing appertaining to divine wisdom or the mysteries of salvation' and was consequently 'unworthy of so sublime a title'.⁵⁴ The gravest defect of contemporary education identified in the *Prodromus* was that studies were 'not sufficiently subordinate to the scope of eternity'.⁵⁵ The agriculturalist Gabriel Plattes, whose works abound in strictly utilitarian self-help schemes for the common man,⁵⁶ was anonymously criticised because he was 'too confident for the improvement of those secondary meanes as if men should be the lesse beholden to God and so

53 See no. 11, text and nn.1-3, and the literature cited there; also *Själviografi*, 151.

54 *Själviografi*, 148-9 (Young, *Comenius in England*, 32-33).

55 *A Reformation of Schooles*, 6.

56 Especially *A Treatise of Husbandry* (London, 1638) and *A Discovery of Infinite Treasure* (London, 1639), the treasure in question being the inexhaustible wealth of well-husbanded nature. The works are aimed emphatically at the ordinary farmer rather than the large landowner and are very practical (and pragmatic) in tone. Plattes was supported for a time by Hartlib but died in poverty. See *DNB*, 410, and Hartlib's own *Legacie of Husbandry* (London, 1651).

inclines to Atheisme'.⁵⁷ It was an error that was becoming alarmingly common:

The greatest philosophers should addresse themselves more to God in prayers and in a holy life and so they should finde out more the secrets of Nature then ever they have done. Eg. wee see it in Cartes glasses [ie. Descartes' parabolic lenses] though his demonstrations bee never so punctual yet it will not doe the reason is because that God is so little regarded in this matter as if humane wit were able to accomplish all. And it may bee an obvious smal matter is only wanting which God hides of purpose from his and other eys.⁵⁸

Another important diversion from Bacon, which I suspect may well be a conscious modification of his portrayal of the world, is that to his 'book of God's word' and 'book of God's works', which between them comprehend the whole of knowledge could we but learn to read them aright, Comenius added the book of Man's mind.⁵⁹ As he was fond of pointing out, Man was made in God's image. Man is a microcosm, not only of the universe but of God himself. The universe is comprehensible to the individual because the individual mind contains it, and contains God's knowledge of it, in miniature:

57 *Eph 39*, 30/4/18B; the remark is not attributed but it sounds to me like Hübner again.

58 *Eph 39*, 30/4/26B. This is almost certainly Hübner. On 'Cartes glasses', see *Biographical Sketch*.

59 *Conatuum Comenianorum Dilucidatio*: 'My intent was to epitomize those bookes of God, Nature, Scripture and mans Conscience' (*Reformation of Schooles*, 65); cf. *Panaugia*, 13; *Pampædia*, 130.

[Man] being the last accomplishment of the creation, and the most absolute Image of his Creator, containing in himself onely the perfections of all other things, why should he not at last habituate himselfe to the contemplation of himselfe, and all things else?⁶⁰

The slightly hysterical insistence on order, pattern and universality in the writings of the pansophists represents the microcosm-macrocosm theory in its death throes.

In Hübner's memorably surreal simile,

Truths or things being known out of their due order are like to an Elephant's Snout or proboscis. The use of them cannot be so evidently and fully be [sic] perceived as when they are linked together which the Pansophia will best performe.⁶¹

The sense of this, I take it, is that a stray and unrelated piece of data is as redundant and absurd as this 'proboscis' must have appeared to Europeans seeing an elephant for the first time, but that just as the trunk turns out to be not only useful but absolutely integral once the organic context of the elephant is grasped, so 'due order' will illuminate the interdependence and mutual relevance of all fragments of

60 *A Reformation of Schooles*, 27. Cf. *Panorthosia*, 25: I say that you must be *Everything* in yourself, as a genuine portion of mankind and a true image of God and Christ. For if every individual Being is an image of the Universe [...] every member of human society ought also to represent human society as a whole, so that [...] one may be or know or wish or do what all men are or know or wish or do.'

61 *Eph* 39, HP 30/4/10A. There is again no clear indication that Hübner is being cited, but the style and content overwhelmingly suggest him.

knowledge. Comenius was to make almost exactly the same point, albeit more prosaically, when defining what he called the 'syncretic' method of analysis:

to understand things in isolation, as men generally do, is a minor part of [the learning process], but to understand the harmony of things and the proportions of all the related parts is the vital factor which brings pure and all-pervading light to men's minds.⁶²

The key was method. This quotation is strongly reminiscent of the encyclopedic ideas of Keckermann and Alsted. But it was becoming increasingly apparent to the younger generation that Alsted had not gone nearly far enough in the methodising of his compendium. And Comenius, much as he respected his former teacher, surely had him among others in mind when he complained

that as yet in all the bookes that ever I saw, I could never find any thing answerable unto the amplitude of things; or which would fetch in the whole universality of them within its compasse: whatsoever some *Encyclopædias*, or *Syntaxes*, or books of *Pansophy*, have pretended to in their titles.⁶³

What was needed, but had never been attempted, was a method that would so

square and proportion the universall principles of things, that they might be the certain limits to bound in that every-way-streaming variety of things: that so invincible, and unchangeable *Truth* might discover its universall, and proportionate harmony in all things.⁶⁴

62 Comenius, *Pampædia*, 85.

63 *A Reformation of Schooles*, 15.

64 *A Reformation of Schooles*, 15.

One anonymous German correspondent of Hartlib actually cited Alsted as an exemplar of unmethodical writing, incidentally providing a vivid description of the sense of distress and confusion induced by lacking a predetermined sense of order:

vil sachen weist man nit wo man sie hin referiren soll. Mueß sie also entweder vnter dem koth, vieler Vnnützer zerstreuter Aphorismorum verborgen ligen laßen, oder mitt Alstedio, ich weiß nicht, waß vor narrischen farragines artium et particulas systematum den gemeinen Vngestalten systematibus subjungiren, welches ihme dan allein die confusion seiner Encyclopode [sic] gnugsam solt zue verstehen geben haben.⁶⁵

'Farragines artium' is a sarcastic reference to the seventh and last book of Alsted's *Encyclopædia* (1630), entitled 'Farragines disciplinarum' (lit. 'Farragoes of Disciplines'), to which Alsted consigned all those disciplines - from alchemy to 'tabacologia' (the study of tobacco) - which he could not fit into his scheme anywhere else. The correspondent would have agreed with Hotson, who argues that this represents a disintegration of Alsted's entire system.⁶⁶ Hotson well summarises the growing disillusion with Alsted and the encyclopedic tradition among 'the generation of English natural philosophers which reached maturity in the mid-

65 HP 36/4/50A: from a long anonymous tract on combatting atheism, undated but composed c.1638/9.

66 Hotson, *Alsted*, 156.

seventeenth century',⁶⁷ though as this quotation suggests the trend was by no means exclusive to England.

Another commentator, writing in favour of the notion of Pansophy (though not in this instance with particular reference to Comenius), observed that a work might contain the greatest confusion that had ever been seen in writing, but nonetheless, provided the author treated his proposed subjects solidly and thoroughly, 'wollen wir ihn doch viel höher halten, als 1000 Alstedios mit allen ihren vermeinten methodis'.⁶⁸ Hübner too provides a good example of this growing disillusion: many of Alsted's works, he complained, had 'no direction or reality of notions in them but I know not what at random scribled'.⁶⁹

Ironically, this can now seem a very apt description of much of Hartlib's papers, particularly the *Ephemerides* in which the remark is recorded. There is an unresolved dichotomy between a genuine appreciation of the multifariousness of raw fact and a passionate need to discern the divine order that would reveal its coherence. Hartlib collected stray facts with tireless zeal, and can often seem less than meticulous in applying Bacon's precept that 'whatever is admitted must be drawn from

67 Ibid., 147.

68 Anon. to [Hartlib?], early 1638, HP 59/10/20B.

69 *Eph* 39, 30/4/2A.

grave and credible history and trustworthy reports'.⁷⁰ But he was generally assiduous in noting his sources, thus providing himself with a means of verification when it came (as it never did) to assembling his database in due order. Maddening as it may be to come across six consecutive entries attributed to 'id.' when the entry preceding them is not attributed to anyone at all, it would be unjust to assume that Hartlib himself would not have known whom he meant. His 'vulgar Baconianism' was not nearly as silly, and certainly not as trivial, as it often looks in the shipwrecked form in which it has come down to us. His papers are the fittingly incomplete record of a desperate last-ditch attempt to reconcile the widening scope of seventeenth-century factual knowledge with faith in a symmetrical, harmonious and comprehensible universe.

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**4:3 'To Leave No Problem Unsolved': The New Mathematics
as a Model for Pansophy**

The bullfinch, if Kuffler's report in the *Ephemerides* of 1656 is to be believed, is

One of the most Musical birds and that is most susceptible to bee taught any kind of melodies or songs [...] as Mr Morian hath found by experience who himself hath taught him *Psalms*

⁷⁰ *Novum organum*, second book of aphorisms, aphorism 29: *Works*, IV, 169.

etc etc for which hee hath beene famed over all
Amsterdam.⁷¹

However much this report owes to the inventor's fertile imagination (which may be its entirety), it is a telling and rather attractive image of the idea of Moriaen built up by his correspondents in England. Besides, it is certainly not inconceivable that Moriaen *tried* to teach a bullfinch psalm tunes, and possibly believed he was making progress with the project.⁷² Moriaen's enthusiasm for music, and the religious dimension of that enthusiasm, have already been touched on. To persuade a bird to apply its God-given voice to explicitly divine melodies would have provided a splendid example of the divine spark latent in all created things, and the potential for humankind to apply its divinely-appointed dominion over Nature⁷³ to the specific end of glorifying God.

Music was regarded at this period as a branch of mathematics - which is emphatically not to say it was seen as a merely abstract or intellectual process. On the contrary, the divine spark discernible in music extended throughout its parent discipline, offering

71 Eph 56, 29/5/89A.

72 The tunes in question would probably have been those of the Huguenot composer Claude le Jeune, which, supplied by Ambrosius Lobwasser with metrical German translations of the texts, became standard in the Reformed churches of Germany: Moriaen supplied a copy for an unknown correspondent in England, possibly Haak, in 1646 or 47 (see nos. 90 and 91 and notes.)

73 Genesis, 1:26.

unique insights into the lineaments of Creation. In the idealised Pansophic educational programme of J.V. Andreae's *Christianopolis*, the mathematical part of the course, described in chapters 61 to 63, begins with arithmetic - for whoever does not know arithmetic knows nothing -, proceeds to geometry - which teaches us to understand 'the pettiness of our little body in the narrow confines of the grave and the tiny ball of this little earth' -, and concludes with the 'secret numbers', comprehensible only by revelation, which provide an insight into the means by which God has measured the universe. From this course, the Christianopolitans proceed directly to music (chapters 64-66), which is depicted as a form of spiritual sustenance. Moriaen's love of music figures in miniature, like a microcosm, his love of mathematics, and the expansion in the purview of mathematics taking place at the time in turn figures the expansion of learning in general that he and Hartlib anticipated. It was harmony that fascinated him in mathematics, as in music, the abstract beauty of numerical patterns - though in his eyes these patterns were not abstract, they were applicable in all fields of learning, including those that would today be considered the least 'scientific', and were simply easier to discern in this area than in others. Mathematics provided the reassurance that there was an ordered harmony to the universe, for 'in dieser irrenden vnd verführischen welt

[... ist] vnß extra Mathesin fast nichts sichers vnd gewißes vbergelaßen' (no. 6).

The music of the spheres might no longer literally be believed in, since the spheres in question had turned out not to exist, but their metaphorical charge - the concept of universal harmony - was redeemable by mathematics. Moriaen was captivated by the idea that an infinite number of problems can be solved by a single verified principle, and saw in this the model for all subjects after the pansophic reformation of learning:

Ich bin dieser sachen auß der maßen begierig
all meine tage gewest nun aber desto mehr weil
Ich mir vnd anderen possibilitatem Pansophiæ
dardurch einbilden kan, damit Ich bereit
etliche widersprecher stumme vnd zweiffeler
glaubig gemacht habe (no. 10).

It was this passion that informed his interest in and sustained support for the leading mathematician among the pansophists, John Pell.

During his own lifetime, Pell (1611-85) enjoyed colossal esteem as a mathematician. As a young man he was a schoolmaster in Sussex, possibly for a while at Hartlib's academy at Chichester, though according to Aubrey's *Brief Lives* he was still teaching there after Hartlib abandoned the project and moved to London.⁷⁴ In due course, Hartlib persuaded Pell to follow him to the capital, and he became, along with Dury, Haak and Hübner,

⁷⁴ Aubrey, *Brief Lives* II, 129.

an intimate of the Pansophic group centred on Hartlib. His friends were eager to advance him, but Pell was temperamentally incapable of making any effort for his own promotion or of bringing any project to a conclusion. Or as Aubrey more kindly put it, he was 'naturally averse from suing or stooping much for what he was worthy of', 'no Courtier' and 'a most shiftless man as to worldly affaires'.⁷⁵

From as early as 1639, Moriaen was active in seeking opportunities in the Netherlands for the mathematician, who numbered Dutch among the many languages he was fluent in. His efforts on Pell's behalf earned him the one mention in print that can ever have caught the eye of non-specialists: a passing reference by Haak preserved in Aubrey's *Brief Life* of the mathematician:

[Pell] communicated to his friends his excellent *Idea Matheseos* in half a sheet of paper, which got him a great deal of repute, both at home and abroad, but no other special advantage, till Mr John Morian, a very learned and expert Gentleman, gave me notice that Hortensius, Mathematical Professor at Amsterdam, was deceased, wishing that our friend Mr Pell might succeed.⁷⁶

This reason the post became vacant was not in fact that Hortensius⁷⁷ had died, but that he had been called

75 Aubrey, *Brief Lives* II, 127 and 129. The first two comments are from a memo to Aubrey from Haak.

76 Aubrey, *Brief Lives* II, 130. On the 'Idea Matheseos', see below.

77 Martinus Hortensius (1605-39), mathematics professor at the Amsterdam Athenæum Illustre since 1634. See *NNBW* I, 1160-64.

to Leiden University, though in the event he did die almost immediately after his move. Moriaen recommended Pell as an 'Architectus Pansophiæ' and an ideal replacement for Hortensius to the burgomasters Cunrad and Bourg, and to the English resident at The Hague, William Boswell.⁷⁸ Through Hartlib, Moriaen urged tirelessly - and fruitlessly - that Pell should produce concrete evidence of his talents to lend weight to these recommendations.⁷⁹ It is a sign of the slight regard in which mathematics was held by traditional academics and the majority of students that the Athenæum's authorities seriously considered letting the post lapse after Hortensius's departure, since his lectures had been so poorly attended,⁸⁰ and it was indeed left vacant for four years. But in 1643, despite Pell's continuing failure to publish anything, Moriaen's persistent lobbying at last bore fruit. At Moriaen's suggestion,⁸¹ Pell took the gamble of moving to Amsterdam in order to recommend himself in person, and was duly offered a probationary year. This he completed with considerable success: the celebrated scholar G.J. Vossius personally congratulated Moriaen on his recommendation.⁸² Pell remained in Amsterdam until 1646, when he was invited by the

78 Nos. 25, 31, 32, 88.

79 Nos. 48, 71, 85.

80 No. 32.

81 No. 88.

82 No. 89.

Stadholder Frederik Hendrik to the newly-founded academy at Breda.

Moriaen was one of Pell's first contacts in Amsterdam, and helped the shiftless mathematician to settle in to his new surroundings, taking it on himself to find him lodgings and, no doubt, introducing him to new friends and showing him round the city.⁸³ The two men remained in close contact during Pell's nine years in the Netherlands (he finally returned to England in 1652 and subsequently became a diplomat under Cromwell, thanks this time to a recommendation from Haak), and were friends for the rest of Moriaen's life. Moriaen deplored the poor remuneration he received for his teaching work,⁸⁴ and always hoped he might distinguish himself sufficiently in print to attract a patron who would allow him to devote his time entirely to mathematical research and Pansophy.

This was a vain hope. Pell published hardly anything at all besides the *Idea* mentioned by Aubrey, which is not in itself a mathematical work, and which,

83 Unfortunately, no letters survive from 1643, the year of Pell's move, and only one (no. 89) from the whole period of his stay in Amsterdam. It is clear from this, however, that Moriaen was one of Pell's first contacts, as he came bearing him a letter from Hartlib. This letter also describes how Pell was offered the post, relates the success of his inaugural lecture, and mentions that Moriaen was trying to find permanent accommodation for Pell.

84 No. 94.

furthermore, seems to have been brought out not on Pell's initiative but on Hartlib's. As his biographer in the *DNB* severely remarks, 'Pell's mathematical performance entirely failed to justify his reputation'.⁸⁵ But in the late 1630s 'and early 1640s, Pell was seen as one of Pansophy's rising stars, and after Comenius himself, it was he, Dury and Hübner who were most often cited in Hartlib's publicity material as worthy recipients of sponsorship and likely producers of genuinely pansophical work. His *Idea of Mathematics* was distributed by Hartlib alongside Dury's writings on exegetical and Hübner's on political method⁸⁶ as an exemplar of and advertisement for the vision of universal learning adumbrated in Comenius's *Præludia* and *Prodromus*.

Though Pell's *Idea*, which Hartlib published in 1638,⁸⁷ can fairly be described as an 'idea' in the modern sense of an innovative suggestion - for it

85 *DNB* XLIV, 262.

86 See nos. 1 and 10. Dury's work on Scriptural analysis is discussed below.

87 According to the manuscript title page in the Hartlib Papers (HP 14/1/6A), the *Idea* was written in 1634. Turnbull suggests it may have been conceived as early as 1630, when Pell sent Hartlib 'a rude draught of his Method' (*HDC*, 88), though this does not necessarily refer to the *Idea*. For the complete English text and the publication date of 1638, see P.J. Wallis, 'An Early Mathematical Manifesto - John Pell's *Idea of Mathematics*', *Durham Research Journal* 18 (1967), 139-48. Wallis's dating is borne out by Pell's reference in a letter of October 1642 which cannot be to anyone but Hartlib to 'my letter to you, which you caused to be published just this time four years' (*Correspondance de Mersenne* XI, 311). For evidence that the addressee is indeed Hartlib, see below.

consists of a set of concrete proposals for a state-sponsored programme to improve mathematical education and research - the word would have been understood at the time in a rather more elevated and philosophical sense, akin to Comenius's 'præcognita'.⁸⁸ It means the prior conception of the nature of a discipline in broad and abstract terms, the conceptual framework that is to be fleshed out with more specific knowledge. For in the course of suggesting means toward the advancement of learning in this particular field, Pell also depicted an ambitious and distinctly pansophic ideal of what mathematics could and should become. His work argues for three main developments: first, the compilation of a comprehensive mathematical encyclopedia and bibliography; second, the foundation at state expense of a universal mathematical public library containing 'all those bookes, and one instrument of every sort that hath beene invented',⁸⁹ to foster interest in the uninitiated and provide research facilities for the expert; and finally the writing of three new text books comprehending the whole of mathematical theory. It is the proposal for the third text book that strikes the truly pansophic note, as this is to deal not only with past and present

88 Comenius derived this term from Alsted's precursor Bartholomæus Keckermann: it refers to Aristotle's assertion that all learning depends on prior knowledge.

89 Pell, *Idea of Mathematics*, ed. P.J. Wallis, in *Durham Research Journal* 18 (1967), 139-148, 143.

mathematical problems but all conceivable problems whatsoever, being

An instruction, shewing how any Mathematician that will take the paines, may prepare himselfe, so, as that he may, though he be utterly destitute of bookes or instruments, resolve any Mathematicall Probleme as exactly as if he had a complete *Library* by him.⁹⁰

This work was distributed around Europe by Hartlib and Haak: the latter sent a copy, together with the *Prodromus*, to Mersenne, who passed it on to Descartes. Both thought the design a worthy one, but balked at the scale of it. What struck them as unfeasible was not, interestingly, the final Pansophic vision of universal method (which Pell himself foresaw would 'perhaps seeme utterly impossible to most'⁹¹), but the enormous size and expense of the proposed library. Mersenne, however, after making contact with Pell personally, was won round by his arguments and became a wholehearted advocate of the plan.⁹² Moriaen received a copy soon after the work's publication in 1638,⁹³ and it excited him as much as anything sent him by his friend in London. This, he thought, was the sort of concrete evidence needed to convince people that workable pansophic schemes could be

90 Ibid., 144.

91 Ibid., 145.

92 Mersenne to Haak, 1 Nov. 1639, *Correspondance de Mersenne* VIII, 580-584; Pell to Mersenne, 21 Nov. 1639 (ibid., 622-630), Mersenne to Pell, 10 Dec. 1639 (ibid., 685-688). See also Wallis's useful summary of the early reception of the *Idea*, *Durham Research Journal* 18 (1967), 145-7.

93 No. 1.

and were being produced. He was zealous in distributing copies of the tract, and specifically requested other works of a mathematical bent, including those of Thomas Harriott and William Oughtred, for the same purpose of promoting Pansophy.⁹⁴

It was the universal validity of mathematical principle that made it illustrative of Pansophy. Such a view of mathematical principles was itself a relative novelty at the time. Jacob Klein suggests in an illuminating study that the very concept of number was undergoing a radical transformation at precisely this period.⁹⁵ Numbers were coming to be seen as concepts in their own right, rather than merely as a means of measuring or counting determinate objects. This he sees as the crucial shift in conceptualisation that made possible the development of modern symbolic algebra. Those who see an infant stage of algebra in the ancient Greek mathematicians are, according to Klein, reading the Greeks anachronistically, according to their own intentionality (that is, 'the mode in which our thought, and also our words, signify or intend their objects'⁹⁶).

Euclidean presentation

is not symbolic. It always intends *determinate numbers or units of measurement*, and it does

94 Nos. 10 and 16.

95 Jacob Klein, *Greek Mathematical Thought and the Origin of Algebra*, trans. Eva Brann, Cambridge Mass. and London 1968.

96 *Ibid.*, 118.

this without any detour through a 'general notion' or a concept of a 'general magnitude'. [...] It does not identify the object represented with the means of its representation, and it does not replace the real determinateness of an object with a possibility of making it determinate, such as would be expressed by a sign which, instead of illustrating a determinate object, would signify possible determinacy.⁹⁷

Modern mathematics, by contrast, which Klein sees as originating with Vieta, Stevin and Descartes,

turns its attention first and last to *method as such*. It determines its objects *by reflecting on the way in which these objects become accessible through a general method*.⁹⁸

Consequently, the focus of mathematical investigation shifts from the solution of given problems to the consideration of how, in the abstract sense, problems are solved: from the ontological to the epistemological. The concept of indeterminate number which makes such a shift of intentionality possible is seen by Klein as first being given conscious, formulated expression in the work of one of Pell's heroes, the earliest of Klein's three founders of modern mathematics, François Viète, or Vieta (1540-1603). It was just such a shift of intentionality that Pell and Moriaen anticipated in the impending establishment of a new, pansophic epistemology.

97 Ibid., 123. In all quotations from him, the italics are Klein's.

98 Ibid., 123.

Pell was not alone in seeing Vieta as an epochal figure in the field.⁹⁹ Marin Mersenne, one of the foremost mathematicians of France, who corresponded regularly with Haak and Pell in 1639 and '40, was eager for a single-volume edition of his great sixteenth-century countryman to be brought out, and commissioned Abraham and Bonaventura Elsevier of Leiden to print it.¹⁰⁰ In 1639 they published an appeal for manuscripts to complete their edition.¹⁰¹ A letter from Pell some three years later, without indication of addressee, mentions this appeal, and says that Pell supposed the idea had been forgotten

till Mr Morian's letters to you told us, not only that they still continue in the same mind, but also they looked upon me, desiring to know

99 Mersenne considered him the foremost exponent of mathematical analysis (*Correspondance de Mersenne* VIII, 581) His work came as a revelation to Jungius and confirmed him in his commitment to mathematics (Guhrauer, *Jungius*, 21-22). Whether his achievement was quite as epochal as Klein argues is not a point I am competent to judge, and is not at issue here. What is important to the argument is that it was regarded as such by the likes of Pell, Moriaen and Jungius, and for very much the reasons Klein proposes. For a more recent account of Vieta, see Jacques Borowczyk, 'Enseignement et Diffusion de l'Algèbre Nouvelle de François Viète', *Diffusion du savoir et affrontement des idées 1600-1770 (Festival d'Histoire de Montbrison 1992)* (Montbrison, 1992), 287-309, and L. Charbonneau and J. Lefebvre, 'L'introduction à l'art analytique de François Viète: programme et méthode de l'algèbre nouvelle', *Proceedings of the Canadian Society for History and Philosophy of Mathematics*, 1992.

100 The edition finally appeared in 1646 (see no. 68, n.8).

101 Facsimile in *Correspondance de Mersenne* VII, facing 109.

how able or willing I am to further that design of theirs.¹⁰²

This is typical of Moriaen's frequent attempts to chivy Pell into producing something, both for his own and the common good. Pell, however, advised that he could 'hear of nothing of Vieta's in manuscript in England but such pieces as are already printed' and, equally typically, recommended other mathematicians who might be able to provide notes.¹⁰³ The Moriaen letters in question are obviously nos. 84 and 85, which clinches the identification in the *Correspondance* of Hartlib as recipient of Pell's letter.

Jungius's closest friend and colleague at the Hamburg Gymnasium, the mathematics professor Johann Adolf Tassius, was another correspondent who followed enthusiastically the progress of the Pansophic project, and he too received a copy of Pell's *Idea* from Hartlib.¹⁰⁴ Whether he knew the work was by Pell is uncertain (it was published anonymously), but he was certainly as convinced as anyone else of Pell's

102 *Correspondance de Mersenne* XI, 308. The letter is also given in Robert Vaughan, *The Protectorate of Oliver Cromwell* (London, 1839) II, 347-54.

103 *Ibid.*, 308-311.

104 Hartlib to Tassius, 10 August 1638, Staats- und Universitätsbibliothek Hamburg, sup. ep. 100, 60-63; slightly edited transcript in *KK I*, 32-36. Hartlib said he was sending 'eine andre Idæam Conatum Mathematicorum eines andern Authoris [than J.L. Wolzogen], darvon ich des H. vnparteyliches judicium mit dem ersten erwarte' (63r; *KK I*, 36), which given that this is precisely the period when Hartlib was distributing the *Idea* is almost certainly a reference to it.

credentials. He too hoped to see Pell contribute to the Vieta edition, and likewise stressed the transcendent importance of method. His comments are preserved in a report from Dury, who wrote that Tassius

entreated Mr Pell to elaborate the Analytical Method which Vieta hath begun to shew but hath not perfected. For if wee have (sayth hee & it is true in all Sciences) The true principles once of Theory & the Method of proceeding from principles to find Conclusions infallibly & sufficiently made knowne wee neede noe more for the resolution of all questions that can bee propounded of what kind soever they bee. For Questions & Cases in all Sciences are infinite but the Rules to find out truth in every thing are few.¹⁰⁵

This perceived centrality of Vieta and the enthusiasm for him shared by both Pell and Moriaen is important to my argument here because Vieta exemplifies with particular clarity how the new mathematics, the new focus not on individual problems but on method as such, could be seen as a model for Pansophy. To quote Klein one last time:

In Vieta's 'general analytic' this symbolic concept of number appears for the first time [...] The condition for this whole development is the transformation of the ancient concept of *arithmos* and its transfer into a new conceptual dimension. The thoroughgoing modification of the means and aims of ancient science which this involves is best characterized by a phrase [...] in which Vieta expresses the ultimate problem, the problem proper, of his 'analytical art': 'Analytical art appropriates to itself by right the proud *problem of problems*, which is: TO LEAVE NO PROBLEM UNSOLVED' ('fastuosum problema problemarum ars Analytice [...] iure

105 Dury to Hartlib, 13 September 1639, HP 9/1/95B.

sibi adrobat, Quod est, NULLUM NON PROBLEMA SOLVERE').¹⁰⁶

This is precisely the ultimate goal proclaimed (a little less portentously) in Pell's *Idea*: to 'resolve any Mathematicall Probleme'. It was cited too - verbatim this time - by Moriaen, soon after receiving a copy of the *Idea*, when enquiring how far Pell's method extended: 'Ich wolte gerne wißen ob sich Mons. Pellii Logistica so weit erstrecke als des Vietæ Nullum non problema soluere' (no. 2). That is to say, was Pell himself capable of putting his *Idea* into practice? If he was, then surely it would be possible - and this is where the leap of faith comes in - to apply analogous means to attain the same end in all other branches of knowledge. It would be possible, as Dury insisted in a letter to Cheney Culpeper,¹⁰⁷ to produce a treatise showing

the universall method of ordering the thoughts, to finde out by our own industry any truth as yet unknown, and to resolve any question which may be proposed in nature as the object of a rationally meditation.¹⁰⁸

Again, the contrast with Bacon is instructive.

Revelling in the concrete and the specific, Bacon clearly thought mathematics rather a bore:

For it being in the nature of the mind of man, to the extreme prejudice of knowledge, to delight in the spacious liberty of

106 Klein, op. cit., 185, quoting Vieta, *In artem analyticen Isagoge*, 1591; the capitalisation is Vieta's.

107 On Culpeper, see chapter Six, section 5, and Chapter Seven, sections 1 and 3.

108 6 Jan. 1642, Young, *Comenius in England*, 74.

generalities, as in a champagne region, and not in the inclosures of particularity; the Mathematics of all other knowledge were the goodliest fields to satisfy that appetite.¹⁰⁹

But to Moriaen, Dury and Tassius (assuming Dury quoted him accurately), mathematics was not a matter of 'spacious generalities', it was a paradigm of 'right method' such as might be applied in any subject, theology not excepted.

This application of 'method' and the extent to which it was novel, even revolutionary, in the mathematics of the period, is exemplified in Moriaen's mild boast about his own abilities as a mathematics teacher: in a fifteen minute lesson, he claimed, he could teach anyone tolerably competent in addition and multiplication to calculate any power of any number, the secret being that he did not attempt to teach by rote but from first principles.¹¹⁰ This can only mean that traditional teachers were wasting an extraordinary amount of time on making their students learn powers by rote, like basic multiplication tables - little wonder that 'fast niemand weit vber den Cubum kommen' - and that Moriaen's breakthrough was to advise them to calculate powers instead of memorising them. Like many bright ideas, it is staggeringly obvious once it has been seen, yet Moriaen claimed to have caused widespread astonishment

109 Bacon, *Advancement of Learning*, Works III, 359-360.

110 No. 10.

with the success of his 'method'. His real point was that the application of proper method would produce results both far more easily and far more reliably than the uttermost exertions of memory. Pansophy similarly aimed not to cram the totality of knowledge into a single head, but to establish a method, a way of looking at the universe, which would enable the student to draw infinite conclusions from the natural symmetry of all things, just as a mathematician using only the basic principles of multiplication can extend a pattern of numbers into infinity:

I say, we would have such a booke compiled, which alone, instead of all, should be the Spense, and Storehouse of Universall Learning [...] by reading whereof, Wisdome should of its own accord, spring up in mens minds, by reason of the cleare, distinct and perpetuall coherence of all things [...] that so all things which may be known (whether Naturall, Morall, or Artificiall, or even Metaphysicall) may be delivered like unto Mathematical demonstrations, with such evidence and certainty, that there may be no roome left for any doubt to arise.¹¹¹

111 *A Reformation of Schooles*, 25. Similarly on p.51: 'Neither in the delivery of these things, though evidently true, do wee presuppose any thing [...] but we premonstrate rather, that is we deduce one thing out of another continually, from the first principles of Metaphysickes, untill we come to the last, and least differences of Things: and this with such evidence of truth, as the propositions of the Mathematicians have, so that there is a necessity of yeelding to the last as well as to the first, for the continuall, and nowhere interrupted demonstration of their truth.' Cf. also Moriaen's quotation of a lost Comenian tract or letter in no. 24.

Dury too, seeking an epistemological tool with which to produce a foolproof method of Scriptural analysis, turned to mathematics as a paradigm. This he described in his *Analysis Demonstrativa*, which Hartlib sent Moriaen in manuscript in March 1639.¹¹² This method Dury explicitly compared to the infallible procedures of mathematics: it too is 'Methodus [...] demonstrandi rem quamlibet a priori cognito' ('a method of demonstrating any thing from a prior knowledge'), and

the end of this Method which I vse is to apprehend it [the wisdom of Scripture] demonstratively that is infallibly./ Soe that a man shal be able to demonstrat every thinge which he doth apprehend to be certainly true a priori noto et infallibili [from things previously and infallibly known] till he come to the first principle of infallibility which noe man can deny, for that by a continuall orderly concatenation of apprehentions the vnderstandinge is ledd by infallible degrees from one intellectual obiect to another till it gather them all vp together in one summe soe that it can all at once apprehend the whole, and all the parts thereof distinctly & conionctly in their severall relations each to other and each to the makeinge vp of the whole, and I can not compare the manner of proceedinge better then to an arithmetically addition or multiplication wherein one summe beinge added to another maketh vp the third and many summes or numbers beinge added into one, make vp a greate totall summe, soe it is in this method of apprehendinge intellectuall obiects one obiect is added to another to make vp a third which is common to both and many obiects are reckoned or summed vp together to make a totall

112 Moriaen acknowledged receipt in no. 10. The *Analysis* consists of a compilation of extracts from letters to Joseph St Amand of November and December 1637 (HP 1/4/19A-22B), and is further elaborated in another letter to him of 26 February 1640 (HP 1/4/1A-8B). Moriaen intended to have it published, but whether he in fact did so remains unclear (see Chapter Two, section 1).

summe and generall conclusion of some
intellectuall matters[.]¹¹³

Just as Vieta and Pell maintained that the application of right method to mathematics would leave no problem unsolved, so Dury thought the same could be done for the exegesis of Scripture. It seems these musings had their genesis as the resolution of a personal crisis of faith at least four years earlier, at a time when Dury almost despaired of resolving the inherent ambiguities of natural language: 'Dury himself,' wrote Hartlib in 1635, could at one time

finde no certainties almost in any thing,
though hee was able to discourse as largely of
any thing as any other. Yet solidly and
demonstratively hee knew nothing, till hee
betooke himself to the Scriptures and lighted
upon the infallible way of interpreting
them.¹¹⁴

Dury apparently claimed to have confuted Descartes' scepticism with this method: though the French philosopher denied the possibility of such certain knowledge, Dury stuck to his guns and Descartes, 'being brought to many absurdities, left of'.¹¹⁵ This is almost certainly the germ of the idea that later developed into the *Analysis Demonstrativa*, but the ideas and the language used in this later work bear the clear imprint

113 HP 1/4/20A.

114 Eph 35, HP 29/3/14A; transcript in *HDC*, 167. Cf. Popkin, 'The Third Force', 40-42. Popkins argues persuasively that it was the millenarian writings of Joseph Mede that first suggested to Dury the way out of his labyrinth.

115 Eph 35, HP 29/3/14A.

of the Comenian *Præcludia* Hartlib had just published when Dury wrote the *Analysis*. The mathematical analogy provided Dury with the assurance he needed that a merely human language could be interpreted with absolute and universal certainty, at least so long as it had the guarantee unique to Scripture of an originally divine inspiration. And he pushed the analogy rather further than Comenius had done. Though he foresaw the obvious objection that natural language does not correlate directly to extra-linguistic reality in the same way that mathematical language does, he denied it - not, significantly, by argument, but by an assertion of faith in method:

But here you will say howe can this be done aswell and demonstratively in obiects intellectuall as in arithmetically numbers? I will answere you that the one can be done aswell as the other yf the right obiects be represented to the minde, and yf the right method of summinge vp the same, be made vse of. For I in this businesse must doe as Mathematicians in their demonstrative sciences vse to doe, I must take a postulatum to be given or granted vnto me, vpon which the whole grounde of these demonstrations will rest, Nowe this Postulatum is a thinge which I suppose noe rationally man will denye, vizt that yf the vnderstandinge can apprehend truely the simple axiomes of a discourse, and that yf those simple axiomes truely apprehended, be rightly ioyned together, that the compound which resulteth from the same in the vnderstandinge cannot be false; vpon this one Postulatum (which yf neede were might be proved by a Mathematicall demonstration of lynes and figures) relyeth the whole demonstrability of this Analytical Method.¹¹⁶

116 Dury, *Analysis Demonstrativa*, HP 1/4/20A-B.

Dury's method of breaking Scripture down into simple unambiguous axioms, and then recomposing it by 'right method' to arrive infallibly at the text's true meaning met with Moriaen's warm approval, despite his habitual scepticism about Dury's irenical projects. What especially appealed to him in this work was no doubt the eschewal, so unusual in Dury, of consideration of particular doctrines as they had been elaborated, and the return instead to first principles and to a single true method that would transcend all doctrine. And he wholeheartedly agreed that mathematical principle could be applied to religion, despite the scepticism of misguided rationalists like Descartes:

dan beÿ vielen gehet der glaub nicht außer den augen vnd ob sie woll gleuben müßen dati certitudinem Mathematicam so glauben sie doch nicht das man einen solchen methodum in relig. scientijs sonderlich aber in Theologia finden vnd practisiren könne vnder welchen auch Mr des Cartes ist (no. 10).

It has to be said that mathematical concision is not one of the merits of Dury's system. I have quoted it at some length here to illustrate the insistent, almost defensive iteration of the mathematical analogy. Dury wanted to represent the literal sense of Scripture as a series of equations with incontrovertible solutions, and though he did go on to say that there is also a deeper sense accessible only to 'the Spirituall man who hath received vnderstanding to discern Spirituall things

Spiritually',¹¹⁷ that spiritual sense can only be discerned through a precise and unambiguous grasp of the literal.¹¹⁸

The attraction of such a view was that if assent could be 'compelled' by 'mathematical' demonstration of the single unambiguous true meaning of Scripture, religious disputation could be done away with at a stroke. It is a strikingly passive form of analysis:

the only Prudency to be vused in this Method is to bringe a mans vnderstandinge to a spirituall Captivitie vnder the sense of the Letter [...] Soe that the vnderstandinge is ledd and becometh wholly passive[:] as an eye that seeketh somethinge is meerely passive in respect of the obiects that it reflecteth vpon, soe must the vnderstandinge be in respect of the words of sacred scripture.¹¹⁹

This distinctly echoes the mathematical analogies of the *Præludia*, and foreshadows the passive assent to mathematical demonstration recommended by Comenius in *Panaugia* (Universal Light), the second part of the *Consultatio*:

117 Ibid., HP 1/4/3A.

118 This desire to equate natural with mathematical language is highly symptomatic of the period's struggle to cling to absolute certainties in the face of an increasing awareness of relativity, and found perhaps its most extreme expression in schemes such as Cave Beck's for a universal language which consisted basically of ascribing a given numerical code to the 'equivalents' in all languages of a given word. See Vivian Salmon, *The Study of Language in Seventeenth-Century England* (Amsterdam, 1979), 176-190. See also no. 139, including an outline of David Goubart's proposal for a similar scheme.

119 HP 1/4/21B.

The ways of light have been so well designed by God's skill that there is nothing vague about them.

They have been made to conform to such unchanging laws that everything about them can be proved with mathematical certainty. By the same theory the intellectual light of wisdom can rightly be governed by unchanging laws of method so that in the process of teaching and learning nothing is left vague and uncertain but everything operates with mathematical precision.¹²⁰

If you use your eyes, you will see the same thing as I do and there can be no difference between us.¹²¹

Such was the vision: the laws of method would teach men to see, and once they had learned to see they would realise they were all looking at the same thing. Comenius too repeatedly stressed the irenical nature of his Pansophy, which he predicted would lead to the healing of all schism within Christianity and the conversion of the infidels.¹²²

All academic and doctrinal disputes would fall away, the Aristotelian would lie down with the Ramist, the Galenist with the Paracelsian, the Lutheran with the Calvinist, the Jew with the Christian; all would assent to the self-evident truth as meekly and dispassionately as they could all assent to a demonstrable mathematical

120 *Panaugia*, trans. A.M.O. Dobbie, Shipton on Stour 1987, ch.11, para. 101, p.71.

121 *Ibid.*, ch.15, para. 42, p.99.

122 *Reformation of Schooles*, 26. It is typical of Comenius's obsession with universality that, unlike so many chiliasts, he was not prepared to settle for the conversion of just the Jews: he wanted to 'reform' (ie. intellectually colonise) the entire world.

equation. In fact, people did not always assent meekly to mathematical demonstrations - witness for instance Pell's controversy with Longomontanus about the latter's supposed squaring of the circle¹²³ - but that, presumably, only meant that at least one of the disputants had not fully grasped the right method. All that was lacking was a proper, incontrovertible exposition of that method, and doubt and division would be at an end, the earth would be filled with the knowledge of the Lord¹²⁴ and the stage set for the Second Coming. First, however, that method had to be definitively worked out and mankind in its wilful blindness persuaded to consider it impartially. It was a task Comenius compared to nothing less than the construction of the Tabernacle of the Ark of the Covenant in the wilderness.¹²⁵ Moriaen adapted this image to apply it to himself:

zue dem werk des heiligthumbs nicht allein
Bezaliel und Aholiab erfordert werden sondern
auch die Ienige so herbeÿ schaffen was zur
arbeit von nothen ist (no. 1).¹²⁶

He saw himself not as one of the craftsmen who actually fashioned the sanctuary, but as someone called to the humbler yet no less necessary task of fetching the material resources necessary for it.

123 See no. 29 and notes.

124 *Isaiah*, 11:9, a citation also used by Comenius (*Reformation of Schooles*, 26).

125 *Reformation of Schooles*, 24.

126 Cf. *Exodus* 31:1-6.

4:4 *The Collection in the Netherlands*

It may have been in the course of his quest for people through whom to distribute the *Præludia* that Hartlib first made personal contact with Moriaen, probably on the recommendation of Dury or Haak. It is evident from his first surviving letter to Hartlib that the latter had been fairly bombarding him with enquiries and publicity relating to the project. The warmth of his response must have been gratifying. Together with Johann Rulice (Rulitius), who was a preacher in the English Church at Amsterdam when Moriaen arrived and moved shortly afterwards to the German,¹²⁷ Moriaen soon became the principal agent in the Netherlands for the Hartlib network and all its multifarious activities, particularly the collection for Comenius.

His previous experience of relief work for the Palatine exiles, and the contacts he had made during his previous career, must have made him an ideal candidate for such a role. His years in Frankfurt and Cologne had given him access to the largely clandestine information network of the German Reformed Church, and in the early years of his correspondence with Hartlib, references recur to largely unspecified sources of information in those cities, notably to a 'Comibarius' (agent) in

127 He joined the English church in November 1635 and transferred to the German on 4 Dec. 1639 (no. 31); cf. O.P. Grell, *Dutch Calvinists*, 181.

Frankfurt, and one Budæus in Cologne, through whom he distributed literature sent him by Hartlib.¹²⁸ Between May and September of 1641, he and Odilia spent some three months in Cologne and Frankfurt, but no account whatsoever is given of their activities there.¹²⁹

This collection had been Hartlib's principal occupation since the early 1630s - well before the appearance of the *Præludia*. Its goals, as has been said, were to relieve Comenius's personal circumstances, to publish his works, to supply him with amanuenses and to enable him to visit England. Hartlib also supplied material for the project: in 1633, Comenius thanked him, through his then collaborator Jan Jonston, for promising to send manuscript copies of (unspecified) works by Bacon.¹³⁰ In 1634, a Bohemian student and Austin Friars protégé in London, Jan Sictor, complained to the Austin Friars consistory that Hartlib was organising a private collection for Bohemian exiles.¹³¹ Quite what Sictor had against this is unclear: perhaps, since he specifically remarked that there were Bohemians who could organise such collections better, this is an example of the rivalry which Grell suggests existed between the different refugee groups,¹³² or perhaps he doubted the

128 Nos. 1, 12, 13, 14.

129 Nos. 63 and 64.

130 Jonston to Hartlib, Aug. 1633, HP 44/1/2A.

131 Hessels, *Ecclesiæ Londino-Bataviæ Archivum*, III, no. 2311.

132 Grell, 203.

probity of such privately administered relief work. As Grell remarks, 'Hartlib's claim that he was only obtaining a few pounds for the publication of a work by Comenius hardly sounds credible', - though it should be added we only have Sictor's word for it that Hartlib did make such a claim.¹³³ It is probably true that Hartlib's collection was for ends related directly to Comenius rather than the exiles in general, but it is doubtful whether the sums involved were as small as Hartlib apparently suggested and certain that his ambitions extended beyond the publication of one book (presumably, as Turnbull suggests, the *Prælua*¹³⁴).

Sictor's accusation was levelled jointly against Hartlib and a Moravian exile, Johann Christoph Berger von Berg (or de Berg), who had been in England at least since the late 1620s.¹³⁵ Von Berg was an inventor whose ideas aroused much attention from Hartlib and his associates, particularly his designs for a *perpetuum mobile*, a device for lifting weights and another for draining mines.¹³⁶

133 Grell, 203. Turnbull in his account of the incident takes Hartlib's alleged word for it (*HDC*, 35).

134 *HDC*, 35, n.4.

135 A petition by von Berg at HP 71/12/1A-7B says he has been in Great Britain for five years; this is undated but must be from before von Berg's departure to the Continent in 1634.

136 Innumerable references in the *Ephemerides*, esp. of 1634 and 1635. See also Webster, *Great Instauration*, 218, 358-9, and Turnbull, 'Samuel Hartlib's connection with Sir Francis Kynaston's "Musæum Minervæ"', *Notes and Queries* 197 (1952), 33-7. On 1 Jan. 1640 he and Caspar Kalthof, Hartlib's other favourite inventor at this period, signed an agreement to share all their

Hartlib was, in fact, publicly engaged in raising support for von Berg himself in the form of investment in his inventions,¹³⁷ not that that would preclude his collaborating on a separate collection for his countrymen.

Von Berg promptly set off for the Netherlands - whether or not on account of the charge it is impossible to say. He was there by 2 November,¹³⁸ bearing 30 shillings to be sent 'ad Bohemum', ie. 'to the Bohemian' - not, it should be noted, 'the Bohemians'.¹³⁹ Though Comenius was in fact Moravian, not Bohemian, it seems likely he is the beneficiary meant. The same unidentified informant went on to report, 'H Berger te salutet. Sagt er habe viel versuchet in bewuster sache,

discoveries under a vow of secrecy, witnessed by Hartlib, Haak and Hübner (HP 48/4/1A-B). John Pym was particularly keen to use his draining machine in the mines around Coventry.

137 There is an account of von Berg's woes, and a plea for assistance through investment, in the form of an open letter 'to all [...] to whome by Mr Hartlib's meanes the seeing & reading of this present shalbe offered' (n.d., HP 71/12/1A-7B), and a petition to the Lord Mayor and Aldermen of London, acknowledging 'a large testimony of their bounty' received some three years previously, and hoping for another (n.d., HP 8/63/25A-B), probably put into English at Hartlib's instigation (the petition itself states that von Berg still did not understand the language).

138 Anon. to Hartlib, 2 Nov. 1634, HP 11/1/10A. Von Berg had obviously spent time and made contacts in the Netherlands before, as the States General granted him a patent for a perpetual motion mill in Jan. 1629 and for a hoisting device in Oct. 1633 (Doorman, G295 a and G323, pp.130 and 133).

139 Anon. to Hartlib, from the Hague, 6 Nov. 1634, HP 11/1/11A.

aber noch wenig ausgerichtet.'¹⁴⁰ This 'known matter' might simply be the promotion of von Berg's own inventions, but it sounds very much as though von Berg had gone over to organise another collection in the Netherlands, albeit without much success. Comenius himself was aware of him, inquiring in 1641, 'Christoph Bergerus noster vivitne? Ubi et quid agit?' ('Is our Christoph Berger still alive? Where [is he] and what is he doing?')¹⁴¹ Writing from the Hague two years later, Dury reported that von Berg's assets had been frozen, presumably by creditors.¹⁴² He seems to have been one of Hartlib's less successful collaborators. Another anonymous correspondent later warned Hartlib that his advocacy of the French inventors Hugh L'Amy and Pierre Le Pruvost would bring him into discredit if they failed to live up to their promises, citing von Berg as a precedent:

der herr gedencke wie es Ihme mit Bergern, mit dem perpetuo mobili vnd anderen dergleichen sachen gangen: welche Ihn an seinen anderen viel nutzlicheren expeditionibus fast gantz verhindert Ihn gantz keinen vortheil, dahingegen aber grossen schaden vnd vngelegenheit gebracht.¹⁴³

From this point on there is no further mention of him in the papers.

140 2 Nov. 1634, HP 11/1/10A.

141 Comenius to Hartlib, 17 Feb. 1641, HP 7/84/8A.

142 Dury to Hartlib, 13 August 1643, HP 2/10/12A.

143 April 1647, HP 59/9/8B.

Similar efforts by Hartlib on behalf of Comenius personally and the promotion of his work continued until 1641 and are partially documented among his surviving papers,¹⁴⁴ but the extent of the contribution from the Netherlands and Germany (apart from the spectacular case of the de Geer family), and the network through which it was organised, have hitherto been underestimated. Moriaen approached the newly-arrived Reformed minister in The Hague, Caspar Streso, who as a student had benefited from the charity of Austin Friars, and was later commissioned to distribute donations from the church to the exiles in Anhalt.¹⁴⁵ Streso was initially sceptical, suspecting the cause was tainted with Socinianism, but Moriaen won him round and established him as the principal organiser of the collection in The Hague.¹⁴⁶ He was keen to cast the net as far afield as Danzig and approach his friend Georg Sommer, who was preacher there, though this suggestion does not seem to have been followed up.¹⁴⁷ Further confirmation of the leading role played by Moriaen and Rulice in the Continental campaign for Comenius is provided by the sheet in Hartlib's hand listing recipients of 'The New Comenian Booke given away', in which Moriaen features twice, first as

144 See M. Greengrass, 'Contributions for Comenius', *Acta Comeniana*, forthcoming.

145 Grell (who spells him Strezzo), 180; Hessels III, nos. 2569 and 2654.

146 No.9.

147 Nos. 9 and 16.

recipient of five copies, then - doubtless in response to his repeated statements that the more publicity he received the better¹⁴⁸ - as co-recipient, with Rulice, of fifty, the largest single consignment by a considerable margin from the total of almost 300 distributed.¹⁴⁹ Streso was sent five copies by Hartlib and more by Moriaen, who also sent some of his copies to Budæus in Cologne for further distribution.¹⁵⁰

He was constantly on the look-out for new recruits or people who might less directly promote the cause. On hearing of an Arab resident in Amsterdam, Moriaen hoped he might be employed to produce an Arabic version of Comenius's *Janua Linguarum*.¹⁵¹ As so often in the Hartlib circle, the enthusiasm was somewhat premature: the man in question (whose name is never revealed) understood only Arabic and Hebrew, and no Hebrew version of the *Janua* had appeared.¹⁵² Nothing daunted, Moriaen

148 Eg. nos. 1, 4, 11.

149 HP 23/13/1B. I am almost certain the recipient of five copies is 'Morian', but the list is in Hartlib's very worst handwriting. It is certainly 'Morian et Rulit.' who received fifty. Turnbull (*HDC*, 343) suggests that the work in question is probably the *Conatuum Comenianorum præludia* (1637) or possibly its second edition, *Prodromus pansophiæ* (1639). Moriaen's acknowledgement of a number of copies of the *Prodromus* which had been passed on to him by Rulice (no. 14, 12 May 1639) would seem rather to suggest the latter. Hartlib's undated list may, however, refer to an earlier consignment of *Præludias* not mentioned in the surviving letters. Von Berg also features on the list, as recipient of one copy.

150 Nos. 13 and 18.

151 No. 10.

152 The anonymous Arab had come to Amsterdam hoping to make a living teaching Arabic, apparently under the

promptly suggested that Rittangel should produce one.¹⁵³ He hoped to persuade the diplomat Bisterfeld to encourage his master, Prince György Rakóczi of Transylvania, to contribute,¹⁵⁴ though there is no evidence he did so. He tried to allay the entirely justifiable fears of the mathematics professor at Hamburg, Jungius's friend J.A. Tassius, that if he responded to Hartlib's request for his opinion of Comenius's work, Hartlib would reveal it to the world at large, laying Tassius open to attacks by controversialists.¹⁵⁵ Moriaen himself repeatedly tried (though again with little success) to coax contributions from the Dutch West and East India companies.¹⁵⁶ A visit from two diplomats from Cologne (to whom Moriaen had presumably been recommended by old colleagues or friends there) provided another opportunity to publicise the cause.¹⁵⁷ As has been mentioned, Moriaen in 1639 arranged publication of a petition entitled *An Exhortation for the Worke of Education Intended by Mr Comenius*, which has since vanished without trace.¹⁵⁸

impression he would find a plentiful supply of Hebrew-speaking students.

153 No. 13 (assuming that 'Rittungal' means Rittangel: see Chapter Two, section 2, and no. 13, n.6).

154 No. 9.

155 No.17; but see n.16 to that letter: it is possible it was Tanckmar rather than Jungius whom Moriaen was trying to reassure.

156 Nos. 10, 14, 38, 43, 51.

157 No. 34.

158 No. 21, see Chapter Two, section 1. It is not in Wing, nor in Turnbull's list of Hartlib's publications (*HDC*, 88-109), and is mentioned nowhere else in the surviving papers.

In more concrete terms, Moriaen could report that by 24 March 1639 he had raised 200 Imperials, which he sent directly to Comenius to cover his immediate needs while waiting for more to come in.¹⁵⁹ This is equivalent to something approaching £50,¹⁶⁰ a substantial sum for a charitable contribution to a single person. Hartlib in the same year passed on £42 7s. 6d. to Comenius from his collection in England.¹⁶¹ Between them, therefore, Hartlib and Moriaen had raised almost the £100 which an anonymous correspondent whose advice on the funding programme Hartlib had canvassed proposed as adequate annual provision for a reasonably frugal scholar.¹⁶² Hartlib would appear to have passed this suggestion on to both Moriaen and Comenius for comment, since Moriaen was initially confident that 'zue 2 oder 3 collaboratoribus Ieden auff ein hundert lib: geschätzt werden wir wills Gott die mittel woll finden' (no. 9) and could later declare himself pleased to hear that Comenius considered either £200 or, at a pinch, precisely this sum, £100 a year, sufficient for his needs.¹⁶³ However, the long-

159 Nos. 10 and 11.

160 Exchange rates fluctuated, but the pound generally equated to something between 4 and 4½ Imperials over the period of Moriaen's and Hartlib's correspondence.

161 HP 26/23/1A-8B; cf. Greengrass, 'Collections for Comenius'.

162 HP 26/23/1A-8B; transcript in Greengrass, 'Collections for Comenius'. The tract is undated but obviously to be placed in the late 1630s. Turnbull gives what seems to me an unduly unsympathetic summary, *HDC*, 347-8.

163 No.23.

term goal was not simply to see Comenius himself tolerably comfortable, but to provide both for him and his family, to employ amanuenses and assistants, and to guarantee the peace and leisure he needed to complete his Pansophy. With this in mind, Moriaen's strategy, like Hartlib's, was to gather in not just one-off contributions, but subscriptions committing the signatories to regular support over a period, the longer the better.¹⁶⁴ This, not surprisingly, proved harder to achieve, but on 14 August 1639, having campaigned for over eight months, he triumphantly reported

das Ich Gott lob nun mehr den anfang der vnderschrift hab. vnd mir nun fort an allein guten succes einbilde. Es ist mir recht saur worden ehe Ichs so weit gebracht hab. Gott lob das es vberwunden ist. der gebe ferner seine genade (no. 22).

And as Moriaen had anticipated, once the ice had thus been broken, the subscription progressed steadily, if less impressively than he had hoped, for the next three years, until the support of Comenius was single-handedly undertaken by Lodewijk de Geer, easily the biggest catch of Moriaen's (or, indeed, Hartlib's) quest for patronage. By the end of 1640, Moriaen had enlisted regular support from the four Reformed Churches of Amsterdam (the German, Dutch, French and English).¹⁶⁵

164 No. 1.

165 This appears from the news that 'diese kirche sich am lezten vnderschrieben hatt' (no. 46, 5 November 1640). It is not clear which church he means by 'diese', though he would himself presumably have been most closely

Unfortunately, no statistics are available for the sums promised or collected, apart from Moriaen's mention of securing 40 Imperials from the Amsterdam consistory in March 1640,¹⁶⁶ sending a further 50 Imperials in mid-July 1640,¹⁶⁷ and raising £25, earmarked especially for Hübner, by 13 January 1641.¹⁶⁸ Hartlib's accounts also mention that 'Mr Morian sent Libr. 4' in 1641, though this relatively small sum probably represents a personal contribution rather than the proceeds from his collection.¹⁶⁹ He also lent 100 Imperials out of his own pocket for Comenius's family on 23 December 1641.¹⁷⁰ This last piece of generosity turned out, in Moriaen's eyes at least, to be superfluous, as Comenius's plea for funds for his family had also reached de Geer, who had sent 100 Imperials independently. However, the Comeniuses apparently found a use for the full 200, as the debt seems not to have been settled until 1648. In Comenius's letter of 11 September 1647 dismissing his assistant Cyprian Kinner, one of the wide assortment of grounds listed is that he could not afford to pay Kinner on account of his debts, especially to Moriaen, whom he

involved with the German, of which his friend Rulice was then preacher, but in any case the implication is clearly that all the others had already committed themselves.

166 No. 38.

167 No. 43.

168 No. 52.

169 HP 23/12/2B. This and a record of the £25 for Hübner (HP 23/7B) are, rather surprisingly, the only mentions of Moriaen in Hartlib's surviving accounts.

170 No. 71.

owed 100 Imperials.¹⁷¹ (An unimpressed Kinner added the marginal notes, 'Hem! vis detrahere mihi salarium jam meritum? [...] Solve tu tua debita ipsemet' 'Huh! do you want to take away the salary I have already earned? Settle your debts yourself!'.) Moriaen finally reported receipt of the money on 3 February 1648.¹⁷² Comenius had benefited from an interest-free loan for rather more than six years, which may be one of the reasons why Moriaen became perceptibly cooler towards him during the 1640s.

Comenius was not, however, the sole beneficiary. Moriaen was keenly aware - as was Comenius himself - that an enterprise of such magnitude could hardly be accomplished by one man, and that Comenius badly needed competent assistance and informed constructive criticism if he was to produce anything more than alluring sketches of his Temple of Wisdom.¹⁷³ It would also, he repeatedly pointed out, take more than alluring sketches to persuade sceptical spirits that such an edifice was feasible at all and that Comenius was capable of supervising its construction. In these respects, his views chimed

171 HP 1/35/3B.

172 No. 96. It is possible, of course, that this represents repayment of a different and later debt not mentioned in the surviving correspondence, but it seems a good deal likelier (given that the sum mentioned is exactly the same) that this was the money Moriaen had forwarded at the end of 1641.

173 Or 'Temple of Christian Pansophy', described in the *Dilucidatio: Reformation of Schooles*, 64-84. It is an allegorical account of Comenius's proposed education system based on the structure of the temple in the vision of Ezekiel.

closely with those of Joachim Hübner, who was at once one of Comenius's greatest admirers and severest critics,¹⁷⁴ and it is little wonder Moriaen had such a high regard for the young man's intelligence and perspicuity, and was keener to see him than anyone engaged as Comenius's assistant. Hübner and Comenius between them would convince all doubters of the viability of their reform programme.¹⁷⁵ (As things turned out, Hübner never did take up such a post, since de Geer disapproved of him, probably on account of his outspoken refusal to commit himself to any doctrinal allegiance.) Comenius was viewed as first among equals in the pansophical undertaking, and Moriaen was given to reminding Hartlib that there were other needy scholars too: he was particularly keen to see funds provided for Hübner and, above all, Pell, who he hoped would be a direct beneficiary of the Dutch collection:

[Ich] hoffe das mit nechstem zum anfang etwas remittirn werde damit Dn Pell in guter devotion erhalten bleibe vnd nicht vrsach bekomme seinen wie es scheint Ihme angeborenen Mathematischen gaist zue dempfen vnd anderwärts vielleicht auch wieder sein aigen herz vnd gemuth zue stellen (no. 6).

Indeed, Moriaen stressed so frequently that the proceeds of the collection should not go to Comenius

174 There are excellent accounts of the relations between Hübner and Comenius in Kvačala, *MGP II*, 51-9, and 'Über die Schicksale der Didactica Magna', *MCG* 8 (1899), 129-144.

175 No. 24.

alone that it seems fair to conjecture he thought Hartlib needed persuading, or at least encouraging, on this point. Comenius made for good publicity, partly no doubt because of the fame of his *Janua linguarum* and partly because of his representative role as senior of the exiled Unity of Brethren, a community remarkably adept at arousing the sympathy of other Protestant denominations for the sack of their country and their persecution by the Habsburgs without alienating them through doctrinal quibbles or political partisanship. Yet Moriaen urged in almost so many words that while the contributors might think they were donating money for Comenius, the administrators of the collection should discreetly see to it that a more equitable distribution was effected:

so müste man so viel möglich ist [...] was hin vnd wieder einkommen möchte in einen gemeinen Beutell samblen vnd nach notturft der sachen ins gemein anwenden. vnd nicht zuelaßen das die leuthe von hauß aus Ihre subsidia H Comenio selbsten zueordnen sonst weiß man nicht woran man ist vnd weil es vnder seinen Nahmen gehet, so würd Er alles bekommen vnd andere nichts.¹⁷⁶

What both men were firmly agreed on was that Leszno was not the place for Comenius. His duties as minister to the Brethren were regarded by many of his West European admirers as a distraction from his far more important pansophic work, worthy enough in themselves but

176 No. 32, 26 December 1639. Cf. also no. 35 (6 February 1640): 'wan diß werkh mit der zeit in rechte ordnung gebracht werden soll, so müsten die subsidia in eine Cassa oder zum wenigsten auff eine rechnung kommen vnd von dann auß dispensirt werden.'

not fit to occupy the time and intellectual resources of a Comenius. As Hübner lamented in 1637:

Von H Comenio Vernehme ich sehr Ungerne, dass er so gantz jetzo Von seinen Pansophischen Meditationibus abgerissen ist, wan er dass werk ubergibt, wird schwerlich so bald ein ander wider kommen, der auff solche weütleüffige gedankhen gerathen wirdt.¹⁷⁷

There is also a distinct sense that an eye needed to be kept on Comenius. As von Berg noted, though Comenius had a 'searching pate et vniversal' and was 'very Expedit et Laborious', he was also 'very Inconstant et sicke et changeable. very credulous et easy to bee persuaded and therefore not good to be alone'.¹⁷⁸ He was prone, Moriaen and many others feared, to allow himself to be side-tracked by such subsidiary labours as the writing of school text-books and, worse still, polemic tracts which rendered him partisan in the eyes of his potential audience and thus compromised the universality of his message.¹⁷⁹ This concern was to become an all too familiar refrain among Comenius's supporters as time went on. As late as 1661, Hartlib could complain to John Winthrop that 'Mr Comenius is continually diverted by particular Controversies of Socinians & others from his main Pansophical Work'.¹⁸⁰ Moriaen's gravest concern as

177 Hübner to Hartlib, 22 March 1637, MGP I, 78.

178 Eph 34, HP 29/2/13A.

179 Eg. nos. 11, 63, 64.

180 R.C. Winthrop, *Correspondence of Hartlib, Haak, Oldenburg, and others of the Founders of the Royal Society, with Governor Winthrop of Connecticut, 1661-1672* (Boston, 1878), 10.

regards the Comenian tendency to wander down blind alleys was aroused by his efforts to invent a *perpetuum mobile*.

This was a subject Comenius had worked on at least as early as 1632, and to which he kept returning obsessively to the very end of his life.¹⁸¹ Not that Moriaen ruled out the possibility of such a thing or considered it unimportant. On the contrary, his informed interest in the Drebbel-Kuffler *perpetuum mobile* in Pfalz-Neuburg has already been mentioned, and he himself had made a practical study of the same problem. This was presumably during his time in Cologne or Nürnberg, though his letters reveal no more about his experiments than that they were unsuccessful.¹⁸² L.E. Harris, in his account of Drebbel's apparatus, maintains that the term was not, at the time, taken literally, but was used to mean merely something that would keep moving of its own accord for an exceptionally long time.¹⁸³ This may be true of Drebbel and the Kufflers, for whom the profit motive was a more important spur to invention than philanthropy or philosophic delight (which is not to deny them a measure of the latter qualities). Their primary concern was to satisfy their customers, a goal which in this case would be achieved by devising a motion that

181 Kumpera, 219-221; Blekastad, *Comenius*, 657.

182 No. 11, 31 March 1639: 'das Ich aber mehr vermuthe dz es Ihm mißluckhen als geluckhen werde, das geschicht auß aigener erfahrung in einer gleichmäßigen sache'; cf. also nos. 34 and 39.

183 L.E. Harris, *The Two Netherlanders*, ch.13 (149-159).

approached more nearly to the eternal than the customers themselves. What Comenius and Moriaen were talking about, however, does indeed appear to have been a mechanism which, barring accidents, would continue until the end of time. An equally important distinction drawn by Harris, which he claims was not drawn at the time, is that between a machine which maintains itself in motion entirely of its own accord and one which relies on the application of some external force such as variation in atmospheric pressure (which he believes Drebbel's depended on) or the use of chemical reactions. But again, as Blekastad's account of Comenius's perpetual motion theory makes plain, Comenius did draw such a distinction, and was quite clear that the application of an external, cosmic and inexhaustible force was the only possible solution to the problem:

Er arbeitete daran nach seiner eigenen Theorie, dass keine irdische Kraft Antrieb dieser Maschine sein könne, da alles Irdische unbeständig sei. Auf eine uns unbekannt Art wollte er den kosmischen 'Dunst' oder die Strahlung auf drei Kugeln von verschiedener Grösse und verschiedenem Metall überführen, um an 'die Kraft, welche die Sterne bewegt', anzuknüpfen.¹⁸⁴

As so often in the schemes of the group - as, indeed, is intrinsic to the very notion of Pansophy - the practical and the metaphysical were inextricably connected.

184 Blekastad, *Comenius*, 303.

The *Ephemerides* are full of excited (and often self-promoting) speculations by a wide range of inventors about the uses to which a *perpetuum mobile* could be put, most of them assuming (though obviously not in so many words) that it would not only sustain but impart energy. One of the most imaginative was William Potter, who in 1652 claimed to foresee that

by it the vse of Horses will be taken away in references to Coaches, wagons etc. The ships shal be driven with any wind as swift as any swift Gale. A Fort shal be caried along the seas and doe all manner of execution [...] Whole Townes shal bee made a floating vpon the seas. Some thousands of swords shal bee wilded by it to cut slash all manner of ways and to destroy whole Armies. All manner of Musical Instruments shal be made most harmonically to play by it. By it may be made to flye throughout the aire.¹⁸⁵

Moriaen, rather more realistically, recognised that, provided the motion were perfectly regular, it could be used to solve the problem of establishing longitudes, a great bugbear of the cartographers of the day.¹⁸⁶ What was preventing the establishment of exact longitude was the lack of a sufficiently accurate chronometer with which to establish the relative timings of given celestial phenomena in different places at sea level. If the motion was perpetual and regular, there could be no question of its running down, and hence it would serve as just such an infallible chronometer. But at least as

185 *Eph* 52, HP 28/2/38B.

186 No. 37.

important to Comenius as any such potential practical application was the idea of connecting with the harmony of the cosmos and demonstrating the most basic tenet of all his thought, that humankind is capable of comprehending the universal (and, significantly, the term *motus universalis* was used interchangeably with *motus perpetuus*). Though Comenius did not expressly say so, the implication is surely that since God created the Universe as, in effect, a gigantic perpetual motion machine, Man should be able to replicate this in the 'little world'. He explicitly compared his vision of Pansophy to a *perpetuum mobile* in which every part is connected with and conducive to the operation of every other.¹⁸⁷ As Blekastad puts it, 'Schon als Bestätigung der Richtigkeit eines Weltsystems war es von grösster Wichtigkeit'.¹⁸⁸ Moriaen, too, believed that if a truly successful demonstration could be made, it would serve, by analogy, like Vieta's and Pell's universal algebra, to demonstrate the truth of Pansophy. He was more concerned, however, about the converse: a public failure would appear to bring the whole pansophic scheme into disrepute.¹⁸⁹

187 *Reformation of Schooles*, 24.

188 Blekastad, *Comenius*, 304.

189 No. 11: 'wie diß werkh der Pansophiæ ein groß Credit machen wird wan es gelucken solte So wird es doch denselben viel einen größeren stoß geben wan es vmbschlägt'.

It was not, then, the study of perpetual motion itself that Moriaen thought misguided. His argument was that such study should be deferred until the forthcoming reformation of learning had furnished the materials and experimental conditions needed to undertake it successfully. Just as in the case of Descartes' parabolic lenses, dreaming up plausible theories was a pointless activity in the absence of an adequate means of testing them experimentally. In the meantime, Comenius would be far better employed in directing his talents to bringing that reformation about. He was, as it were, trying to display the products of Solomon's House before it had even been built.

* * * * *

4:5 Comenius's Visits to England and the Netherlands

Comenius's visit to England in 1641 - an event Hartlib had been striving to bring about for five years¹⁹⁰ - and his subsequent move to Sweden at the invitation of Lodewijk de Geer are already amply documented.¹⁹¹ None of the extant accounts, however, properly brings out the fact that the whole business was a protracted saga of misunderstandings and conflicting agendas. It is almost impossible to ascertain how far

190 *HDC*, 342.

191 See especially *Själviografi*, 149-165, *HDC*, 342-370 and *Blekastad, Comenius*, 299-339. Further accounts by Comenius himself are given in English translation in *Young, Comenius in England*.

Comenius appreciated the centrality of the role Hartlib was casting him in. He can hardly have believed, as he later claimed he did, that he was being asked to undertake, 'for the glory of God', a sea voyage of over a thousand miles merely for the sake of a few days' private conversation.¹⁹² But it seems equally unlikely he would have embarked on such a venture without making any provision for his wife and family or for the future administration of his ecclesiastical duties if he had seriously anticipated settling indefinitely in England and overseeing an altogether epochal transformation of education and science, all which is clearly no less than Hartlib expected. I incline to the view that he was responding to what he genuinely believed was a divine summons without having any clear idea what it was a summons to.

On arriving in England in September 1641, he promptly formed the mistaken impression that he had been summoned by order of Parliament. The grounds he later gave for this assumption, of which he was never disabused, were that he had been shown a copy of a sermon preached before Parliament on 17 November the previous year by John Gauden, which concluded with warm praise of Comenius and Dury and exhorted the members

¹⁹² *Själviografi*, 152 (Young, *Comenius in England*, 41); fuller quotation below.

to consider, whether it were not worthy the name and honour of this State and Church to invite these men to you [... and] to give them all publike aid and encouragement to goe on and perfect so happy works, which tend so much to the advancing of truth and peace.¹⁹³

If it was not Hartlib himself who told Comenius he had been summoned by Parliament, he evidently did nothing to correct the notion. One of the things that particularly impressed Comenius about the sermon was that Parliament had ordered it to be printed: no one seems to have pointed out to him that this was fairly common practice in the case of Parliamentary fast-day sermons. As Comenius himself recalled the business:

'Friends,' said I, 'ye have acted with more caution than candour in that ye have concealed these things [the supposed parliamentary summons] from me. Had I been apprised of them beforehand, I know not whether I should have been of such a mind as to suffer myself to be brought forward into a theatre so great [...]. But this I beg of you [...]: let us alone among ourselves be known to one another for the few days that we have, for I must be returning.' They answered that my return was impossible this year. For the King was gone into Scotland for the coronation of the Queen: Parliament was adjourned until the King's return [...]. For me this was grievous hearing.¹⁹⁴

193 John Gauden, *The Love of Truth and Peace: A Sermon Preached before the Honovrable Hovse of Commons Assembled in Parliament Novemb. 29. 1640* (London, 1641), 40-41. Comenius first made the claim publicly in the introduction to *ODO* (1657). Again in the dedication of the *Via lucis* (1668) he stated that he had been invited 'by public authority' for discussions on the propagation of the Gospel. He expanded on the account (adding this quotation from the sermon) in the *Continuatio admonitionis fraternæ* (1669) (*Självbiografi*, 152-3; cf. Young, *Comenius in England*, 39-41, 52, 60).

194 *Självbiografi*, 153 (Young, *Comenus in England*, 41).

Trevor-Roper's assertion that Gauden was probably unfamiliar with Comenius's work, and was merely parroting what Pym and other Parliament men close to Hartlib had told him to say, is less than just.¹⁹⁵ Gauden had been a recipient of the 'new Comenian Booke' and on 3 March 1641 he donated £5 to Hartlib's Comenius fund.¹⁹⁶ A letter from Dury which it seems altogether likely is to Gauden suggests a more than passing acquaintance. Obviously written at the time Dury was preparing to leave Amsterdam for England (c. January 1641), it expresses his thanks that 'of yr owne accord yow were pleased to recommend to the most honorable Court of Parliament my negotiation'. He intended to set out for England the moment the weather permitted, for 'My eares do tingle at the Newes which I heare of the Parliament'. Meanwhile, Hartlib would advise the addressee of Dury's recommendations as to what should be 'thought vppon in my worke'.¹⁹⁷ Gauden was certainly not an intimate of the circle, and, as Trevor-Roper points out, there is no evidence of his having any further connection with them after Comenius's arrival. It may well be that Pym or his allies proposed him as preacher and knew more or less what he was going to say.

195 'Three Foreigners', 262.

196 HP 23/13/1A and 23/10A (the donation is also noted at 23/12/2B).

197 HP 6/4/159A. The letter survives only in an undated and unaddressed copy, so it is not certain it is to Gauden, but he is the obvious candidate: cf. *HDC*, 219.

That does not mean, however, that he was mouthing a prepared script on a subject he knew nothing about.

There can be no doubt that Gauden's sermon had an impact. The printed version included a marginal note advising that anyone inclined to undertake the promotion of Dury and Comenius might find 'a faire, easie, and safe way of adresses to them both, opened by the Industry and fidelity of Mr. Hartlibe [sic], whose house is in Duks-place in London'.¹⁹⁸ Cheney Culpeper, who was to become one of Hartlib's firmest allies in Parliament, later told him,

I often rejoyce in that hower in wch (by a meere occasionall readinge of Dr Gaudens sermon) Gods prouidence brought me to your acquaintance, & hath synce & dothe still by it bringe me to the acquaintance of others.¹⁹⁹

But Trevor-Roper's report that as a result of the sermon Hartlib was 'approached' and 'told to invite both Dury and Comenius in the name of "the Parliament of England"' is pure speculation.²⁰⁰ Hartlib had allies in Parliament who were keen to attract Comenius to these shores, and it may well be that he misrepresented this, deliberately or otherwise, as an official summons, but there is no

198 *The Love of Truth and Peace*, 43.

199 Culpeper to Hartlib, Dec. 1645, HP 13/110A-B.

200 'Three Foreigners', 262. Trevor-Roper omits to suggest who did the approaching and gives no source for his quotation. It is perhaps a paraphrase of Young's translation of the *Continuatio admonitionis fraternæ*: 'on entering London [...] I learnt at length the truth: I had been summoned by command of Parliament' (Young, *Comenius in England*, 39).

evidence anyone told him to do so. It is not inconceivable, but neither is it verifiable.

Something must have happened, however, to make Hartlib's oft-repeated invitation take on in June 1641 the extra urgency and sense of divine imperative that proved too much for Comenius to resist. I would suggest that the convening of the Long Parliament in November 1640, followed up by the impeachment of Laud in December and the execution of Strafford the following May, and the apparent prospect of Parliamentary support for educational reform schemes, persuaded the ever-optimistic Hartlib, probably after consultation with Pym and his allies, that the time was ripe to confront Parliament with the appearance of Comenius and Dury in England as a providential *fait accompli*. The best efforts of Hartlib and Moriaen in the way of private subscriptions were falling far short of the projected £500 a year to maintain Comenius and some four assistants plus funds for printing, binding and distributing the products of their labours. Once Parliament saw Comenius and Dury not just as hypothetical worthy causes otherwise engaged in foreign countries, but as a golden opportunity within its grasp, a physical presence in England free of other commitments and ready to set to work at once on a practical programme, it would surely not balk at voting the modest sum necessary for a work so manifestly worthy

and beneficial. No matter if Comenius himself was a little confused about the sequence of cause and effect, provided the divinely appointed goal was attained.

This was the purpose of the petition presented by the group immediately after the reconvening of Parliament on 20 October 1641 - that is, at the first possible opportunity after Comenius's arrival.²⁰¹ It was hoped in particular that Parliament would fund a complete overhaul of some educational establishment, recasting it as a centre of experimental and pansophic learning, a 'Collegium lucis' such as Comenius set out to describe in the *Via Lucis*, written during his visit to England. And for a brief while, until the outbreak of the Irish rebellion and the civil wars put paid to all such notions, it must have seemed the plan would indeed bear fruit. Parliament proposed to earmark the Anglican Chelsea College for just such a project.²⁰² The plan was doubtless to install Comenius as head of this visionary new establishment, or at least as a prominent member of it. At a stroke, the problem of Comenius's maintenance would be solved, and a major step forward taken in the

201 *Englands Thankfulness, or, an Humble Remembrance Presented to the Committee for Religion in the High Court of Parliament* (London, 1642): extracts in Webster, *Samuel Hartlib and the Advancement of Learning*, 90-97.

202 See Webster, *Great Instauration*, 49, 71, 221; *Självsbiografi* 154-5 and n.42; Blekastad, *Comenius*, 313-315.

reformation of schooling that in time would spill over into a reformation of the world.

Moriaen, however, while he fully agreed with Hartlib that a semi-permanent transfer of Comenius to north-west Europe was devoutly to be wished, had very different ideas about what should be done with him once established there. Though an enthusiastic backer of the collection from private individuals, he never held with the idea of thrusting Comenius onto the public stage in an attempt to secure state funding. Throughout the discussions on the subject, he repeatedly stressed that the aim must be for Comenius to be relieved of all distractions and allowed to devote himself to his meditations. As he reported having told Burgomaster Cunrad,

Meinem bedunckhen nach aber würde es der gemeinen Sache fürderlicher sein wan Er an einem einsamen vnd etwas abgelegenen als volkreichen vnd dem zuelauff vnderworffenen ortt sich enthielte (no. 14).

But Comenius had his own agenda too, one understandably played down in his biographical accounts, which were composed principally as descriptions or defences of his pansophic work. He was, first and foremost, a minister of the Unity of Brethren and, as Blekastad puts it,

Mitglied einer Kirche, in der 'keiner sich selber angehört', [...] ihr Wortführer und bedeutender Repräsentant. [...] Seine Arbeit an der Pansophie musste unter diesen Umständen mit

grösster Verantwortung für die gesamte Unität verbunden sein - oder aufgegeben werden.²⁰³

Comenius was given a commission by the seniors of the Brethren to go to England to promote a collection for the exiles. This work had originally been assigned to two other members of the Unity, Daniel Vetter and Jan Felin, who in 1641 were engaged on a similar collection in the Netherlands,²⁰⁴ but Comenius replaced them as the community's ambassador to England. Comenius later implied that this plan was agreed by the elders merely as a pretext to free him from his ecclesiastical duties for his pansophic mission.²⁰⁵ This does not strike me as very convincing, nor does it accord very well with his simultaneous claim that he only expected to stay in England for a few days. What interest had the Unity in the reformation of Chelsea College in London? But in any case, whether it was a pretext or not, fund-raising was his official mission, and while there was undoubtedly a strong personal appeal for him in the prospect of meeting such fervent admirers as Hartlib, Hübner, Haak and Dury and discussing his work with them, he was also well aware

203 *Comenius*, 302, cf. *Självsbiografi*, 154.

204 Cf. nos. 64, 65, 66, 67 and 71 and annotations.

205 *Självsbiografi*, 152 (*Young, Comenius in England*, 39). Comenius did not in fact mention the fundraising mission at all in this work, merely saying the Bishops agreed that he should go and that the co-rector and pro-rector who stood in for him at the school in Leszno in his absence should not know the real reason for his departure, ie. the summons from Hartlib. The official fundraising mission is mentioned in Hessels III, nos. 2607 and 2673. Blekastad, *Comenius*, 302-3, draws the inference.

that these were seasoned and effective organisers of charitable collections. Besides the money they had provided for Comenius himself, Hartlib and Haak in particular had been prominent figures in the relief operation for refugees from the Palatinate. It is evident enough now that the success of that operation depended not so much on the organisational skills of any individual fund-raisers as on a royal sanction gained through the political influence of the senior members of the Austin Friars church and the marshalling of public opinion behind the cause of the Palatine Protestants. But whether this was evident in Leszno in 1641 is very much to be doubted.

The motivation behind de Geer's invitation to Sweden is harder to pinpoint. His offer of accommodation and funding was issued, through Hotton and Rulice, in late summer 1641, probably in September, just as Comenius was on his way to England.²⁰⁶ The Dutch entrepreneur was then resident in Finspång, near Stockholm, and eager to gather about him a group of learned and pious men, among whom he hoped Comenius would feature.²⁰⁷ There is no evidence exactly what form and function de Geer envisaged for the group, but such societies were very much in vogue

206 *HDC*, 356; the Latin letter from Hotton on which Turnbull bases his account is at HP 9/7/2A-B. De Geer's letter of invitation (19 Oct. 1641) is reproduced in the appendix to *Comenius' Självbiografi*, 267.

207 No. 64, and cf. *HDC*, 355-6.

at the time. Patronage of them tended to be the province of the nobility: typical examples are Prince Moritz of Hessen's 'Orden der Temperanz', Prince Ludwig of Anhalt's 'Fruchtbringende Gesellschaft', and Princess Anna Sophia von Schwarzburg-Rudolfstadt's 'Tugendliche Gesellschaft'; at the same time that de Geer was casting around for pious and learned company, J.V. Andreae was doing his utmost to interest Duke August the Younger of Braunschweig-Wolfenbüttel in fulfilling a similar role for his projected 'Societas Christiana'.²⁰⁸ De Geer, a Swedish citizen since 1627, was ennobled as Baron of Finspång in 1641 for services to Sweden (principally loans of money for the war effort). The inauguration of such a society would have set the seal on his new status, besides constituting another of the good works which, as a devout Calvinist, he was assiduous in performing (throughout his career, ten per cent of his profits were set aside for charity). Moriaen, however, was firmly convinced that de Geer, out of the sheer goodness of his heart and devotion to his God, expected nothing at all from Comenius for himself, not even his conversation: he simply wished to enable him to continue laying the foundations of the reformation envisaged by Moriaen and Hartlib, either in Sweden or elsewhere, as might be deemed best by Comenius himself and his collaborators.

208 See Chapter One, section 3.

The kindest description that can be given of Hartlib's reply to de Geer, ostensibly at least on Comenius's behalf, is polite prevarication.²⁰⁹ Its gist is this: delighted as he is by the invitation, Comenius's commitments to the friends in England he has travelled so far to see, together with his obligations to the Moravian exiles whose cause he is to plead there, not to mention his advanced years²¹⁰ and need of privacy, compel him to remain where he is for the time being at least. These excuses, especially coming from Hartlib, are not overly convincing.

Hartlib's account of Comenius's situation contrasts strikingly with Comenius's own. Though there can be no doubt of the genuine friendship and affection between the two men, there were certainly times when Comenius felt he was being pushed around by Hartlib. Some years later, upset by a lapse in Hartlib's correspondence, he gave a rather ponderously jesting depiction of himself as a recalcitrant ass and Hartlib as a driver who had given up shouting at the beast because doing so had no effect.²¹¹ If there is a healthy dose of self-mockery in this, it is not exactly complimentary to Hartlib either, and in the

209 Hartlib to de Geer, 4 October 1641, draft version at HP 7/46/1A-2B, English paraphrase in *HDC*, 356-7.

210 Comenius was forty-nine, far from young by seventeenth-century standards, and had led a less than sheltered existence, though he in fact had another twenty-nine years before him.

211 Comenius to Hartlib, 25 May 1646, HP 7/73/1A.

years 1637-41, the driver had been shouting his loudest. First, he published the *Præludia* without bothering to ask for Comenius's authorisation, then (seconded by Moriaen, Hotton and others) he pestered him into setting off for England: if Comenius's account is accurate, one might almost say bullied him into it.²¹² Finally, having persuaded him to come, he exposed him at once to the full glare of public attention, in direct contradiction to his express wishes. He later told Hartlib bluntly - and it must have hurt:

If there be one man who has brought hindrance to the pansophic study, you are he, friend, in not allowing me to do what I had to do in peace, but dragging me forth into so broad a light, and setting me in the midst of such great crowds.²¹³

Effectively, Hartlib was telling de Geer that Comenius was not prepared to go through any of the things Hartlib himself had just put him through.

Comenius was highly suggestible to the idea of divine imperatives, terrified of contravening the will of God. It was a side of his character that later became particularly obvious, and particularly damaging to his reputation, in the business of the composition and

212 See especially *Själviografi*, 151-2 (Young, *Comenius in England*, 38-39), and see below.

213 Comenius's self-quotation from a letter to Hartlib, *Själviografi*, 157 (Young, *Comenius in England*, 49). Cf. Comenius to Hartlib, 25 May 1646, HP 7/73/1A-6B, and 21 Jan. 1647, Patera, *Jana Amosa Komenského Korrespondence* (Prague, 1892), no. 107 (pp.126-9).

eventual publication of the prophetic book *Lux in Tenebris*. Comenius had begun collecting the visions of Christoph Kotter and Christina Poniatovská in the 1620s.²¹⁴ These were overtly political and explicitly topical prophecies dealing with the restoration of Friedrich V of the Palatinate, the liberation of Bohemia and the overthrow of the Habsburgs. In 1633, a synod of the Unity placed a ban on such controversial material. Nonetheless, despite the fact the ban had not been lifted, Comenius supplemented his collection some twenty years later with a new set of visions in the same vein, this time from another member of the Unity, Mikuláš Drabik (Drabicius), who was insistent Comenius should bring them to press. The publication of all three bodies of prophecy, under the title *Lux in Tenebris*, took place in 1657, after a long inner struggle as Comenius debated with himself whether the visions might not be inspired by evil spirits (he had ruled out the possibility of fraud on the grounds that none of the visionaries was educated enough to perpetrate one so convincingly). In the end, Drabik's insistence that the same God who had sent him

214 Kotter was a Lutheran by upbringing, a tanner by trade and a Silesian by nationality. He learned to write for the specific purpose of setting his revelations down. Comenius met him in 1625 and translated his visions from German into Czech the same year. Poniatowska, the daughter of a Reformed minister, began experiencing visions in 1627, at the age of seventeen, having been driven, like Comenius, into exile from Bohemia to Leszno. Comenius proceeded to produce a Latin version of both her prophecies and Kotter's.

the visions demanded also that they should be published was more than Comenius's scepticism could withstand. There can be no doubt that there was a political motive to the timing of the publication, which was part of the propaganda drive behind the bid to replace the recently deceased Emperor Ferdinand III, whose only son had narrowly and fortuitously predeceased him, with a Protestant emperor such as Carolus Gustavus of Sweden, or at least an anti-Habsburg such as Louis XIV of France. But this is not to deny a genuine religious impulse to Comenius, for whom religious and political considerations were indivisible. If God chose to act in the world by issuing self-fulfilling prophecies, it was not for Comenius to obstruct him.²¹⁵ Wilhelmus Rood goes so far as to say that Drabik 'urged Comenius with threats to publish his visions',²¹⁶ but it was God, not Drabik, whom Comenius was afraid to contradict.

The relevance of the *Lux in tenebris* controversy to the much earlier visit to England is that if Drabik can be accused of morally blackmailing Comenius (for whatever

215 For a detailed account of the circumstances leading up to the publication and its aftermath, see Blekastad, *Comenius*, 573-584. Blekastad tends, however, to play down the extent of the disapproval the work aroused, takes at face value Comenius's totally unfeasible and indeed (as his correspondence with Hartlib abundantly proves) mendacious claim that the published work was intended only for a few selected and responsible figures, and remarks in what would appear to be her own voice, 'Dass diese Visionen [...] von bösen Geistern stammen, ist unwahrscheinlich' (578).

216 Rood, *Comenius and the Low Countries*, 170.

motives), Hartlib employed very similar pressures in persuading him to visit this island. That the visit to England has generally received so much better a press than *Lux in tenebris*, both from contemporaries and subsequent commentators, does not alter this fact. Comenius's own account of the event makes very clear how shrewdly Hartlib played on his sense of divine mission:

now he invited me to London, now to Amsterdam, or to Hamburg (yea even to Stettin or Danzig, if I wished); he would come there with his friends. But it could not be, because I was now tied to my place by the character of the office I had undertaken.²¹⁷ At last in 1641 in the month of July, I received three letters from him (written in the same tenor but dispatched by three different routes), in which he insisted on my coming to him at once, and thus he concluded: 'Come, come, come: it is for the glory of God: deliberate not longer with flesh and blood.' What could I do?²¹⁸

At this stage at least, Hartlib saw Comenius as a lynchpin of the divine purpose he thought was being worked out before his eyes. Throughout his life, he was much taken with the idea that England would be the launching pad of the Third Reformation. For him, Comenius was the right man, England the right place, and 1641 the right time, and having finally, with considerable effort, succeeded in establishing him there, he was extremely reluctant to relinquish him.

217 Ie. the headmastership of the school in Leszno.

218 *Själviografi*, 151-2 (Young, *Comenius in England*, 38-39).

Moriaen, thanks perhaps to the perspective lent by distance, seems to have discerned more clearly than Hartlib the way the situation in England was developing, even though it was Hartlib who was his principal informant on the subject. This is not to claim any particular subtlety or insight for Moriaen's political thought. His comments on the developments on the eve of the civil wars follow the standard Puritan line: Strafford, Laud and their supporters are the villains of the piece, who have misguided the King and led him into a factitious quarrel with Parliament based on misunderstandings and misrepresentations. What he foresaw more clearly than Hartlib was just how severe that quarrel would become. He interpreted such matters in distinctly apocalyptic terms:

Wir können an vnß selbsten abnehmen wie den guten herzen beÿ Euch zue muth ist [...] fur erst wird vnß angenehm sein zue hören was das Buch mit 7 Siegeln an den tag bringen werde vnd machen vnß die gedanckhen das ein iedweders der 7 Siegel ein besonder wee bedeuten vnd dem einen oder anderen auff den kopff bringen werde (no. 47, 10 December 1640).

But whereas Hartlib in mid-1641 seems to have believed that with Strafford and Laud out of the way and the Long Parliament convened things had taken a decisive turn for the better, Moriaen - though he had initially favoured England as a destination for Comenius - remained sceptical.

Moriaen learned of the invitation to Sweden on 3 October 1641, and wrote to Hartlib the same day endorsing the plan wholeheartedly.²¹⁹ The few mild reservations expressed probably sprang from a sense that Hartlib's feelings might be hurt, or his hopes disappointed, by the suggestion that London was not the ideal location after all, for he followed them with the far more emphatic commendation of de Geer cited earlier, and with more well-judged scepticism about the prospects for funding by the English Parliament. Writing to Comenius himself a week later, he was totally unequivocal in his support for the Swedish plan.²²⁰

When he discovered what Hartlib's response had been, he made no attempt to disguise his annoyance, declaring roundly that Hartlib had completely misinterpreted the proposal, and heavily implying that he had done so wilfully. 'Ich hab Ia deutlich geschrieben', he observed, with unconcealed exasperation,

das Er [Comenius] da ohne amtsgeschäfte oder hinderung sein soll allein zue gesellschaft ansprach vnd Rath mit genugsamer gelegenheit seinen conatibus einzig vnd allein obzueliegen (no. 67).

Rulice felt the same, and wrote in almost identical terms:

der H hatt uns gantzlich nit recht verstanden:
H de Geer begehrt in der welt nichts von H.
Comenio nur allein bißweilen mit ihm zu
conversiren. [...] H. Comenius solte alda

219 No. 64.

220 No. 65.

guten vnterhalt haben, recht gelegenheit ohn
 ander vnkosten mit andern zu correspondiren,
 vnd otium seine meditationes zu perficiren²²¹

Moriaen also had, as was mentioned in the previous chapter, personal experience of the generosity de Geer was prepared to bestow on a cause he deemed worthy. Though every bit as convinced as Hartlib that to support Comenius was to undertake missionary work in the cause of world reformation, he was a good deal less optimistic about the potential of England to supply the necessary conditions for this. On 18 November, he again urged acceptance of de Geer's plan, which Hübner (who at this stage was seen as a likely beneficiary of it) by then also approved.²²² He observed in somewhat more down-to-earth fashion this time, 'Ich sehe die Englische sachen noch nicht an dem ortt da Ich sie gern hette, vnd Sorge wo es Gott nicht genadiglich verhutet das es noch blutige köpffe kosten möchte'.

By this time, the Irish Rebellion had broken out, and in the end it was political circumstance rather than persuasive argument that determined the outcome. But Hartlib was still receiving donations and hoping for a positive response from Parliament;²²³ as late as 23

221 Rulice to Hartlib, 17 Oct. 1641, HP 23/9A-B, summarised in *HDC*, 357.

222 No. 69.

223 *HDC*, 360-361. But compare Dury's letter to de Geer of 19 Dec. 1641, promising that he and Hartlib would petition the Brethren in Leszno to grant Comenius leave to visit Sweden (*Självbioграфи*, 268-9). Nevertheless, Dury, who had met with a cool reception from the Lutheran

December Moriaen was still nagging him to come to a decision.²²⁴ By the spring of 1642 even Hartlib must have realised that major state subsidy from England in the near future was a forlorn hope, and Comenius's move to Sweden was settled, though his friends in England continued to insist he should return as soon as circumstances permitted.²²⁵

En route to Sweden, Comenius spent a month travelling round the Netherlands visiting friends and supporters there (June-July 1642). The event was, however, for Moriaen at least, something of an anti-climax. He would have liked to lodge Comenius himself, but de Geer's son Laurens was on hand to provide much more luxurious accommodation than Moriaen could run to. The crush to see the Pansophist was so great that personal conversation of any depth and intimacy was precluded. Perhaps it was some consolation to Moriaen that all this bore witness to the success of his propaganda drive, but there is no mistaking the sense of let-down in his accounts of their meeting.²²⁶ He was set to work with Budæus (who had evidently joined Moriaen in Amsterdam) examining Comenius's perpetual motion theory, the very part of all the latter's undertakings he had

clergy in Sweden, was sceptical of the prospects for Comenius there.

224 No. 71.

225 *Själviografi*, 155 (Young, *Comenius in England*, 48).

226 Nos. 82 and 83.

always expressed the greatest scepticism about, and he found it even less satisfactory than he had anticipated. Comenius had almost entirely neglected to provide any experimental demonstration, and Moriaen was openly scathing about the 'liederliche modellen' he and Budæus were expected to improve on. A few months later, the ailing Budæus was dead, and a somewhat jaundiced Moriaen declared himself heartily sick of perpetual motion, for which he now had 'wenig zeit vnd nicht viel mehr muth' (no. 84). Moreover, he had met some other investigators who claimed the successful invention of a *perpetuum mobile* but could find nothing useful to do with it. The metaphysical dimension so prominent in Moriaen's earlier speculations on the subject is conspicuously absent from this letter. In its place is redoubled concern that Comenius would be discredited if his work in the field became known, either through his own publications or through loose talk by his associates. The very thought of the device can only have served to call to Moriaen's mind his dead friend Budæus and his frustrated hopes of Comenius.

The Swedish project too failed utterly to live up to Moriaen's expectations. He had envisaged Comenius settled in comfort and tranquility, free from any distraction other than the stimulating conversation of scholars, secure in de Geer's disinterested munificence,

supported by able assistants and labouring diligently at his *Janua Rerum*, not producing sketches of Pansophy any more but the thing itself. In the event, Comenius spent only two months in Sweden, largely taken up with meeting dignitaries such as the effective ruler Chancellor Oxenstierna, the teenage Queen Christina, and Dury's old ally the Lutheran irenicist Johannes Matthiæ, Bishop of Strengnäs.

Oxenstierna came out against de Geer's plan to keep Comenius in Sweden, ostensibly on the grounds that his views on the fundamental goodness of human nature and his particular brand of chiliasm, envisaging a golden age on earth before the Last Judgment, would lead to ructions with the established Lutheran clergy: instead he suggested Elblag, Hartlib's birthplace, at this time under Swedish occupation, where the climate of religious tolerance would provide a more congenial atmosphere for him to work in.²²⁷ There may have been some truth in this, but Oxenstierna's principal interest was almost certainly in having an informed agent in an area of crucial strategic importance to Sweden. Moriaen's second-hand report of this, summarising a letter from Lodewijk de Geer, and of Oxenstierna's alleged suggestion that the Swedish state should bear some of Comenius's costs, is exceptionally bald and non-committal, in marked

227 Cf. no. 86; Blekastad, *Comenius*, 350; Oxenstierna to de Geer, 14 Sept. 1642 (*Självsbiografi*, 271-2).

contrast to his passionate arguments in favour of the original plan.²²⁸

The nature of Comenius's undertakings to Oxenstierna remains unknown, but in the event either Oxenstierna changed his mind about state funding or Comenius balked at such an overt commitment to a nation whose intentions in the Baltic were viewed with suspicion, to say the least, by his own exiled brethren there, and it was de Geer who, having reluctantly followed Oxenstierna's advice and given up his plan for a learned society, nonetheless took the whole charge upon himself. He provided Comenius with 1000 Imperials annually, and agreed moreover to donate the same annual sum to the Unity of Brethren.²²⁹ This still only amounts to about half the thousand pounds a year Moriaen had said he could easily spare,²³⁰ but represents a far larger income than Hartlib, and Comenius himself, had considered adequate (though the funding of assistants remained a problem), and also meant that Comenius could claim a measure of success in his official fundraising mission.

Where Moriaen had completely misjudged de Geer, however, was in the matter of the return he expected on his investment. One of the often-invoked advantages of public collections, however troublesome they might be to

228 No. 86.

229 *Självtbiografi*, 164.

230 No. 67.

organise, was that the contributors, not being an organised body, could lay no proprietorial claim to the recipient's work and exercise no control over it: they simply had to trust the organisers' judgment (and honesty) in the use of their money. Private patrons, however generous, were a different matter, and here de Geer turned out to be less exceptional than Moriaen had imagined. His (purely verbal) contract with Comenius, as the latter much later recalled it,²³¹ committed him to work in the first place on educational materials for Sweden. This was precisely the sort of commitment to sub-pansophic drudgery Hartlib had been so chary of, while Moriaen had strongly insisted no such risk was being run. Why de Geer suddenly became so interested in Swedish educational reform, which had not been mentioned in his original invitation, is not clear: perhaps he felt that if he was not to have his learned society he would distinguish himself in another way in the eyes of his adopted nation; perhaps he had simply never seen Comenius's mission in quite such exalted terms as the Hartlibians. Whatever the reason, the commitment was made.

Moriaen seems to have been completely unaware of this contract. Like many others associated with the business, he was surprised and deeply disappointed to

231 *Självsbiografi*, 164.

find that Comenius continued to busy himself with schoolbooks. He had always nursed a fear that the high expectations he and his collaborators were raising might not be met:

Wir haben bißhero viel von Ihme [Comenius] geruhmt vnß selbsten vnd andern grose hoffnung gemacht, wolte mir von herzen lieb sein wan wir in vnserem ruhm vnd hoffnung nicht zue schanden würden (no. 31, 5 Dec. 1639).

During his first year in Elblag, Comenius asked his associates to keep correspondence to a minimum in order that he might not be distracted.²³² Having waited eagerly to see what fruits might be borne of this retirement, Moriaen found his worst suspicions realised:

vnd höre Ich das Er nur seine Ianuam vnd Vestibulum revidirt vnd auff einen andern schlaag gebracht haben soll, welches ob es zwar ein gut werkh sein möchte so ists doch das Ienige nicht darauff man so lang gewartet vnd den leuthen hoffnung gemacht/ Ich hoffe Ia es werde was anderes dabej sein sonst müste man sich fast schämen das [...] nun nichts anders als solche schuhl sachen herauß kommen solten (no. 88).

This marked the end of Moriaen's active involvement in the pansophic project. In part this was because, thanks to the de Geers, the funding problem was substantially solved. But to a much larger extent, it reflected a deep disappointment, a loss of faith on Moriaen's part in Comenius's ability, or perhaps in his willingness, to fulfil the task. The very notion of

232 No. 87.

Pansophy seems to have lost its appeal. Comenius mentioned him in May 1646 as being in a position to send Hartlib copies of his works as they came off the press in Amsterdam,²³³ but there is no evidence of his having done so; as will be argued later, there is reason to doubt whether Moriaen was in touch with Hartlib at all at that date. His hopes were raised again somewhat many years later by an encouraging report from Magnus Hesenthaler of Comenius's work on the *Consultatio Catholica*,²³⁴ but the passionate faith of the late 'thirties was gone for good. There is a very striking drop in the number of references to Comenius from this point on, and as for the word *pansophia*, it never occurs again in the surviving correspondence.

A decade and a half later, in 1656, Comenius finally settled in Amsterdam, under the patronage of Laurens de Geer, and remained there for the rest of his life. Moriaen evinced singularly little response to this event. Though he had by this time left Amsterdam for Arnhem, contact between them would have been made a great deal easier than ever before had they so wished. Moriaen at least manifestly did not. On a visit to Amsterdam at the beginning of 1657, he did indeed briefly meet Comenius on the street, and arranged to spend the whole of the following day with him. He changed his mind, however (or

233 Comenius to Hartlib, 25 May 1646, HP 7/73/3A.

234 No. 114, July 1650.

so he later told Hartlib), because a chill was setting in and Odilia was eager to return to Arnhem. Instead of keeping his appointment, he went back home.²³⁵ It should be said that the danger of becoming snowbound was not one to be taken lightly. Nevertheless, for a man in 1657 to cite the weather and his wife's wishes as grounds for breaking an appointment with someone whose cause he had earlier regarded as the defining purpose of his very existence must be seen as a conspicuous snub.

The notion of universal wisdom itself, however, by no means vanished from Moriaen's outlook. His disillusion was not with the ideal itself but with Comenius's particular scheme for realising it. His personal history after 1642 is dominated by a series of attempts to attain by other means the crucial pansophic goals of 'right method' and universal harmony.

235 No. 152, text and n.19.

Chapter Five

'Ora et Labora': Science and Spirituality

'Qui scit in aurum convertere aliud metallum sive cum lucro, sive sine lucro, januam habet apertam in Naturam' ('Whoever knows how to transmute another metal into gold, whether with profit or without, has an open gateway into Nature') - Michael Sendivogius, cited by Heinrich Appellius, letter to Hartlib, 26 August 1647, HP 45/1/34B.

5:1 '*Philosophia Experimentalis*'

The four and a half years following the collapse of the grand design for a Pansophic reformation feature a striking gap in Moriaen's surviving correspondence with Hartlib and his associates. Between the letter of 30 October 1642 expressing his disappointment and disillusion at the course of events, and that of 2 May 1647,¹ only three holograph letters (all to Hartlib) and one copy extract (addressee unknown) are to be found among Hartlib's papers (in contrast with a total of seventy-one holographs and six copy extracts from the previous four years).² This could simply be due to the loss of material from the archive.³ It is striking,

1 Nos. 86 and 92.

2 Nos. 88 (15 Oct. 1643), 89 (2 June 1644) 91 (7 Feb. 1647) (holographs), and no. 90 (6 Nov. 1646). There also survive in Amsterdam two letters to Van Assche (UBA N65g, 9 May 1643, and N65h, November 1644).

3 It is certain that there were substantial losses from the archive. See Hartlib to Worthington, 2 Nov. 1661, *Worthington Diary* II, 67, on the 'distraction or embezzlement' of many books and manuscripts he had entrusted to an unnamed friend for safekeeping, and 6 Feb. 1662, *ibid.*, 107, on the loss of more through a fire in his house. While he was living with his son in Axe Yard, his friend Samuel Wartensky was alarmed to find that his possessions were 'a prey to plunder by all' ('omnium exposita rapinæ' - Wartensky to Hartlib, 23 July

however, that the dearth of letters from Moriaen during these years is matched by a dearth of reference to him by Hartlib's other correspondents. Apart from a single comment in a letter from Comenius, it is only in the letters of Heinrich Appelius, Dury's devoted brother-in-law, that he is mentioned at all.⁴ Appelius was obviously under the impression that Moriaen and Hartlib were still in regular contact, but as will be shown below it is precisely his letters that give the strongest indication they were not. It seems likely, therefore, that this gap does indeed reflect a period of estrangement, or at any rate a cooling of relations, in the wake of the Pansophic debacle and Moriaen's rather bitter reaction.

Moriaen, who at the end of the 1630s awaited nothing with more excited anticipation than what he generally referred to as Comenius's 'Metaphysica', ie. the prospective *Janua Rerum*, appears in a markedly different guise in the letters of 1647 on. He could write by 10 February 1648:

bin woll eher ein großer liebhaber und
verfechter metaphysicarum et metaphysicorum
gewest, wie Ich aber darnach ad scientias
reales et usuales kommen, sind mir die

1661, HP 32/3/40A). Other papers were almost certainly abstracted from the collection after his death.

4 Comenius to Hartlib, 25 May 1646, HP 7/73/3A, stating that Moriaen would send Hartlib Comenius's new publications from Amsterdam; cf. Chapter Four, section 5. Mentions by Appelius are discussed below.

speculationes inutiles stinkend worden (no. 97).

The concept of 'scientias usuales' - 'useful knowledge' - was discussed in the previous chapter. The whole point of Comenian metaphysics had been, of course, that it should be utterly distinct from what was seen as the empty semantics of the scholastic variety, from what Bacon described as the Schoolmen's 'monstrous disputations and barking questions',⁵ and should deal not with ideas or words but with 'things'. As Comenius put it in the *Continuatio admonitionis fraternæ*,

it does not matter which language we speak (whether rude or cultured), since we are all nought but sounding brass and tinkling cymbals so long as words not things (I mean the husks of words, not the kernels of meanings) be in our mouths.⁶

There is an element of deliberate oxymoron in referring to a 'Janua rerum' as a 'metaphysics'. There is also a deliberate ambiguity in the title, literally 'The Gateway of Things': is the book the gateway to things, or are the things themselves the gateway? Both senses are intended. 'Metaphysics', the realm beyond the physical, was to be attained not by abstraction, not by bypassing the physical, but on the contrary *through* the physical, through a detailed practical study of nature.

5 *The Advancement of Learning, Works, III, 287.*

6 *Comenius' Självbiografi, 148* (cf. Young, *Comenius in England, 31*).

But here, I believe, Moriaen expresses a loss of faith even in Comenius's reformed, pansophic concept of metaphysics, which, whatever its claims, remained in the event bogged down in verbal formulations. He begins to sound a good deal less like Comenius, and a good deal more like Hartlib's new friend Robert Boyle, with his enthusiasm for the new 'philosophical college' in London that 'values no knowledge, but as it hath a tendency to use'.⁷ Previously, the 'use' of knowledge had been seen primarily as its application to personal morality and social ethics. Here, though that dimension has by no means disappeared, the term becomes something closer to 'application', in the sense of the modern term 'applied science'.

This is not to suggest that there was a sudden sea-change in Moriaen's outlook at some point between 1642 and 1647, that he went to bed one night a mystic Pansophist and woke up a rational empiricist. On the

7 Boyle to Isaac Marcombes, 22 Oct. 1646, *Works*, ed. Birch (1744 edition) I, 20. The identity of this 'new philosophical college', referred to elsewhere by Boyle as the 'Invisible College', has been much debated: for a summary of opinions, see Webster, *Great Instauration*, 57-67, and 'Benjamin Worsley: Engineering for universal reform from the Invisible College to the Navigation Act', *SHUR* 213-235. Webster's own suggestion that it was an informal association of younger scientists centred on Boyle, Worsley and Katherine Ranelagh, and possibly including the Boate brothers, John Sadler, Robert Child and John Winthrop, seems to me the most plausible, though as Webster points out there is no more than circumstantial evidence for anyone's membership but Boyle's.

contrary, what seems on the face of it a complete change of tack in the subject matter of the correspondence proves on closer analysis to be a logical development: a change of emphasis rather than a volte face. Though the letters written after this hiatus in the 1640s deal primarily in practical experiments and technological innovations, whereas those before are mainly given over to the Pansophical scheme and the dissemination of knowledge and understanding through the medium of the written word, the ethos underlying them is the same.

Moreover, though there is next to nothing about the subject in the earlier letters to Hartlib, it is evident from the handful of letters to Van Assche preserved in Amsterdam that Moriaen was a practising alchemist and iatrochemist at least as early as 1634, ie. during his second spell in Cologne.⁸ It is a salutary warning not to draw over-confident inferences from fragmentary documentation.

A possible reason for the change of emphasis in the Moriaen-Hartlib correspondence is that it was Hartlib, rather than Moriaen, who had turned more whole-heartedly

⁸ UBA N65a, 8 March 1634 (not 10 March as the UBA catalogue and Van Der Wall (*Serrarius*, 661) state, misreading the Gothic 8 which is written at 90° to the modern one): the letter is largely given over to describing chemical preparations, mostly of a medicinal nature. It does not indicate where Moriaen was at the time of writing. Chemistry is also discussed in letters from Cologne of 6 Sept. 1636 and 17 Jan. 1637 (UBA N65c and N65d).

to the practical and experimental as opposed to the theoretical during this period. Having declared his own disillusion with metaphysics, Moriaen went on to add, 'das mein herr [Hartlib] in *Philosophia experimentalis* & *mechanica* sich verliebet ist nicht zue wundern'.⁹ Though Hartlib too had certainly been interested in 'realia', and particularly in chemical and physical experiments, throughout his life, the *Ephemerides* distinctly chart a personal history in which over the years such subjects increasingly occupied his mind, at the expense of more abstruse philosophical and theological speculations. Though the religious motivation underlying all his actions and studies remained the driving force, detailed experimental investigation of the 'creatures', the 'Book of God's Works', gradually ousted the more abstract and analogical aspects of his thought.¹⁰ Such a development cannot be demonstrated by isolated examples out of context, and can be fully appreciated only if one reads through the whole of the *Ephemerides* in sequence. But two admittedly extreme cases from near the opposite chronological ends of the diaries may serve to illustrate the trend. There is nothing from the latter years

9 It is unclear whether 'verliebet' is here a past participle or a present indicative: the sense could be either 'that you [have] fallen in love with experimental philosophy' or 'that you are falling in love with experimental philosophy'.

10 For a detailed case study of the conscious excision of analogy in Hartlib's later treatments of a given subject, see Timothy Raylor, 'Samuel Hartlib and the Commonwealth of Bees', *Culture and Cultivation*, 91-129.

remotely like this of 1639 under the heading 'MS

Theologica':

A Question Answered by Mr Gawdin to my Lady Barrington, whether the Essence or Being of all created things purely considered and only substantially as metaphisically abstract and separat from accidental qualityes and mutable formes (which being is in everything real true and one and while it is in being most necessary to bee) whether I say this pure and precise being bee of the very essence or Being of God etc.¹¹

Nor is there, conversely, anything in the early years to compare with the report in 1656 of Rushworth's

optical undertakings in my dining roome to know all what is done at Charing Crosse or in the Strand by meanes of the Chimney with some extraordinary cost.¹²

The branch of 'philosophia experimentalis' that came increasingly to dominate Hartlib's interest from the late 1640s on was chemistry - or, rather, what Allen G. Debus has dubbed 'the Chemical Philosophy'.¹³ For chemistry, or alchemy, rarely depicted itself at this period as a mere branch of knowledge: it was, rather, a means of understanding and regaining dominion over the very fabric of Creation. Debus aptly describes its goal as finding 'the key to a truly Christian interpretation of

11 HP 30/4/27A. Gauden's reply to the question, dated 16 June 1637, is preserved in full in the papers, HP 26/14/1A-15B. This is the same Gauden whose *Love of Truth and Peace* recommended Dury and Comenius to Parliament (see Chapter Four, section 5).

12 HP 29/5/77B.

13 Allen G. Debus, *The Chemical Philosophy: Paracelsian Science and Medicine in the Sixteenth and Seventeenth Centuries* (2 vols.), New York 1977.

nature.¹⁴ But the emphasis was always on more than just understanding: the purpose of that understanding was control and manipulation. Its aims were no less ambitious than, and in many respects strikingly similar to, those of Pansophy, though its means were very different. Comenius, it seemed to many of his original supporters, remained mired in didactics and declined into an increasingly crotchety and belligerently eccentric old age. He fell out with one collaborator after another, exasperating his patron Laurens de Geer¹⁵ and even his closest and most loyal supporters. Figulus, for instance, more in sorrow than in anger, wrote to Hartlib in 1658 that 'My Father in Law is likewise withering & decaying [...] I beginne to feare our Pansophia, shall neuer come to perfection',¹⁶ and that

his vehement desire, of the wished for Change of all things, to see the Antichrist fall, & Christ in his Kingdome triumphing & reigning ouer the whole world, cannot permitt his Spirit to bee quiete: & likewise for his Pansophica & the like labours, which lye upon his [sic] dayly. I beleeeue, in well considering his nature, & his age also, these things are irremediable, & there will bee no helpe for him, but hee thus must bring his bones into the graue.¹⁷

14 *The Chemical Philosophy* I, xi.

15 Cf. *HDC*, 382-413 on Comenius and his assistants, especially Kinner; Rood, *Comenius and the Low Countries*, 77-87, on strained relations with Lodewijk, and no. 118 on the annoyance of Laurens de Geer.

16 Figulus to Hartlib, 19 July 1658, HP 9/17/11A; Blekastad, *Peter Figulus. Letters to Samuel Hartlib*, 216.

17 Figulus to Hartlib, 2 Aug. 1658, HP 9/17/15B; Blekastad, *Figulus Letters*, 219.

Hartlib was only one of many in the circle who turned increasingly to the chemical philosophy to supply the universal reformation and enlightenment that had so fervently been expected from Comenius's labours.

The difficulty for the modern scholar attempting to make sense of alchemical texts is essentially twofold. First, there is the problem of making the imaginative jump to a world-view and habits of thought that are wholly alien - a problem which this thesis in its entirety attempts to address. The second problem, closely related to the first, is linguistic and semantic. Alchemy developed a highly specialised technical jargon to such an extent that not only the Latin but also the vernacular texts are, effectively, written in what is now a dead language. Moreover, at least in the case of material intended for publication or public distribution, it is a language that even at the time was expressly designed to be comprehensible only to a select minority of initiates.

It was a commonplace that arcana were to be revealed, if at all, only in veiled, symbolic terms, to ensure that the mysteries disclosed would be accessible only to those who had proved themselves worthy through years of diligent and unprofitable study. Even at the time, of course, this left every writer open to the countercharge that his (or, in rare cases, her) veiled

symbolism in fact concealed not profound knowledge but vacuity or lies. The symbolism developed to express alchemical theory was extremely intricate, and furthermore, to make life especially difficult for the later student, there was very little attempt made to standardise it. A measure of agreement was established, and remains discernible today, on the symbolic nomenclature applied to some of the more basic substances. But when it came to finer detail, writers were prone to launch into a private or esoteric symbolism that was accessible only to those with access through personal contact or the still-thriving oral tradition to the intentions behind an often self-consciously literary façade. Jonson's lampoons in *The Alchemist* are no exaggeration. Here, for instance, is George Starkey on transmutation, speaking 'not [...] one word doubtfully or mystically':

In this our work, our Diana is our body when it is mixed with the water, for then all is called the Moon, for Laton is whitened, and the Woman beares rule, our Diana hath a wood, for in the first dayes of the Stone, our body after it is whitened grows vegetably. In this wood, are at the last found two Doves, for about the end of three weeks, the soul of the Mercury ascends, with the soul of the dissolved Gold, these are infolded in the everlasting armes of Venus, for in this season the confection are all tinted with a pure green colour, these Doves are circulated seven times, for in seven is perfection, and then they are left dead, for

they then rise and move no more, our Body is
then black like to a Crowes bill¹⁸

By the standards of the day, this is indeed relatively clear. 'Diana' (or 'the Moon') can confidently be identified as silver, the 'water' is mercury and 'Venus' is copper. The 'souls' of the mercury and gold cannot be translated into modern chemical terminology since they are supposed extracts of what are in fact elementary substances. But when it comes to such crucial details as quantities and temperatures, the account is decidedly unhelpful. And even to experts at the time, some of the symbolism proved baffling. It is doubtless with reference to this passage that the question in the *Ephemerides* is posed: 'Quid sint Columbæ Dianæ [what may the doves of Diana be]? which yet Mr Clodius is to seek out for the perfecting himself in the understanding of this mystery'.¹⁹

To cap it all, a common strategy was to declare openly in one work that a previous work contained deliberate falsehoods. Starkey in the same piece warned that in his previous writings he had implied 'some things which taken without a figure, are utterly false, which we did onely to conceal this Art'.²⁰ Whether or not such a declaration should itself be seen as sincere is a moot

18 Starkey, 'Sir George Riplye's Epistle to King Edward Unfolded', in *Chymical, Medicinal and Chyrurgicall Addresses*, 19-47, 20 and 42.

19 *Eph* 51, HP 28/2/24B.

20 'Sir George Riplye's Epistle Unfolded', 20.

point. Besides genuine concern that knowledge of such enormous potential for either good or evil should neither perish with the discoverer nor become available to all and sundry, there is often more than a suspicion of a rather clubby atmosphere of passwords and code-names which must have been very gratifying to those who were in the know, or supposed they were - the latter in turn providing a good deal of entertainment for the genuine initiates. Poleman, for instance, found few things more amusing than a misinformed alchemist. Hearing that Hartprecht thought the Philosopher's Stone would dissolve bladder stones, he had 'darüber hertzlich gelachtet, so ist er billig hierin ausslachsens wert, als welcher ihm unterstehet von farben zu urtheilen, die er nimmermehr gesehen'.²¹ One begins to wonder whether some of these texts were intended to communicate anything at all to anyone, or were not rather analogous to a crossword puzzle consisting entirely of clues with no feasible solution, a joke by the author at the expense of every reader.

However, the wilful obscurity of many alchemical writings is by no means the greatest obstacle to understanding them as *scientific texts*. Still more pernicious and impenetrable is the unintentional obscurity (from our point of view) of even the most

21 Poleman to Hartlib, 17 Oct. 1659, HP 60/4/171B.

private writings, resulting from the limitations of knowledge and consequently of vocabulary. Alchemists could and did, when they chose, write quite plainly and objectively about what they were doing.²² But even in these cases, it is quite obvious that much of the time a given word is being applied to two different substances or operations. In such cases, the confusion is quite innocent, merely reflecting the fact that the analytical methods of the day were inadequate to draw the distinction. Kurt Gugel, in his study of J.R. Glauber, maintains that 'Die geschraubte Symbolsprache war den Chemikern seiner Zeit genau so verständlich, wie es die moderne Formel uns heute ist'.²³ But while firmly agreeing it is important to remember that much alchemical

22 See for instance the letters of Moriaen to Worsley cited in Chapter Seven, section 2, or Otto Sperling's account of his experiments on Glauber's 'aurum potable' (Sperling to Glauber, 9 Feb. 1658, in Ad Clément and J.W.S. Johnsson, 'Briefwechsel zwischen J.R. Glauber und Otto Sperling', *Janus* 29 (1925), 210-233, 221-230. Cf. William Newman, 'Newton's *Clavis* as Starkey's Key', *Isis* 78 (1987), 564-74, esp. p. 569.

23 K.F. Gugel, *Johann Rudolph Glauber 1604-70: Leben und Werk* (Würzburg, 1955), 39. To illustrate his point, Gugel takes an example from Goethe's *Faust* (so a later pastiche, though admittedly a very good one, of alchemical writing rather than the thing proper), and 'translates' 'Da ward ein roter Leu, ein kühner Freier, / Im lauen Bad der Lilie vermählt / Und beide dann mit offnem Flammenfeuer / Aus einem Brautgemach ins andere gequält. / Erschien darauf mit bunten Farben / Die junge Königin im Glas' as 'Quecksilberoxyd + Salmiak = Sulbimat + Ammoniak + Wasser'. This may well be what Goethe meant, but it is hardly reasonable to suggest that 'roter Leu' can be seen as yielding as precise a definition as 'HgO' (mercury oxide), and 'im lauen Bad' or 'mit offnem Flammenfeuer' are not very precise indications of the temperatures required.

writing was not nearly as obscure to its intended audience as it may appear today, I think this is an overstatement. Lack of standardisation, imprecision in weighing and measuring, and inability to distinguish related but discrete materials all meant that even with the best will in the world, considerable confusion was possible. The same problem faces scientific historians of whatever age confronted with the writings of their predecessors.

Hence the bewilderment frequently expressed that applying precisely the same operation to the same quantity of the same material produced different results. Moriaen, for instance, in an account of his alchemical labours, reported with some puzzlement that

'ex eadem prorsus materia eâdem via præparata, semel novemdecimæ partes Stannj in Argentum abierunt alias ex centum libris, 27. libræ, 16. 12, in argentum mutatæ sunt'²⁴

('at one time, of the same materials prepared in the same way, nineteen parts of the tin was turned to silver, other times 27lb out of 100, or 16, or 12, were transmuted into silver').

Evidently either the material or the operation was not in fact exactly the same, or Moriaen's understanding of the words 'tin' and 'silver' was not the same as ours, but since we have nothing to go on but reports by people unable to make our distinctions, only conjecture is possible as to where exactly such discrepancies lay.

24 Moriaen to Worsley, 27 Jan. 1651, HP 9/16/1A.

Hence too claims such as this from the *Ephemerides* of 1653:

The 2d of March Starkey came and told that he had now perfected his Experiment to make Luna fixa, and that it did vndergoe all the trials of the Goldsmith i.e. silver equivalent to Gold wantinng nothing but the colour, which could easily be added.²⁵

Whatever Starkey had produced, it was not gold. However, since it answered to no other term in his vocabulary, and since he was assured that gold (or something approaching it) was what his method would produce, that is what he took it to be. The account leaves only the scantiest evidence as to what he had in fact done. Between the deliberate red herrings and the linguistic circumscriptions, there is only very limited ground on which confident deductions can be made as to what the 'adepts' were 'really' doing, and their processes translated into the language of modern chemistry. But if we turn to what they were *assumed* to be doing, and why, in more general ideological terms, their published writings, and above all their private correspondence, supply invaluable insights into the mental world they inhabited.

A somewhat more negotiable linguistic obstacle is the way in which language, particularly scientific language, has developed in the interim. It is not so

25 *Eph* 53, HP 28/2/54A.

much the totally obsolete terms such as alcahest, azoth, ludus and lapis that are the problem: these can easily be learned. The greatest source of confusion lies in the far more numerous cases where terms have remained current but been applied more narrowly or to totally different things. Though my principal concern here is with the ideas and ideals of the alchemists rather than the details of their laboratory practice, there follows a brief and generalised introduction to alchemical presuppositions and terminology with a view to minimising confusion.

The implications of contemporary usage of the terms 'chemist' and 'alchemist' will be dealt with in more detail below. Other terms used by practitioners of the art to describe themselves were 'Spagyrist' - a word of uncertain origin possibly coined by Paracelsus - or 'Hermetic', after the totally mythical Egyptian sage Hermes Trismegistus, supposedly a contemporary of Moses and author of the *Tabula Smagdarina* (*Emerald Table*). The Hermetic corpus was in fact written by semi-Christianised Greek neo-Platonists in the second or third century AD, but what appeared to be vivid pre-echoes of Christianity in these supposedly ancient texts, combined with their emphasis on chemical symbolism, confirmed for many readers that the pristine knowledge granted to Adam, or at least a good part of it, had in fact been preserved

and was accessible through the twin paths of piety and experimental study. Other popular terms, denoting more specific allegiance to individual practitioners, were 'Paracelsian' and 'Helmontian'.²⁶

A Paracelsian tenet central to the understanding of seventeenth-century chemistry is that of the three 'principles', to wit 'salt', 'sulphur' and 'mercury'. Here more than anywhere, confusion with the modern sense of these terms is apt to cause bewilderment. Indeed, even at the time, alchemists frequently found it necessary to distinguish between these terms as used to denote specific substances or to refer to the underlying 'principles'. 'Common' salt, sulphur and mercury were each of them made up of different admixtures of 'philosophical' salt, sulphur and mercury. The term 'principle' meant, in theory, more or less the same as the Aristotelian (or the modern) term 'element': the basic, indivisible substances of which all matter is compounded. Taking fire (or, more generally, heat) as

26 From Theophrastus Paracelsus (1493-1541), arguably the founder of chemical medicine, and Jan Baptista van Helmont (1579-1644), probably the most widely respected chemist of the first half of his century, who revised or indeed wholly rejected a great many strictly Paracelsian notions while remaining firmly committed to the same general course of practical experiment directed by pious meditation and personal revelation. See Walter Pagel, *Paracelsus: An Introduction to Philosophical Medicine in the Era of the Renaissance* (Basel and New York, 1958), and Joan Baptista Van Helmont: *Reformer of Science and Medicine* (Cambridge, London, New York, New Rochelle, Melbourne and Sidney, 1982).

the most thorough means of separating matter into its component parts, the Spagyrist defined as 'sulphur' whatever was resolved by combustion into flame or gas, as 'mercury' whatever emerged as liquid, and as 'salt' the incombustible solid residue.²⁷ Even at the time there were those who argued (with some justice) that this was far less of a revolution against the Aristotelian 'elements' (earth, air, fire and water) than it was generally made out to be, 'salt' corresponding roughly to 'earth' and 'mercury' to 'water', while 'sulphur' subsumed 'fire' and 'air'.²⁸ And, indeed, many chemical writers, including Paracelsus himself, seem to have been happy to use both sets of terminology more or less interchangeably: 'water' in particular was frequently used as a synonym, or at least a metaphor, for 'mercury'. There was, not surprisingly, considerable scope for debate in the case of many products of combustion as to which category they should be ascribed to. Nor was assent to the theory of the 'principles' by any means universal among the Spagyrist. Van Helmont in particular came up with the idea that there was only one element, water; and many, without going so far,

27 For a more detailed account of the 'principles' and variant individual interpretations of them, see A.G. Debus, *Chemistry, Alchemy and the New Philosophy*, chapter 7.

28 The whole of Boyle's *The Sceptical Chymist* (London, 1661), revolves around a debate about the relative merits of the Aristotelian and Paracelsian concepts of the division of matter. Boyle himself found both unsatisfactory.

considered all three principles to be variant forms of the *prima materia* that made up all things.

The more perfectly fused the principles were within a given substance, the more perfect that substance was. Metals therefore, and gold more than any other, were seen as particularly exalted forms of matter, and to break them down into their component parts was one of the alchemists' principal goals. This proved, naturally, very difficult to do, a fact which served only to confirm how 'noble' these substances were. But many were firmly convinced they had indeed separated metals into their 'principles': hence such apparently meaningless terms as 'salt of lead' (*sal saturni*), 'mercury of antimony' (*mercurius antimonii*) and 'sulphur of gold' (*sulphurus solis*) which recur in these texts.

It is this theory that accounts for the enormous importance ascribed to the supposed universal solvent 'alcahest' (or alkahest). (The word itself appears to be a pseudo-Arabic coinage by Paracelsus.) Van Helmont claimed with the greatest conviction and apparent sincerity that he had possessed this. Since even Boyle accepted Van Helmont's good faith while suspecting he was probably mistaken on many points, it is little wonder other chemists were utterly persuaded the thing was possible. The idea was that having broken matter down to its component parts, one would be in a position to

reassemble it as one chose, or at least be in a position to find a way of doing so. Some identified the alcahest with the Philosopher's Stone itself, though this met with the disapproval of Clodius, who maintained that chemists 'grosly mistake if they vnderstand not the difference between the preparation of the Alcahest and the Lapis [...] a World of Chymists have split themselves vpon this rock'.²⁹ The Philosopher's Stone (*lapis philosophorum* or *lapis philosophicum*) - another code word, which no 'true chemist' would have supposed actually was a stone - was the method or substance by which the elemental soup would be reconstituted in exalted form. Closely connected with these terms is the still more bizarre cipher 'ludus' (literally meaning 'game'), often specified as 'ludus Paracelsi' or 'ludus Helmontii' which would provide a universal medicine by transmuting diseased into healthy matter or by dissolving bodily corruptions.³⁰

Metals themselves were generally seen not as inanimate, but as organic substances growing in the earth like vegetables (though far more slowly). This idea dates back at least to Hellenistic times. Bruce T. Moran gives a fascinating account of how in 1618 the alchemist Johann Popp 'proved' the theory to the delight of his patron Moritz of Hessen by growing crystal flowers from

29 *Eph* 52, HP 28/2/30A.

30 Partington suggests it may have been boracite or magnesium borate (*History of Chemistry* II, 226).

lead.³¹ A contemporary (and open-ended) discussion of the idea can be found in 'A Discourse about the Essence or Existence of Mettals' by Gerard Malyne, the (unpaginated) Appendix to the *Chymical, Medicinal and Chyrurgical Addresses* Hartlib had published in 1655.³² Comenius took it entirely for granted:

if one wishes to distinguish Man's end and the means to his end by comparing him with other creatures, one will not concentrate upon his points of likeness to metals or stones or animals (inasmuch as he is born and grows and feeds and moves and uses his senses) but upon his points of excellence.³³

Even Boyle (or at least his fictional persona, the 'Sceptical Chymist' Carneades) thought the most plausible account of the origin of mineral matter, including metals, to be that it grew in the earth, citing the formation of stalactites as an example.³⁴ (Boyle did not, however, commit himself to the belief that it was animate, and, indeed, asserted that 'those things which Chymists produce by the help of the Fire are but inanimate Bodies'.³⁵) He also thought it probable that minerals altered in nature in the course of their development, though he characteristically warned that

the growth or increment of Minerals being usually a work of excessively long time, and

31 *The Alchemical World of the German Court*, 130-131.

32 *Chymical, Medicinal and Chyrurgical Addresses made to Samuel Hartlib Esquire* (London, 1655).

33 *Panegersia* (1657), trans. A.M.O. Dobbie (Shipton on Stour, 1990), 10.

34 Boyle, *The Sceptical Chymist*, 356-367.

35 *Sceptical Chymist*, 423.

for the most part perform'd in the bowels of the Earth, where we cannot see it, I must instead of Experiments make use, on this occasion, of Observations.³⁶

Many less cautious spirits took such natural growth and transmutation of metals as axiomatic, and assumed that since Nature, being the creation of God, aspired always toward perfection, they reached the highest stage of their development in gold. What the alchemists were trying to do was not to pervert Nature by magic, but to act as catalysts in a natural process. As Glauber put it, 'Die Natur sucht allzeit jhre Kinder zur perfection zubringen/ vnd die geringe Metallen seynd nicht perfect. Warumb solte man der Natur nit zu hülff kommen/ vnd dieselbe verbessern können?'³⁷ Alchemy was the husbandry of matter, and especially of metals. Thus, for instance, Glauber gives a method of 'planting' a gold 'seed' in the 'earth' of copper and regulus of antimony and 'watering' it with saltpetre to stimulate its growth:

vnd ist daß Goldt alhier anstatt eines Samens/ das [Kupfer]/ vnd Regul. Antim. aber an statt der Erden/ darauß das [Gold] sich nehret vnnd vermehret/ vnd der Salpeter anstat des Regenwassers/ dadurch daß Erdreich befeuchtet/ vnd fruchtbar gemacht wirdt. Je länger nun daß [Gold] in diesem Erdreich liegt/ vnd wächst/ je mehr es zuwachses darauß stehet³⁸

Though a more ancient astrologically-based tradition that saw each metal as being born of the astral 'seeds'

36 *Sceptical Chymist*, 356.

37 *Furni Novi Philosophici* IV (Amsterdam, 1650), 37.

38 *Miraculi Mundi Continuatio* (Amsterdam, 1657), 67.

with which each 'planet' impregnated the earth was by no means universally accepted even among the Spagyrist, its implications were deep-rooted and continued to influence their thought if only at a subconscious level. It is essential to bear in mind that only seven metals were distinguished at this period, corresponding to the seven 'planets': from Saturn came lead; from Jupiter, tin; from Venus, copper; from Mars, iron; from Mercury, mercury (the one hangover in modern English of chemistry's astrological pedigree); from the Moon, silver, and from the Sun, gold. Among its full adherents, the Copernican reorganisation of the model of the solar system did nothing to dent this astrological and microcosmical interpretation of the nature of metals: on the contrary, the centrality it accorded the sun served rather to confirm the privileged position of gold in the hierarchy of created matter, and to confirm that other metals drew their life from it and aspired to develop into it. Even among those who were more sceptical, the Latin names and astrological symbols for the 'planets' were used as synonyms and shorthand respectively for the corresponding metals until well into the eighteenth century. This ingrained habit, together with the deeply-rooted belief that seven was a magic or mystic number, probably did much to retard the realisation that there are in fact rather more than seven metals. Though other metals were known and named, such as bismuth, antimony and zinc,

these were taken to be 'imperfect', 'immature' or 'half' metals, which had not yet grown into true ones.³⁹

Especially since Paracelsus, the notion of a medicinal and a spiritual aspect of alchemy was quite as important as the mere physical manipulation and transformation of created matter, the mere party trick of turning things into gold. So at least the alchemists' rhetoric regularly proclaimed, and in a great many cases there is every reason to believe it was sincere. Paracelsus himself had defined alchemy as nothing else but 'eine bereiterin der arzney'.⁴⁰ The prospect of unlimited access to wealth doubtless had its attractions, and could be reassuringly rationalised - as in the case of any presumptively profitable enterprise - by the thought that such wealth would be devoted to pious ends. In German, the word 'Goldmacher' became a widely-used term of abuse directed by serious alchemists at those who envisaged nothing beyond personal material profit. One of Moriaen's sternest criticisms of Glauber was his mercenary streak:

Es gefelt mir auch nicht aller dings an
Glaubern das er eben hohen Persohnen solche
rare Wissenschaft mitheilen will, den die
pflegen dergleichen köstliche sachen doch nur

39 Cf. Link, *Glauber*, 77.

40 Paracelsus, *Werke*, ed. Karl Sudhoff (Berlin, 1922-33), VIII, 38, cit. Heinrich Schipperges, 'Strukturen und Prozesse Alchimistischer Überlieferungen', in Emil Ploss et. al., *Alchimia: Ideologie und Technologie* (Munich, 1970), 67-118, 108

gemeiniglich zu ihrer wollust und geitz zu misbrauchen (no. 122).

To sell genuine arcana to Epicure Mammon was an even greater sin than to sell him false ones. Gold was significant not for its monetary worth, but as the most exalted and incorruptible substance on earth, the substance supplied abundantly by God in Havilah, just outside Eden (*Genesis* 2:11-12), but which had since become so scarce. To be able to raise another substance to this sublime state, even if the costs of the operation were so high as to entail a net loss to the transmuter in merely financial terms, was to regain dominion over Nature.

The idea of an unprofitable transmutation, proving the possibility of the thing and the adept's prowess while remaining free of the taint of material greed, became something of an alchemical topos.⁴¹ According to the 1649 *Ephemerides*,

Mr Boyle hath a Recipe how to turne iron into gold but there is nothing to bee gotten by it. Yet it is worth the best consideration in reference to the Experiment of Iron and Antimony discovered in Mr Boyle's Letter.⁴²

Gabriel Plattes' *Discovery of Subterranean Treasure* (London, 1639) included a whole chapter (chapter nine) 'Wherein is shewed, how true and perfect gold may bee

41 See the epigraph to this chapter.

42 *Eph* 49, 28/1/35A: the informants are Boyle himself and Worsley.

made by Art with losse to the workman'. 'If any one doubt the truth of *Alchemy*,' Plattes suggested, 'he may be satisfied by this triall; but instead of gaine he shall pay for his learning, by going away with losse'.⁴³ Glauber made the same claim in *Miraculi Mundi Continuatio* (1656), and again in *De Medicina Universali* (1657), a point Moriaen thought it worth drawing to Hartlib's attention:

Er bekent in diesem tractat [*De Medicina Universali*] das diß sein aurum potabile nicht allein den [*mercurium*] sondern auch alle andere metallen in gutt goltt transmutire oder gradire aber ohne nuz und also unnötig darzue zue gebrauchen als allein die möglichkeit und warheit zue beweisen, wie auch diße medicinam als Universalem zue bewehren (no. 164).

The human being who could do this appeared regenerate in the form God originally intended, having dominion over all the earth. Alchemy was far more than a natural science or a 'natural philosophy'. Exactly like Pansophy, it concerned itself equally with the three revelations of God in the world: the book of his word, the book of his works, and the book of the human soul. It aimed to elucidate the first, master the second, and transmute the third.

It says much about the preconceptions of our own day that, until quite recently, such ideas could be dismissed by historians of science and ideas as mere superstition.

43 *A Discovery of Subterranean Treasure*, 42.

or plain daftness, at least so long as they remained the province of 'minor' thinkers. When they become manifest in individuals who have since been accepted into the progressivist canon, their acceptance has not infrequently evinced blank incomprehension. Figures supposedly on the threshold of a 'modern', 'rational', 'enlightened' methodology are expected to have known better. Margery Purver, for instance, regrets that 'Even Boyle was not immune from occasional aberrations' such as entertaining the suggestion that an excessive intake of coffee induces palsy.⁴⁴ Mary Hesse considers that

So long as we select science as our subject-matter, we are bound to write forward-looking history in the limited sense that we regard as important what we recognise as our own rationality, having some historical continuity with our own science.⁴⁵

No such dismissal is made of the assumption that every word of the Bible is at least figuratively true. That given is almost universally treated if not with actual assent then at least with respect, as a viable position to have held at the time. Faith is a mental habit not easily broken, and the faith invested by the alchemists in the lore of their subject was scarcely if at all less than their faith in Scripture. A striking example of this occurs in one of Poleman's numerous diatribes

44 *The Royal Society: Concept and Creation*, 84.

45 Mary Hesse, 'Reasons and Evaluation in the History of Science', *Changing Perspectives in the History of Science*, ed. Mikuláš Teich and Robert Young, London 1973, 127-147, 141.

against Glauber. Informing Hartlib that he had no intention of visiting Glauber's laboratory and inspecting his 'gauckelspiel', he explicitly compared the latter's wilful perversions of the 'wise writings' of the alchemical tradition with heretical misinterpretations of Holy Scripture, expressing his 'just wrath' at the 'wicked man':

seine bücher in vnd allezeit [haben mir] sehr missgefallen, dass ich gar ein grossen äckel dafür bekommen, vnd [...] kaum ein paragraphum darin lesen kan, dass ich über den verkehrten man nicht ein gerechten zorn concipire, weil er so trotziglich vnd speciosè der weisen schrifften viel gräwlicher drähet vnd zwacket, als die allergreiligsten vnd ärgesten kätzer die Heilige Schrift verkehren; vnd verleitet dieser böse man die einfaltigen vnd vnwissenden auf solche grewliche irr wege, auf welchen sie nimmermehr zur warheit kommen können. Mit was für gewissen solte ich wohl solchen muthwilligen verführer besuchen?⁴⁶

As with Scripture, there was scope for endless dispute as to how to interpret the canonical texts and indeed as to what constituted the canon, but the conviction was equally profound in both cases that what the true canon said, once properly established and interpreted, was incontrovertible truth. If this is silly, it is no sillier in the case of the *Tabula Smagdarina* than in the case of the Bible, and virtually

46 Poleman to Hartlib, 12 Sept. 1659, HP 60/10/2A. The analogy with Scripture comes over even more strongly in German since the same word, 'Schriften', covers both human writings and holy writ.

everyone in early seventeenth-century Europe must be deemed silly.

Enlightenment was to be sought by the twofold route of practical experiment guided by personal divine revelation. This parallels the twin emphasis of such 'third force' theologians as Böhme on the practical expression of faith through works (which is not to be confused with justification by works) and a personal relationship with God. The classic emblem of this is the plate at the end of Heinrich Khunrath's *Amphitheatrum Sapientiæ æternæ* (Hanover, 1609), showing an adept kneeling at prayer before an altar in his laboratory, surrounded at once by the apparatus of religion and that of scientific experiment. 'Laboratorium' and 'oratorium', laboratory and house of prayer, were one. There was no question, for the 'chemical philosophers', of choosing between divine and experimental revelation: they amounted to the same thing.

* * * * *

5:2 *Chemistry versus Alchemy?*

Alchemy had of course had its detractors for as long as it had been practised: the fable of Midas might be read as a satire on it. Chaucer parodied it in the *Canon's Yeoman's Tale*, a cautionary fable cited approvingly, if rather vaguely, by Hartlib's friend

Gabriel Plattes in his *Caveat for Alchemists*.⁴⁷ The classic example in English is Jonson's *The Alchemist*. Sebastian Franck's *Narrenschiff* had a place of honour for 'das große Bschiß der Alchimey', and Donne in *Ignatius his Conclave* gives a hilarious account of Paracelsus arguing his higher claim over Copernicus and Machiavelli to a seat at the right hand of Satan for services to the detriment of mankind (all three are beaten hands down by Ignatius Loyola, the founder of the Jesuits). Donne has a great deal of fun with the Paracelsian doctrine that like cures like, ie. that the remedy of a disease is to be sought in the source of that disease, and that noxious substances, suitably treated by the alchemist's art, become medicines. He has Paracelsus boast that

whereas almost all poysons are so disposed and conditioned by nature, that they offend some of the senses, and so are easily discerned and avoided, I brought it to passe, that that treacherous quality of theirs might bee removed, and so they might safely bee given

47 *Chymical, Medicinal and Chyrurgical Addresses*, 81-83 (83 misnumbered 82). 'This Cheat is described in old Chawcer, in his *Canterbury Tale*,' observes Plattes, and having summarised the counterfeit concludes by saying that the dupe 'was earnest with the cheater to teach him his Art, but what bargain they made I have forgotten, for it is twenty years since I read Chawcers book'. The *Canon's Yeoman's Tale* features in Elias Ashmole's *Theatrum Chemicum Britannicum* (1652; facsimile reproduction with an introduction by A.G. Debus, London, 1967, 227-256), not, I think, as a result of its having been mistaken for a genuine alchemical tract, but in the same spirit as Plattes' *Caveat*: a warning not against alchemy per se but against false alchemists (see below).

without suspicion, and yet performe their office as strongly.⁴⁸

Hartlib's death at the hands of Moriaen's well-meaning friend Kreußner shows just how pertinent Donne's satire was. But none of these lampoons sets against the quacks and fraudsters it pillories a genuine art or science of chemical investigation. For all these critics, the fact that some alchemists were charlatans was sufficient to discredit the whole discipline. For Donne, indeed, the principle charge against all his accused is new-fangledness, and the question of objective truth barely enters into consideration. He unashamedly puts himself into the camp of hidebound intellectual conservatism by satirising Copernicus in the same breath as Paracelsus for having troubled men's brains by calling into dispute a theory that had been perfectly satisfactory for thousands of years. Copernicus is derided, interestingly, not for being wrong - a point on which Donne, like Bacon, reserved judgment - but for causing unrest. He has Ignatius Loyola tell Copernicus,

this detracts from the dignity of your learning, and derogates from your right and title of comminge to this place [Hell], that those opinions of yours may very well be true.⁴⁹

48 Donne, *Ignatius his Conclave*, ed. T.S. Healy (Oxford, 1969), 21 (Donne's own translation of his Latin original).

49 Ibid., 17.

What is mocked in these works is chemical investigation per se, which is depicted as the exclusive province of quacks and gulls: there is no hint of distinguishing between a rational and a superstitious aspect of it.

Chemical practitioners of the seventeenth century were keenly aware of such charges and repeatedly defended themselves against them. The denunciation of dupes and charlatans is a major theme in the works of almost every serious writer on the subject. For one thing, there was the fear of being tarred with the same brush; for another, there was a strong incentive for the alchemist in search of patronage to cast aspersions on the probity of other aspirants to the same funding.⁵⁰

Plattes 'Caveat for Alchemists' in the *Chymical, Medicinal and Chyrurgical Addresses* is essentially a catalogue of alchemical confidence tricks, aimed not at discrediting alchemy itself but at sparing serious would-be adepts the time and expense of learning to recognise cheats the hard way. Far from rejecting the philosophy itself, Plattes announced at the end of the tract that he had petitioned Parliament 'that I may demonstrate my ability to do the Common-wealth of *England* some service' by reforming husbandry and medicine

50 Cf. Bruce T. Moran, *The Alchemical World of the German Court: Occult Philosophy and Chemical Medicine in the Circle of Moritz of Hessen (1572-1632)*, Sudhoffs Archiv Beiheft 29, Stuttgart 1991, *passim*.

and lastly, to shew the Art of the transmutation of Mettals, if I may have a Laboratory, like to that in the City of Venice, where they are sure of secrecy, by reason that no man is suffered to enter in, unless he can be contented to remain there, being surely provided for, till he be brought forth to go to the Church to be buried.⁵¹

He had evidently concluded that with further refinement, the loss-making method of transmutation described in his *Discovery of Subterraneall Treasure* could be rendered profitable. He also asserted this possibility, emphasising the potential benefits to the State as a whole, in his Utopian tract *Macaria* (1645). There is no record of Plattes' having in fact made such a petition, and Hartlib later told Winthrop that 'Platts never made any demonstration befor the Parliament of the possibility of the Lapis for ought I know'.⁵² This probably, however, reflects lack of opportunity rather than lack of will. Moriaen offered a simpler and more general rule of thumb for detecting fraudsters: anyone selling his secrets for money was manifestly a charlatan, since if his methods were genuine, his ability to produce precious metal would make money a matter of complete indifference. There was, however, a handy get-out clause: 'Sucht Er aber Laboris socium [a companion in the work] vnd kan seine wißenschafft allein nicht ins werkh stellen, der gibt Ihm genug wan Er ihn das werckh auff seine kosten

51 *Chymical, Medicinal and Chyrurgical Addresses*, 87.

52 Hartlib to Winthrop, 16 March 1660, HP 7/7/2B, replying to Winthrop's query at HP 32/1/4A (16 Dec. 1659).

machen läst' (no. 10). Alchemical expense accounts were seldom modest.

Contracts relating to alchemical funding fall into at least two distinct categories. In the one case the 'adept' simply sold his secret to a wealthier but less enlightened patron. More often, however, potential patrons were themselves practising alchemists, and in such instances the proposals tended to be cast rather in terms of research agreements than plain trafficking in information, and the question of finance, while remaining crucial, became rather less blatant. One such document is a letter from the chemist Friedrich Kretschmar⁵³ to Hartlib, Clodius, Dury and a fourth whose name has been carefully obliterated from the manuscript. I agree with Turnbull's reading of Brereton.⁵⁴

53 Kretschmar was a diplomat in the service of Elector Friedrich ('the Great') of Brandenburg, and was in England in 1657-8, petitioning Cromwell to release the funds raised by an official charitable collection for the Bohemian and Polish exiles (copy of the petition at HP 54/35A), and approaching the Austin Friars Consistory for further assistance for them (Hessels, III, nos. 3441, 3445). While in London he made the acquaintance of Hartlib and his friends, and seems to have been involved with Clodius's 'Chemical College' (Webster, *Great Instauration*, 302).

54 22 July/1 August 1659, HP 26/64/1A-4B; cf. Turnbull, 'Johann Valentin Andreæ Societas Christiana', *Zeitschrift für deutsche Philologie* 73 (1954), 407-431, 414 n.53. William Brereton (1631-1679) was a founder member of the Royal Society and from 1664 third Lord Brereton. He had studied at Breda under Pell and was close to the Hartlib circle; it was he who purchased Hartlib's papers after their owner's death. See James Crossley (ed.) *The Diary and Correspondence of John Worthington I* (Manchester, 1847), 212-13, and the 'Introduction' to *SHUR*, 4-7.

The gist of the proposed deal was as follows. Having been shamelessly betrayed and abandoned by his previous associate, Hartprecht⁵⁵ (who, however, did not have the wisdom to use his ill-gotten knowledge correctly), Kretschmar had been left stranded and destitute, barely able to support his laboratory and his large family. However, his desperate entreaties to God had been rewarded with the discovery of a method for extracting a grain of gold from an (unspecified) quantity of silver which, repeated often enough, would eventually transmute all the metal. After a couple of pages of pious outbursts about this, he abruptly came to the point by proposing a very businesslike contract in five numbered clauses. In return for a full revelation both of the materials involved in the process and the method of effecting it, Hartlib and his friends would undertake 1) to provide £600, either themselves or from a sponsor 'den sie dieser warheit wehrt achten', 2) never to impart the knowledge to unworthy people, 3) never to set it down 'klar und deutlich' on paper, 4) to inform Kretschmar (or his heirs should he be dead) of any refinement or development of the process they might subsequently discover, and 5) to sell on his behalf, for a small

55 Johannes Fortitudo Hartprecht, an alchemist of some renown, who had studied under Michael Sendivogius and styled himself *filius Sendivogii*. In 1660, he published a denunciation of Glauber, *Sudum Philosophicum*. See J. Ferguson, *Bibliotheca Chemica I* (Glasgow, 1906), 338-41 and 368-70.

commission, a large quantity of a cure for the plague he had just prepared.

The document is a treasure-trove of alchemical clichés. Such agreements to pool knowledge were forever ending with one side or both claiming to have been swindled by the other, as Kretschmar said he had been by Hartprecht. And it was rarely that anyone claimed to have found the Stone itself: what was normally offered, as here, was a first step in the right direction, not yet profitable enough to cover its own costs but pointing towards great future achievements.⁵⁶ Still more typical is the aura of intense piety and secrecy (Kretschmar was most insistent Hartlib should show the letter to no-one but the other three addressees, a stipulation Hartlib characteristically broke) and the insistence on keeping the mystery hidden from those who might use it for improper purposes. Clause 3 is the standard undertaking that so bedevils any modern attempt at reconstructing the real chemical details behind such processes. This was a sales pitch which at once enhanced the value of the goods on offer and flattered the proposed recipients, who had been specially selected as fit trustees of the arcanum - which is not necessarily to say that the effect was mere calculation. Kretschmar's most successful piece of audience-targetting was an extra promise to reveal a new

⁵⁶ Bruce T. Moran cites many similar examples in *The Alchemical World of the German Court*.

medicine based on the same materials which he was certain would cure bladder stones. Hartlib was already taking one of Kretschmar's remedies for the stone, and told Boyle it 'is certainly most excellent, and absolutely the best that ever I have used'.⁵⁷ The passage relating to the new cure has been underlined in what is presumably Hartlib's own hand.

The business sense tempering the mysticism in this proposal was at least matched in the witheringly sarcastic reply to it composed by Clodius.⁵⁸ He demanded statistics: exactly how much gold was yielded by a given quantity of silver; was it 'common' or 'expensively prepared' silver (note how readily the term was accepted as having a number of distinct meanings); how much did it cost to reconstitute the left-over silver after the gold had been extracted? And who would bear the costs should any of the plague medicine fail to sell? What is interesting is that for all his wariness and scepticism, Clodius did not for a moment seem to doubt that Kretschmar really had produced gold. Indeed, he affected not to be particularly impressed by the fact.

57 Hartlib to Boyle, 7 Jan. 1658, Boyle, *Works*, VI, 99.

58 A draft of this letter in Clodius's hand and a fair scribal copy, both undated, are appended to the original Kretschmar letter, HP 26/64/5A-7B. Turnbull states rather bewilderingly that 'eine Abschrift befindet sich bei den Briefen Johann Morians in Hartlibs Papieren, und jener konnte es verfaßt haben' ('J.V. Andreae Societas Christiana', 414 n.53), but it is not located among Moriaen's letters within the papers, and the hand of the draft is unmistakably Clodius's.

Den mein H wir sindt alhie nicht so vnwissend, dz wir nicht könnten [...] auß einer Vntze ein wenig goldes bringen, aber hier entweder es zahlet nicht die vnkosten oder es gehet nicht an im großen.

He could himself by such a method offer a fair return on a £100 investment, but 'versichere Meinen Herrn dz man davor gewißlich helt dz sein weg sehr profitable muste sein weil er 600lb davor begehret'.

More damning still was the judgment of Joachim Poleman. Despite all the strict injunctions to secrecy, Hartlib had obviously sent a copy of the proposal to Poleman, who in several letters over the following few months spoke contemptuously of Kretschmar as the archetypal false alchemist, accusing him of having bought his 'goltmacherische taschenspielerey' from the 'Hauptbetruger' Glauber and warning Hartlib against 'dz liebliche zischen einer solchen listigen schlangen'.⁵⁹ Not that Poleman, any more than Plattes, disbelieved in alchemy itself, of which he too was an ardent practitioner. His contempt - which he expressed frequently and vitriolically - was for charlatans such as Kretschmar and Glauber, whose conjuring tricks redounded 'zur großen schmach der mehr als königlichen kunst, der wahren Chymia'.⁶⁰

⁵⁹ HP 60/4/56B-57A, 12 Sept. 1659, and HP 60/10/1A, 15 Aug. 1659..

⁶⁰ HP 60/4/58A-B, 19 Sept. 1659. Poleman is referring here to yet another German alchemist in Amsterdam, Liebhart.

The standard strategy of the defenders of 'die wahre Chymia' was to distinguish not between chemistry and alchemy, but between the true philosopher and the false, both of whom might go under the name of either chemist or alchemist. There is a need for a detailed philological study of the usage of the words 'alchemy' and 'chemistry' and their derivatives with a view to establishing what difference there was between their usages, and how those usages developed and altered in the course of the century. An exhaustive account of this development could alone furnish material for an entire thesis, but I shall offer here some pointers and suggestions, based on the extensive chemical/alchemical material in the Hartlib Papers. Etymologically, they amount to the same thing. The precise origin of the term is disputed, but the derivation in both cases is from the Greek *chymia*: the 'al' in 'alchemy' is merely the Arabic definite article, reflecting the fact that the art reached Western Europe from Ancient Greece by way of Africa, where the Arabs were its principal practitioners in the Middle Ages. There can be little doubt that by the end of the century it had become possible to distinguish between the two terms in the manner still current today, seeing chemistry as a 'true' and 'rational' science, alchemy as 'false' and 'superstitious' myth or magic if not outright charlatanism. (That is not to say such a distinction was universally accepted. On the contrary, the vehemence

with which alchemy was derided by rationalists such as J.C. Adelung in the following century is evidence of how seriously it continued to be taken in many quarters during the 'Age of Reason'. One does not waste ammunition on an opponent who is already dead.⁶¹⁾ But no such distinction could have been made at the beginning of the century, and it was barely beginning to be made by the time of Hartlib's death in 1662.

In the following examples, the two words appear to be used without distinction (in this and the following paragraphs, emphasis has been added to citations by the use of bold type). The author of one anonymous and undated alchemical tract among Hartlib's papers inveighed in the same breath against the 'common herd of alchemists' and 'pseudo-philosophical chemists'.⁶² Sophronius Kozack in his *Liber Spagyricæ* mocked at 'ignorant apothecaries, lying alchemists and presumptuous surgeons',⁶³ having just said that a true physician must be, among other things, a master of alchemy.⁶⁴ The

61 Adelung, *Geschichte der menschlichen Narrheit* (Leipzig, 1785), *passim*. Cf. Debus, 'The Paracelsians in Eighteenth-Century France: A Renaissance Tradition in the Age of Enlightenment', *Ambix* 28 (1981), 36-54; reproduced as chapter 14 of *Chemistry, Alchemy and the New Philosophy: studies in the history of science and medicine* (Variorum Reprints, London, 1987).

62 '... alchemistarum vulgo', 'Chemici Philosophastri' (HP 18/12/11B).

63 'Ignari pharmacopæi, mendaces alchimistæ, temerarij chyirurgi' (HP 25/20/7A).

64 'Famulantur autem Medicinæ, Physica, Botanica, Anatomica, Chyirurgica, Alchimistica Pharmaceutica; omnes

American alchemist George Starkey⁶⁵ contrasted the 'half-learned knowledge of alchemy'⁶⁶ of 'deceivers and sophists'⁶⁷ with the true and faithful student who 'at once acquires the name of chemist, and soon afterward earns the title of Philosopher',⁶⁸ learning operations that are beyond the reach of the 'common chemists'.⁶⁹ Starkey himself had identified mercury as the 'true key to the art of alchemy'.⁷⁰ Glauber recalled having had to suffer the jibes of the ignorant rabble jeering 'Alchimist, Alchimist!', who failed to distinguish 'die wahre Alchimia von den Landtläuferischen Buben oder falschen Alchymisten'.⁷¹ In none of this does the choice of the term 'alchemy' carry a greater suggestion of mysticism, esotericism or magic, either approvingly or

has artes cognoscere tenetur quisquis ambit titulum Medici' (HP 25/20/6B).

65 The untitled and unasccribed Latin tract at HP 18/7/1A-20B is a complete copy of Starkey's *Metallorum Metamorphosis*, which was later published under his pseudonym 'Philaethes' in the collection *Musæum Hermeticum Reformatum et Amplificatum* (Frankfurt, 1678), 743-774. See William Newman, 'Prophecy and Alchemy: The Origin of Eiranæus Philaethes', *Ambix* 37 part 3 (Nov. 1990), 97-115, for identification of Philaethes as Starkey.

66 'Nihil enim præter dispendium (et nummorum et temporis) à semidocta Alchymix scientia' (HP 18/7/1B; *Musæum Hermeticum*, 743).

67 'Non etenim (quia plurimi repriuntur, Alcymiam tractantes, deceptores sophistæ) hæc perinde) aut falsitates aut ineptix arguitur' (HP 18/7/2A-B; *Musæum*, 745).

68 'Chymistæ actutum nomen induit; mox [...] protinus Philosophi titulam vendicat' (HP 18/7/1B; *Musæum*, 744).

69 'Chymici vulgares' (HP 18/7/4A; *Musæum*, 748).

70 '... veram (Artis Alchymix) clavem' (HP 18/7/17B; *Musæum*, 770).

71 Glauber, *De tribus lapidibus ignium secretorum* (Amsterdam 1667), 6-7.

pejoratively. Much of the time the two terms were used interchangeably, almost synonymously. If there is a distinction to be drawn between them in the writings of this period, it is not the distinction that is drawn today. Herwig Buntz speaks of a 'Trennung von Alchimie und Chemie' in the seventeenth century, but the work he cites as a ground-breaking example of the latter is a book by Andreas Libavius entitled 'Alchemia' (1597).⁷²

There are, however, many instances where a distinction does seem to be made, though it is often difficult to deduce quite what that distinction is intended to be. One self-promoting list of experiments proclaimed that the author had 'many things in chemistry, alchemy, medicine, the mechanical arts and natural magic'.⁷³ Heinrich Appelius, informing Hartlib about Glauber's furnaces, remarked 'einem Chymico oder Alchymiste [...] dienen sie sehr wol'.⁷⁴ He later added, 'I think those that have skill in chymicall et alchymisticall matters [...] will be best able to judge

72 Herwig Buntz, 'Die europäische Alchimie vom 13. bis zum 18. Jahrhundert', in Ploss et al., *Alchimia: Ideologie und Technologie*, 119-210, 194.

73 'In Chymicis, Alchymicis, Medicinâ, Mechanicis artibus, Magiâ Naturali, plurima habeo' (HP 1/33/106A-B). The undated tract is entitled 'N. Reneri, Professoris Ultrajectini, Experimenta'. This is perhaps Cyprien Regneri ab Oosterga, who became professor at Utrecht in 1641 (cf. *Correspondance de Mersenne* X, 203), though it is not clear where the initial N comes from. It could simply be a mistake.

74 Appelius to Hartlib, 5 Sept. 1644, HP 45/1/13A.

of his [Glauber's] inventions'.⁷⁵ Hartlib heard in 1652 that one Dr Fogarty had acquired 'all the MS. of Hugen [probably Constantijn Hujgens] [...] They are all in Latin several Volums Medicinal Chymical and Alchymical'.⁷⁶ Dury spoke of ploys to inveigle information out of people, 'as Chimists sometimes or Alchimists use to doe when they would dive into the secrets of nature which others pretend to have'.⁷⁷

Some of this may be mere tautology, a common enough feature of seventeenth-century writing in general (and of Dury's in particular). But tautology was a rhetorical or stylistic device designed either to clarify unfamiliar terms (as in 'your Tubus or Telescopium') or to add weight to a discourse and to enhance the writer's perceived authority by showing off his or her command of language: it characteristically juxtaposes synonyms or near-synonyms that are etymologically distinct and do not look or sound unduly similar. The effect becomes transparent if obvious cognates are used. Tautology is not an adequate explanation of this repeated placing side by side of these two terms as though in opposition.

There is one document in particular which suggests a distinction compatible with all the types of usage described above: it is again a letter from Appelius to

75 Appelius to Hartlib, 26 Aug. 1647, HP 45/1/33B.

76 Eph 52, HP 28/2/27B.

77 Dury to [Worsley?], 25 Aug. 1655, HP 4/3/121A.

Hartlib, and is a personal assessment of what advantages a friend of Hartlib's (unnamed but almost certainly Benjamin Worsley⁷⁸) might reasonably expect from a visit to Glauber. Though inclined to favour the idea, Appellius prefaced his remarks with this caveat:

I doubt not but the Gentleman knowes how fickel, difficult, dangerous et chargable matter is Chymia especially Alchimia [...] Chymia egregia promittit, et præstat, sed non sunt omnium temporum nec personarum, Condimenta dat non Alimenta, Coronam non Vestem. [Chemistry promises and delivers great things, but they are not for all times and all people; it gives the spices but not the substance, the crown but not the clothes.] [...] Alchimia adhuc est difficilior [alchemy has so far been more difficult]: yet intend I not to make the friend afraid: naturalis impetus hic Coryphæus est, si uspiam est [a natural impulse is the leader here if anywhere].⁷⁹

Appellius's terms here are hardly crystal clear, but the general implication is surely that alchemy is a distinct field not from chemistry but within it. It is the most 'difficult, dangerous et chargable [ie. expensive]' part of it, but it is also the core, the yolk of it, providing sustenance rather than mere flavouring through an understanding of essences as opposed to outward forms. Just as Bacon's 'Natural Histories' were a preparative to the 'experiments of fruit' that would once again make Nature Man's servant; just as Comenius's didactics were a preparative to the opening of the 'Janua Rerum', the

78 On Worsley and his visit to the Netherlands, see Chapter Seven.

79 Appellius to Hartlib, 6 Nov. 1647 (dated 27 Oct. O.S.), HP 45/1/27A.

gateway to real things; just as Pell's *Idea of Mathematics* proposed all preliminary mathematical study as a preparative for grasping the method that would solve all mathematical problems whatsoever; so the theoretical aspects of chemistry were a preparative to penetrating its core, alchemy, the spiritual understanding of created matter and mastery of the 'soul of the world'. All alchemists were chemists, but not all chemists were alchemists. The distinction is between the mere student and the practitioner or 'adept', between passive understanding of Nature's forms and active dominion over her spirit. The chemist was as it were the cartographer of a newly discovered country; the alchemist colonised it.

* * * * *

5:3 *The Key to Creation*

The seventeenth century was alchemy's Indian summer. Its practitioners had no sense of nurturing a science in its infancy, a 'prelude to chemistry';⁸⁰ on the contrary, they looked to the imminent culmination of all knowledge. Like Pansophy, alchemical theory presupposed a universe in which everything was interconnected, and its resurgence at the same period represented another dying convulsion of the microcosm-macrocosm theory.

⁸⁰ John Read, *Prelude to Chemistry: An Outline of Alchemy, Its Literature and Relationships* (London, 1936).

The 'Chymicall Gentleman' Cheney Culpeper⁸¹ wished to learn more about the effect of 'cold', understood at the time as a potentially definable and measurable quality opposite to heat rather than simply a lack of the latter, on 'putrefaction' and 'multiplying of the spirit of nature', a 'multiplying' which would manifest itself in increased fertility. Given the terminology of the time and the known interests of Culpeper and his correspondent, Worsley, this is much likelier to refer to the transmutation and multiplication of metals than to an agricultural process in the literal sense. Culpeper was explicit about having hit on the idea through a reflection on macrocosm-microcosm analogies:

not but that I acknowledge alsoe a spring and an autumn as well in our lithe [sic: presumably a scribal error for 'litle'] world as in the great but my desire is that if wee desire to see a fruitful summer, wee must pass through the winter quarters, for if wee looke into nature wee shall find winter to be a naturall cause of the fruitfullnes in summer.⁸²

The mystical-alchemical theosophy of Jacob Böhme, also highly influential on many of these thinkers, set out to define God himself as, effectively, a chemical reaction (though obviously of a highly exalted nature). God consisted, he claimed, of seven 'Quell-Geister' or source spirits, each with a different quality: the sour,

81 A fuller account of Culpeper is given in Chapter Seven, section 1.

82 Culpeper to Worsley, n.d. but probably late 1647, HP 13/223A.

the sweet, the bitter, heat, love, sound and the 'corpus' which comprehended the first six. All seven constantly gave birth to each other and affected or 'qualified' one another in, as it were, an eternal and infinite chain reaction.⁸³ Böhme, it should be pointed out, was not himself a practising alchemist, though the influence of alchemical literature (especially Paracelsus) on his idiosyncratic account of God, Creation and the Universe is unmistakable. Nor was he so presumptuous as to purport to have analysed God in this fashion by experiment. He claimed a single and irrefutable source for all his knowledge of such matters: God had told him personally. But his association of alchemical theories and language with insight into the deepest mysteries of God and Nature is highly symptomatic of the aspirations of the chemical philosophers.

Creation itself was seen by many as an alchemical process, the separating out into discrete elements of the initial Chaos. Culpeper sought to produce 'such an excitation of the Spirit of nature as that it may (as in the beginning) move in and upon the waters'.⁸⁴ It followed that to practise alchemy was to emulate God - an idea strikingly exemplified in a tract sent to Hartlib

83 *Aurora, oder Morgenröthe im Aufgang, Sämtliche Schriften I*, ed. Ernst Peuckert, (Stuttgart, 1955), 85-132. I have drastically edited Böhme's account of these seven 'Quell-Geister', which I make no pretence of understanding in any detail.

84 Culpeper to [Worsley?], 9 May 1648, HP 13/218B.

from Hamburg,⁸⁵ which he passed on to Moriaen, J.F. Schlezer and others for comment, advertising a miraculous 'spiritus mercurii' or 'philosophisches wasser' which would preserve seeds from frost, increase the yield of a crop three thousandfold and cure all diseases, 'vnd ist dieses die Quinta Essentia des Universal Geistes, welcher Genesi primo Auff dem Wasser geschwebet'.⁸⁶ To be sure, this remarkable claim of in vitro revelation was too much for Hartlib's correspondents. Moriaen characteristically criticised it as undemonstrated speculation: 'sehe wol dz des Authoris Philosophia höher gehet als seine Erfahrung'. But, equally typically, he suggested the discovery was probably not without value, albeit the claims made for it were preposterously exaggerated.⁸⁷ Schlezer suspected the 'philosophical water' of being merely ammonia ('Spiritus Vrinæ').⁸⁸ Another commentator, who remains anonymous, objected more sternly to the virtually blasphemous implication of the claims:

expresse im text stehet, dz derselbe geist sey der geist Gottes gewesen, ein absurdum aber ist zu sagen, dz ein chymicus wolle eine quintam essentiam, den Spiritum DEI machen.⁸⁹

85 HP 63/14/23A-24A, undated. The tract was sent by Joachim Lange on 14 October 1653.

86 HP 63/14/23A. The author's name is not given, but according to Schlezer he was a 72-year-old Hamburger known as 'Stapula' (HP 63/14/26A).

87 No. 134.

88 HP 63/14/26A.

89 HP 63/14/33A, n.d.

But the fact remains that the claim was made and that Hartlib seriously canvassed opinions on it. This science not only saw but set out to analyse the world in a grain of sand and heaven in a wild flower.

Underlying this animistic view was the conviction that all Creation was imbued with a materially identifiable life-force, variously defined as 'spiritus mundi', 'anima mundi', 'spiritus universalis' and the like. Paracelsus called it an 'aerial nitre'.⁹⁰ As ever, it is very difficult if not impossible to determine just what was understood by these terms, if, indeed, there was any consensus as to their definition, but the scientific literature of the period is full of practical experiments aiming to isolate and analyse this spirit, illustrating the way in which the new experimental philosophy was seen by the alchemists not as a challenge but an ally. 'Salt' in particular - a term of even greater ambiguity as used at the time - came to assume an importance it would be virtually impossible to overstate. Robert Fludd thought he had isolated the material spirit of life from wheat as 'a pure and divine volatile salt of wondrous properties',⁹¹ and J.B. Van Helmont was 'convinced that the vital spirit must be saltlike and

90 On the 'aerial nitre', see Allen G. Debus, *Chemistry, Alchemy and the New Philosophy, 1550-1700* (Variorum Reprints, London 1987), ch. 9, 'The Paracelsian Aerial Nitre'.

91 Debus, *op. cit.*, ch. 10, 253; Robert Fludd, *Philosophical Key*, ed. Debus (New York, 1979).

aerial in nature'.⁹² Perhaps the most spectacular claims for salt were made by the colourful figure of J.R. Glauber, who will provide the focus for the following chapter.

'Salt' is the dominant theme in much of Glauber's writing. Like most authors who accepted the microcosm-macrocosm theory - and Glauber embraced it wholeheartedly -, he saw nothing odd in setting down side by side recipes for a salt preparation to kill maggots in cheese and another to turn base metals into gold, for preparing 'aurum potabile' and 'philosophic dung' ('philosophischer Mist').⁹³ He was typical too in combining, almost in the same breath, conclusions drawn from laboratory experiment and from Scriptural exegesis and seeing the two as complementary. He pointed out that Christ referred to his disciples as 'the salt of the earth' (Mark 9:49-50.), proving that salt is divinely privileged above all other substances just as the disciples were divinely chosen above all other men,⁹⁴ and went so far as to speak of Christ himself as 'ein lauter Gottlicher Saltz'.⁹⁵ Its value as a fertiliser and preservative proved that it contained the miraculous spark of life itself, associating it in Glauber's mind with the sun, likewise a

92 Debus, *ibid.*, 256. It is worth noting the blithe co-existence in this world-view of materialism and intensely religious mysticism.

93 *Miraculi Mundi Continuatio* (Amsterdam, 1657), 85.

94 *De Natura Salium* (Amsterdam, 1658), 14.

95 *Ibid.*, 115.

great fructifier, and with the first divine act of Creation, making it superior and anterior to the four Aristotelian elements:

Das Saltz ist ... ein Symbolum Æternitatis, weiln weder im Feuer/ Luft/ Wasser/ noch Erden alteriret oder geringert wirdt/ sondern alles vor verderben eine lange Zeit bewaret. [...] Das Saltz ist bey der Schöpfung Gottes das erste Fiat gewesen, vnd ausz dem Fiat sind hernach die Elementa entstanden.⁹⁶

Hard as it may be to imagine God's first words having been 'let there be salt', Glauber went on to explain how salt emanating from the sun's fire passes down through air into the sea water (which, he claimed, is far saltier in sunny climes⁹⁷) and thence into the interstices of the earth, animating and fecundating as it goes. In short, 'Komt also alle fruchtbarkeit/ vnd Nahrung vom Saltze/ das Saltz von der Sonnen/ die Sonne von Gott dem Schöpffer aller dingen'.⁹⁸

This identification of sunlight with 'salt' finds a clear echo in Moriaen's descriptions of his optical experiments:

Von den brenn gläsern hab ich gleichwoll auch diß gesehen, wan man ein klein gestoßenen antimonium an der Sonne damit anstecket so rauchet Er stark hinweg und verliert gleichwoll nichts an seinem gewicht sondern wird schwerer dardurch, das dan freylich ein beweiß ist das der Sonnen stralen das sal naturæ hinein bringen und damit imprægniren (no. 183).

96 Ibid., 43-44.

97 Ibid., 10-11.

98 Ibid., 117.

The conclusion is not as wild as it may at first sound. The nature of light was one of the great mysteries of seventeenth-century science, and many leading thinkers tending towards atomism, including Gassendi and Newton, inclined to the view that it was composed of extremely small atoms, ie. was a material substance, albeit of an exceptionally rarefied nature. Taken together with the premise of the Paracelsian 'principles', this makes it altogether reasonable to expect to find that sunlight consists at least partially of salt.

The influence of such convictions on the laboratory practice of the alchemists is illustrated in two strikingly similar experiments aiming to isolate the life-spirit, one described by Moriaen in somewhat fragmentary fashion (and at second hand, as he frankly admitted) in the course of three letters between April and July 1658,⁹⁹ the other, apparently independently, by Glauber in Part IV of *Des Teutschlands Wohlfahrt*,¹⁰⁰ published the following year. Both versions involved 'magnetising' a raw material by impregnating it with sunlight and the subsequent use of the 'magnet' to attract from the night air something described by Moriaen as 'sal naturæ' and by Glauber as 'ein [Wasser] [...] in

99 Nos. 177 (to Clodius), 183 and (most fully) 189 (both to Hartlib). The process is also referred to in nos. 180 and 181.

100 Reproduced in *Glauberus Concentratus oder Kern der Glauberischen Schrifften* (Leipzig and Breslau, 1715), 465-466.

welchem [Wasser] die allgemeine Lebens-Speise der [Luft] verborgen'.¹⁰¹ This substance was then purified by distillation (Moriaen) or evaporation of the superfluous fluid (Glauber), and what remained exposed again by night, purified again, and so forth, over a period of some thirty days in Moriaen's version, or a hundred in Glauber's. What remained at the end was, according to Moriaen, a 'liquor' containing the sperm of both the sun and the moon, or in Glauber's account a 'salt' in which 'die astralisch lebendig-machende Sonnen-Strahlen' had been made 'sichtlich/ greifflich/ corporalisch und fix'.¹⁰²

Moriaen called his liquor 'das Universale menstruum'¹⁰³ but - perhaps because Hartlib would regard it as self-evident - gave no clearer indication of what he thought it was or what was to be done with it; however, the mention of solar and lunar seeds clearly points to an alchemical purpose, the sun and moon being the ruling planets of gold and silver respectively. Glauber was marginally more forthcoming on this point: his preparation was a medicine (though he neglected to say what for) and it could transmute metals (but he forgot to mention how). What comes down to us is a great cry of Eureka but no very clear definition of what was

101 *Glauberus Concentratus*, 465.

102 *Ibid.*

103 No. 180.

supposed to have been found. That it struck a chord in contemporary minds, however, is evidenced not only by the fact that Moriaen returned to the subject four times within three months, obviously at Hartlib's urging, but by Hartlib's underlining relevant passages in the manuscripts or having scribal copies and translations made of them.¹⁰⁴ He was certainly in touch with Boyle about a later version of Moriaen's experiment, of which there is now no trace in the surviving papers,¹⁰⁵ and elicited a lively reaction from Poleman, who asked Hartlib to send him full details as soon as possible:

Fur die communicata ex MS Morianis de
 Concentrandu Spiritu Mundi bedancke Ich mich
 gar herzlich [...] es saget aber H Morian in
 dieser Description vnter Andern Er habe dem H.
 vor diesem eine weisse entdecket, durch
 Calcinirte Kiesel-steine [...] dz wasser der
 luft zu fangen [...] als bitte Ich solchen
 aufzusuchen vnd ehestes zu vbersenden.¹⁰⁶

This (assuming Hartlib did as he was asked) was one of the more circuitous exchanges of information within the Hartlib network, from Moriaen in Arnhem via Hartlib in London to Poleman in Amsterdam. Poleman knew Moriaen, but presumably did not feel intimate enough to approach him directly with a request for such privileged information.

104 German copy and Latin translation of the relevant parts of no. 177 at HP 60/4/214A-B.

105 Hartlib to Boyle, 5 April 1659: 'Concerning the instrument of catching and condensing the sun-beams, I have a promise of a large account from Mr Morian' (Works VI, 117).

106 Poleman to Hartlib, 5 Dec. 1659, HP 60/4/159A.

Close comparison of the two experiments leaves Glauber's account looking suspiciously like a rewrite of Moriaen's with certain crucial details left out.¹⁰⁷ Glauber totally omitted to define the nature of his raw material; Moriaen somewhat more helpfully described his as a coarse powder obtained by grinding a type of flint or pebble¹⁰⁸ to be found by the Rhine. Moriaen was quite explicit in stating that what his 'magnet' initially attracted from the air was 'salt'; Glauber said no such thing, but did suddenly and bafflingly start referring to the residue after evaporation as 'salt'. Similarly, Glauber abruptly remarked that the evaporation drew off superfluous liquid without affecting the 'seeds' the magnet had attracted, but gave no hint as to what these seeds were or where they had come from; Moriaen was far more specific with his solar and lunar spermata. Moriaen was clearly aiming (albeit not very successfully, at least to a modern reader) at giving a much more complete and comprehensible report. This is only to be expected, since Moriaen was writing a private letter to a friend whereas Glauber was aiming at the general public, and

107 The point cannot be proved one way or the other without further documentary evidence, but I do not think it out of the question that Glauber based his version, without acknowledgment, on information given him by Moriaen. Since Moriaen made no claim to have devised or even conducted the experiment himself, I can see no grounds for supposing that if it was he who had it from Glauber he would have concealed the fact from Hartlib.

108 In Latin passages, the term consistently used is 'silices', in the German, 'Kießlinge'.

whatever they may have claimed, alchemists generally published not precise scientific descriptions but tantalisingly and deliberately veiled or incomplete hints, with a view not so much to public edification as to arousing the interest of well-heeled potential patrons. Glauber, indeed, was in the habit of sending presentation copies of his new publications to such figures.¹⁰⁹

As with most alchemical recipes, it is unlikely we shall ever be able to say with exactitude and certainty either what Glauber and Moriaen thought they were doing or what they were doing in fact. Such accounts remain valuable, however, for the help they give in conceptualising the role of practical experiment at a period in which the methodology of hypothesis and controlled test, as understood in modern empirical science, had barely been formulated, let alone accepted as standard. However obscure the technical details may be, what does emerge quite clearly is an unconscious ambivalence between the use of phenomena to evaluate theories and the use of theories to interpret phenomena - a methodological confusion compounded by the fact that such theories were often directly derived from articles of religious or quasi-religious faith. Glauber and Moriaen found what they were looking for because they

109 See Link, *Glauber*, 103-4.

defined their results in terms of what they were expecting to find. By the same token, many an alchemist, like Starkey in the example cited above, concluded that what he had produced was a form of gold because he was assured by respected authority and/or what he took to be divine inspiration that gold was what his method would produce. It was one thing to dismiss the theories of pagans like Galen and Aristotle as ignorant or misguided and to refute them by experiment, but the study of true Scripture and the insights achieved through pious Christian meditation could only serve to illuminate and explain experimental data. This is not to accuse these thinkers of intellectual laziness or dishonesty, merely to attempt to understand their habits of thought by placing them in historical context.

The letters and documents of the German natural philosophers directly or indirectly associated with Hartlib in the mid-seventeenth century, far from showing any increased scepticism about the claims of alchemy, manifest a mounting and at times near-hysterical enthusiasm. Uprooted from their home countries and in many cases plunged into at least relative poverty by the social, political, religious and economic turmoil of the Thirty Years' War and its aftermath, they found in alchemy a system of thought that reconciled the evidence of their senses with the demands and promised rewards of

the Reformed faith to which they clung with almost desperate tenacity. There was, in their minds, no antithesis between the pragmatic rationalism of Bacon and the mystic Paracelsianism of Böhme, and they actively encouraged the development of new technology and experimental science, which they thought could only contribute to their work. The revival of alchemy and the growth of the new science were not merely parallel but inextricably intertwined: though empiricism was in time to sound the death-knell of alchemy, it is wholly anachronistic to speak in terms of a conflict between the two at this date. Francis Bacon thought he was speaking of the past, but might equally be seen as having predicted the future, when in 1605 he acknowledged that

surely to alchemy this right is due: that [...] the search and stir to make gold hath brought to light a great number of good and fruitful inventions and experiments, as well for the disclosing of nature as for the use of man's life'.¹¹⁰

110 Francis Bacon, *The Advancement of Learning*, I; in *Works* III, 289.

Chapter Six

A Case Study in Seventeenth-Century Scientific Exchange:

Moriaen, Glauber and the Hartlib Circle

'Er ist ein Mensch voller verstand und wißenschafften in re medico-chimica Ia so [sehr?] daß Er gleichsam darinnen sich veriret und nicht weiß welches er am ersten furnehmen oder ins werkh richten soll' - Moriaen to Hartlib, 27 August 1647, HP 37/121A (no. 93).

6:1 'Paracelsus of the Seventeenth Century' or 'German Robert Boyle'?

Of all the many 'Chemical Philosophers' with whom Moriaen became associated in the course of his long involvement with alchemy, the one personally closest to him and on whom he sent the longest and most detailed reports was his highly controversial countryman Johann Rudolf Glauber (1604-1670).¹ It is now generally accepted that Glauber was among the most historically significant practical chemists of his day, though assessments of the scientific value of his work still

¹ On Glauber, see J.C. Adelung, *Geschichte der Menschlichen Narrheit* (Leipzig, 1785) II, 161-192; H. Kopp, *Beiträge zur Geschichte der Chemie* (Braunschweig, 1869), 160-163; Kurt F. Gugel, *Johann Rudolph Glauber: Leben und Werk 1604-1670* (Würzburg, 1955); Erich Pietsch, 'Johann Rudolph Glauber: Der Mensch, sein Werk und seine Zeit', *Deutsches Museum Abhandlungen und Berichte* 24 (1956), Heft 1, Munich 1956, 1-64; J.R. Partington, *A History of Chemistry II* (London, 1961), 341-361; *NDB VI*, 437-8, and the excellent summary by Katherine Ahonen in *DSB V*, 419-23. Far and away the fullest and most objective account to date of Glauber's life and work, distinguishing carefully between pure myth, plausible speculation and verifiable fact, is Arnulf Link, *Johann Rudolph Glauber 1604-1670: Leben und Werk* (doctoral dissertation, Heidelberg, 1993); this also gives an excellent bibliography. I am deeply indebted to Dr. Link for supplying me with a copy of his thesis, which is not obtainable in England.

vary considerably. Because of Moriaen's personal friendship and practical collaboration with the man, his comments on Glauber are of particular value. They supply some hint of what is most irrevocably lost to later scholars, the essential oral component of alchemical communication, in the context of which published and even manuscript material was intended to be understood.

Though numerous monographs on him have been written, many details of Glauber's personal history remain obscure. The principal source of information hitherto available on his life has been his own autobiographical writings - a notoriously unreliable form of evidence. These autobiographical fragments, which are scattered in typically disorganised fashion throughout his work, were mostly written in response to accusations published by Christoph Fahrner, an assistant and protégé with whom Glauber fell out in 1654.² They are thus highly polemical and defensive, and particularly in the cases where Fahrner's charges appear to have had at least an element of truth in them, Glauber did not scruple to

² See section 3 of this chapter. Glauber's principal autobiographical works are *J.R. Glauberi Apologia Oder Verthädigung Gegen Christoff Farners Lügen vnd Ehrabschneidung* (Mainz, 1655); *Johann Rud: Glaubers Zweyte Apologia, Oder Ehren-Rettung Gegen Christoff Farnern [...] unmenschliche Lügen vnd Ehrabschneidung* (Frankfurt am Main, 1656), *Glauberus Ridivivus [sic]* (Amsterdam, 1656), and *Joh. Rudlophi Glauberi Testimonium Veritatis* (Amsterdam, 1657). There are, however, biographical asides in a great many other works, especially *De tribus Lapidibus Ignium secretorum* (Amsterdam, 1667).

doctor the facts in order to refute them. The other main source has been contemporary publications about him, almost all of which were written by personal enemies such as Fahrner and are hence equally partisan and unreliable.

Hartlib's papers, especially the letters from Moriaen, supply a number of lacunae in the biographical data so far available on Glauber, particularly for the 1640s and 1650s. They are also a rich source of informal contemporary comment on the man and his work, covering the whole gamut from enthusiastic approval through interested comment, scepticism and frank bafflement to outraged condemnation. This chapter will present a considerable body of new biographical evidence to supplement the extant accounts, and draw on the Hartlib archive to provide a more sophisticated analysis of the reception of his work in his own age than can be gleaned from printed sources. Though the letters preserved by Hartlib are by no means free of partisanship and personal agendas, neither are they public denunciations or defences, and a measure of balance is supplied by the sheer variety of sources and opinions. The case of Glauber also provides a very interesting and well-documented example of the workings of Hartlib's information network as applied to a given subject or individual.

Glauber's life and work were both consciously modelled on those of Paracelsus: he has been described as the 'Paracelsus des 17. Jahrhundert'.³ He wandered as restlessly through Europe as his forebear before finally settling for good in the Netherlands in his fifties. Like Paracelsus, he wrote in the vernacular, though in Glauber's case this was as much a consequence of linguistic limitation as of principle. He despised received academic wisdom, though as Boyle was to complain of the Spagyrist in general, he was not always so sceptical of doctrines of the non-'academic' variety. He laid great emphasis on exact observation and physical experiment, and displayed exceptional practical expertise, particularly in technological and agricultural matters.

Like Paracelsus, he was a spectacularly controversial figure during his lifetime, and has continued to be the object of both uncritical praise and excessive vilification in the centuries since his death. What both camps have generally agreed on, however, is that an evaluative judgment of Glauber depends on the question of whether he is to be seen as an alchemist or a chemist - a question which, as was argued in the previous chapter, is wholly anachronistic.⁴ Adelung thought him a

3 Wolfgang Schneider, *Geschichte der Pharmazeutischen Chemie* (Weinheim, 1972), 130, cit. Link, *Glauber*, 8.

4 For an extensive summary of assessments of Glauber from his own time to ours, see Link, *op. cit.*, 8-13.

complete charlatan, but he is seen far more sympathetically by most of his more recent biographers. Pietsch calls him 'einen Ergründer der chemischen Technologie'; for Gugel 'wurde er zu einem der Väter der deutschen Chemie überhaupt'.⁵ Jan V. Golinski agrees with Pietsch in seeing Glauber as a pioneer of precise and lucid scientific terminology,⁶ but J.R. Partington, while acknowledging him to have been 'a very skilled practical chemist', criticises him as 'an extremely untidy, verbose and often obscure author', 'too fond of praising himself and posing as a benefactor of mankind in general and Germany in particular'.⁷

Paul Walden, on the other hand, goes so far as to call him 'den deutschen Robert Boyle'.⁸ This is about as illuminating as calling Shakespeare the English Racine. Both can be seen as the leading exponents in their respective countries and generations (Glauber was already about 23 when Boyle was born) of the same discipline, but in almost every other respect they were diametrical opposites. Boyle was an aristocrat with a thorough

Link's own work is an honourable exception in this respect, presenting a much more integrated view of Glauber's natural philosophy and relating it more fully to contemporary currents of thought.

5 Pietsch, 51; Gugel, 69.

6 'Chemistry in the Scientific Revolution: Problems of language and communication', *Reappraisals of the Scientific Revolution*, ed. David C. Lindberg and Robert S. Westman (Cambridge, 1990), 367-396.

7 *A History of Chemistry II*, 349, 343.

8 Entry on Glauber in Günther Bugge (ed.), *Das Buch der großen Chemiker I* (Weinheim, 1974; first pub. 1929), 153.

classical education, a man of independent means which enabled him to devote his time and energy to his beloved science without being distracted by the problem of funding. Glauber's origins were in the artisan class and he was largely self-taught, facts he stressed in his autobiographical writings with truculent pride if not outright inverted snobbery:

Ich gestehe das gern/ daß ich niemahlen auff
Hohen Schulen gewesen/ auch niemahlen drauff
begehrt/ wann solches geschehen/ ich vielleicht
zu solcher Erkäntnus der Natur/ so ich
ietzunder (ohne Rum zu melden) besitze/
nimmermehr kommen were: Reuhet mich also gantz
nicht/ daß ich von Jugend auff die Hand in die
Kohlen gesteket/ vnd dardurch die verborgene
Heimlichkeiten der Natur erfahren habe. Ich
suche niemand zu vertreiben/ habe auch
niemahlen darnach getrachtet grosser Herren
Brodt zu essen/ sondern viel lieber solches
durch mein eigen Hand/ neben Betrachtung dieses
Spruchs (ALTERIUS NON SIT QUI SUUS ESSE POTEST)
Ehrlich zu erwerben.⁹

The motto ('let him belong to no one else who can belong to himself') is taken directly from Paracelsus,¹⁰ a reference Glauber would have expected a reader with any knowledge of the chemical tradition to recognise. Chemistry was the trade by which Glauber earned his living, partly by teaching, both publicly and privately, partly by seeking employment and (for all his declared distaste for eating fine gentlemen's bread) patronage

⁹ Glauber, *Deß Teutschlands Wolfahrt* I (Amsterdam, 1656), 80.

¹⁰ It appears above the most famous portrait of him, by Augustin Hirschvogel (1538), reproduction in Pagel, *Paracelsus*, 28.

from men of rank, and partly by marketing a whole range of products, principally distillation ovens and other equipment, mead and wine made from various fruits, and patent chemical medicines.

Boyle's thought was exceptionally systematic and consequent: he was among the first clearly to formulate and practise a method of consistent scepticism and experimental verification, rejecting all prior authority and tradition, of what is now called empiricism (though the word had other connotations at the time, implying random guesswork if not outright quackery). The insistence on trusting only the evidence of the senses, the 'light of nature', was nothing new, having been commonplace already in medieval alchemical writing and become even more strident in Paracelsus and his followers, especially (in his earlier work) Glauber. What is revolutionary about Boyle is that he followed the idea through and made it the central tenet of his scientific method rather than a mere rhetorical tag. His style is incomparably more organised and sophisticated (though at times hardly less verbose) than Glauber's: indeed, Glauber's frequent coarseness is singled out for criticism in Boyle's *Sceptical Chymist*.¹¹

11 Complaining in the 'Preface Introductory' of those who 'rail instead of arguing, as hath been done of Late in Print by divers Chymists', Boyle adds the marginal note 'G. and F. and H. and others, in their books against one another' (*Sceptical Chymist*, A5v), a thinly disguised

Glauber's thought and writing, by contrast, were spectacularly unorganised, and he had the practical autodidact's defensive contempt of theory and method. As Gugel points out, although he described his profession (on his second marriage certificate) as 'apothecarius', he never attempted to gain a qualification from the Amsterdam Collegium Medicum, as practising apothecaries were theoretically required to do.¹² Gugel considers this surprising, but it probably reflects the same disapproval of monopolies and mistrust of academic establishments that characterised the attitude of so many English iatrochemists to the College of Physicians.¹³ There is no documentary evidence about his education. His father was a barber,¹⁴ and it is not clear what first attracted him to natural philosophy, though the combination of a quick brain, lively imagination, practical dexterity and strong ambition are in themselves perhaps explanation enough. Thanks to the keen interest taken in chemistry, and the substantial sums laid out on it, by many German princes and indeed the Emperor himself,¹⁵ few professions offered such potential rewards

allusion to Glauber, Fahrner, and J.F. Hartprecht, who also wrote against Glauber (see below).

12 Gugel, *Glauber*, 13.

13 Cf. Webster 'English Medical Reformers of the Puritan Revolution: A background to the "Society of Chymical Physitians"', *Ambix* 14 (1967), 16-41; also *The Great Instauration*, 250-256.

14 *Glauberus Ridivivus*, 65.

15 This was especially true of Rudolf II, but rather less so of Ferdinand II. It has been alleged that

for a gifted man without formal training or private means as that of investigator of nature.

Boyle's thorough scepticism led him to be chary of all tradition and received wisdom from whatever source, to take nothing on trust until he had himself seen it experimentally verified. Glauber, like the majority of iatrochemists, ostensibly held the same opinion, but in fact reserved his scepticism for the authorities sanctioned by the Schools, investing in the Hermetic writers, particularly Van Helmont, 'der aller gelährteste vnd erfahrneste Philosophus bey seinen lebezeiten',¹⁶ and above all his hero Paracelsus, a faith every bit as blind as that of the Schoolmen in their sacred cows. He portrayed it as part of his mission on earth to unravel and state in plain terms the mysteries embedded in Paracelsus's often well-nigh impenetrable pronouncements, into which he had gained unique insight by the parallel routes of meditation and practical experiment. His methodology, in later years at least, ran to such procedures as solving what he took to be anagrams in his

Glauber himself was associated with Ferdinand's court in 1625-6 (Gugel, 13-14) but Link exposes this as unsubstantiated conjecture (Link, 18). On the patronage of German princes, see William B. Ashworth Jr., 'The Habsburg Circle', and Bruce T. Moran, 'Patronage and Institutions: Courts, Universities, and Academies in Germany; an Overview: 1550-1750', in Bruce T. Moran (ed.), *Patronage and Institutions: Science, Technology and Medicine at the European Court 1500-1750* (Boydell, 1991), 137-167 and 169-183.

¹⁶ *De Tribus Lapidibus*, 4.

forebear's work, in a manner distinctly akin to the approach of the chiliasts who applied numerology to the prophetic books of the Bible in order to date history in advance, and his belief in the transcendent truth of these texts was almost as fervent as theirs in Scripture.

Finally, while Boyle's thought evolved towards a scientific methodology recognisable and indeed still practised today, Glauber in his old age turned away from the practical chemistry for which he is now best known - his observations on acids, alkalis and salts, his production of fertilisers and fruit wines, his studies of the therapeutic effect of spa waters - and turned instead to a wholly contemplative and mystical approach, depicting his earlier labours as a superficial and mechanical preliminary to the true transcendent insights into the secret fires of the earth, the transmutation of metals and the universal animating spirit which he gained only after abandoning practical experiment. The development of Glauber's scientific thought from the merely practical to the transcendent could serve as a paradigm of the progression through 'chemistry' to 'alchemy' suggested in the previous chapter, though the utter rejection in his last years of practical experimentation makes his a rather extreme and idiosyncratic case.

6:2 Heyday in the Netherlands

Between the still almost totally obscure *Wanderjahre* of his youth and his move to the Netherlands in c.1640, Glauber was for a time Court Apothecary to Landgrave Georg II of Hessen-Darmstadt, in Giessen and Marburg. He occupied this position by 1635 at the latest.¹⁷ Why he left the post remains entirely unknown, but it is certain he was in Amsterdam by 1640, for it was there that he married Helena Cornelisdottir on 20 January 1641.¹⁸ This was his second marriage, the first having come to an untimely end, according to Glauber, some two years earlier when he surprised his wife in bed with his servant.¹⁹ He had not, he claimed, intended to settle in Amsterdam, but had merely been making a business visit. He cited two compelling grounds for taking on another wife in spite of the previous unfortunate and cautionary experience: he had fallen ill, and he disliked Dutch food:

bin [...] nach Hollandt wegen einiger
geschäfte verweist/ da selbst aber wegen
verenderung der Luft Kranck worden/ vnd weilen
ich die Hollandische Kost nicht aller Dings

17 Link, *Glauber*, 27.

18 Link, *Glauber*, 29-31; Gugel, *Glauber*, 16.

19 *Glauberus Ridivivus*, 50 and 65. Glauber is rather vague about the details, saying of his second wife, 'sind 2 Jahr verlauffen gewest/ ehe ich diese nach der ersten Geheurat' (*Glauberus Ridivivus*, 65); whether this means two years after the first marriage or two years after its annulment (if indeed it was officially annulled) is not clear. Fahrner accused him of adultery and bigamy, which he of course denied, but with a suspicious lack of verifiable evidence.

vertragen können/ ich nothwendig mich wieder in
Eehstant (desto besser wartung zu haben)
begeben müssen.²⁰

An additional and more convincing incentive is suggested by the fact that the couple's first child, Anna, was born almost exactly seven months after the date of the wedding, on 29 September.²¹

It may well have been at this time that Glauber made friends with Moriaen. It is the first time both men were demonstrably in the same place, and as two German emigrés with a pronounced interest in chemistry, it is hardly surprising they should have become known to one another. They were certainly acquainted by 1642, for on returning to Amsterdam in September that year after two months' absence, Moriaen mentioned to Van Assche that on account of this he had not seen Glauber for some time.²² This is his first surviving mention of the man, but makes it obvious he already knew him well. According to Moriaen, Glauber at some unspecified point spent 'a long time' as a guest or lodger in his house,²³ and it seems very likely that this refers to some at least of the period between Glauber's arrival in Amsterdam and his marriage.

20 *Glauberus Ridivivus*, 65.

21 Though both these dates have been available to Glauber's biographers since 1949 (Dirk Wittop Koning, 'J.R. Glauber in Amsterdam', *Jaarboek van het Genootschap Amstelodamum* 43 (1949), 1-6), none of them has drawn the obvious inference.

22 UBA N65f, 23 Sept. 1642.

23 No. 91: 'hab Ihn lang bey mir im hauß gehabt'.

On 9 May 1643, Moriaen told Van Assche that Glauber had moved into a new house in Amsterdam.²⁴ This was on the Elandsgracht,²⁵ and is doubtless the house described in Glauber's *De Tribus Lapidibus*, which the chemist had bought from a 'Liebhaber der Kunst' (ie. an alchemist), who had had it built expressly to house a laboratory. Glauber gave a grand account of the establishment he set up here with the intention of performing 'etwaß Rechtes ins grosse in Alchimia' It featured, he claimed, six large stone outbuildings with mighty chimneys, 'allerhandt klein vnd große Oefens [...], vnterschiedliche klein vnd grosse Blaßbälge' and a staff (number unspecified) of labourers and apprentices.²⁶ Among the visitors to this impressive-sounding public laboratory were Moriaen, who received instruction in metallurgy from Glauber,²⁷ and Dury's future brother-in-law Heinrich Appelius.

In a letter to Hartlib of 7 June 1644, Appelius assumed his friend in London would already have heard all about Glauber from Moriaen:

Utilitates furni noui Philosophici Glauberi²⁸
 wolte ich jetzt geschickt haben, halte aber,
 der H wird von H Morian selbiger sachen schon
 gnugsam berichtet sein, wo nicht kan er sich am

24 UBA N65g.

25 Link, *Glauber*, 31.

26 Glauber, *De Tribus Lapidibus*, 9; cf. Link, *Glauber*, 32-3.

27 Moriaen to Van Assche, Nov. 1644, UBA N65h.

28 See below for identification and description of this work.

gewissesten bey ihm erkundigen [...] dann ihm ohne zweifel mehr davon bewust als mir.²⁹

Apparently, however, Appelius was wrong, for some two or three weeks later, he sent a copy of 'Glauberi ofen', presumably at Hartlib's request, mentioning again that 'H Morian, vnd andere Medici/ die was von ihm haben, seind mit ihm wohl zufrieden'.³⁰ But either Hartlib did not follow up the suggestion of directing his enquiries to Moriaen for another two and a half to three years, or Moriaen did not bother replying until then.³¹ This lends considerable weight to the conjecture that there was a lapse in Moriaen's relations with Hartlib between these dates. From this point on, however, Glauber became far and away the most discussed figure in the correspondence, and Moriaen took over from Appelius as Hartlib's principal source of information on the German chemist.

The tract sent by Appelius was an advertisement for Glauber's new laboratory. A copy, in Appelius's hand, is preserved among Hartlib's papers, entitled 'Furni Noui Philosophici Utilitates oder Beschreibung der eigenschafften eines sonderbaren new erfundenen

29 Appelius to Hartlib, 28 May/7 June 1644, HP 45/1/6A.

30 22 June 1644 (or possibly 2 July if Appelius is using Old Style), HP 45/1/8A.

31 Moriaen's first mention of Glauber in the Hartlib archive is in no. 91, 7 Feb. 1647, obviously written in reply to specific questions, but not necessarily to Hartlib. The next, which is definitely to Hartlib and sets out at some length to supply 'was mein H sonst wegen H Glauberi zu wißen begehret', is no. 93, 27 Aug. 1647.

Philosophischen distillir ofens [...] Zu Amsterdam gedruckt bey Broer Ianß. Ao 1643'.³² No copies of the printed version of this pamphlet seem to have survived, and it is not mentioned in any bibliography of Glauber. Pre-dating his first previously recorded publication by three years, it is the earliest known piece of writing by him, and is presented as Appendix 1 to this chapter.

In contrast to the later *Furni novi Philosophici* (1646-9), the work that was to make Glauber's name throughout Europe, the advertisement gives no indication whatsoever of how the furnace was constructed or how it worked. Instead, it describes, in deliberately vague terms, the processes it could perform and the products it could yield. The fact that only one oven is mentioned suggests that Glauber's later description of his laboratory in *De Tribus Lapidibus* had benefited from a certain amount of retrospective embellishment. It may be, however, that Glauber was using one oven for public displays and others for his private research: it is clear from Appelius's report that there was at least one other oven in the house. The advertisement concludes with an invitation to 'der warheit vnd spagyrischen kunst liebhabern' to visit Glauber and have the furnace's operations revealed to them: 'soll er [der Ofen ...] dem

32 HP 63/14/48A-49B. Hartlib had a Latin translation made for circulation, of which there are two manuscript copies (HP 16/8/1A-4B and 25/22/1A-4B).

liebhaber [...] nicht gewegert sein'. Not, at least, if the visitor came armed with a suitable fee. Appelius was charged 30 Imperials to see both furnaces and their more basic operations: he thought this 'ein leidlich gelt'.³³ The more specialised processes, however, had to be paid for separately. The sums involved are revealed in detail by Appelius in a later letter,³⁴ and make it clear that the charge of 30 Imperials was very much a budget-class deal. Between them, these documents supply quite a detailed price list of the marvels on display in a mid-seventeenth century public chemical laboratory.

A particularly striking feature of the list is that Glauber was already speaking of the 'secret philosophic fire', probably some highly corrosive acid, which was to become one of his deepest obsessions in later years. The prices quoted by Appelius were what he and his friend³⁵ had themselves paid - a fact of some significance, since

33 Appelius to Hartlib, 7 June 1644, HP 45/1/6A: 'man kriegt sie [seine Sachen] wol vmb ein leidlich gelt von ihm'; 13 Aug. 1644, HP 45/1/12A: 'Glauberus hath his furnaces communicated to my Docteur, et to me'. The doctor may have been Francis de la Boë Sylvius, with whom Appelius was familiar at this period. The charge of 30 Imperials is specified in Appelius's footnote to his copy of Glauber's advertisement (HP 63/14/49B).

34 Appelius to Hartlib, 6 Nov. 47, HP 45/1/37A-B. Hartlib was interested enough to add notes of these figures to his copy of the original advertisement: see Appendix 1.

35 Appelius says no more about this friend than that he was a doctor. It may well have been the physician and alchemist François de le Boë ('Sylvius') (1614-1672), with whom Appelius was friendly at the time. On Sylvius, see Partington, *History of Chemistry II*, 281-89.

Appelius made not the least mention of being dissatisfied with the deal. This tends to verify that Glauber's claims were genuine, or at least appeared so to two experienced chemists of the day who had investigated them in person. Deliberately vague though much of Glauber's terminology is, it is not mere attention-grabbing publicity.

The total fee mentioned by Appelius is 420 Imperials, or about £100. Had Glauber had many such eager customers, his business would have been a very profitable one indeed: £100, it may be remembered, is what Comenius a few years earlier had considered an adequate annual income. Glauber was doubtless also selling the products of his laboratory, such as medicines, pesticides, preparations for purifying or preserving food and drink, and the like. But it seems there were few both able and willing to run to expenditure on this scale for the satisfaction of their curiosity, and the overheads must have been considerable. The chemist himself later described the enterprise as 'nichts als viel geldt außgebens/ vnd wenig dargegen einkommens'.³⁶ Moreover, Glauber, whose health was precarious throughout his life (which is hardly surprising given that the senses of taste and smell ranked first among the analytical apparatus of mid-17th-

³⁶ *De Tribus Lapidibus*, 10.

century chemistry), repeatedly complained that the damp and noxious Amsterdam air disagreed with him. On 22 July 1644, Appelius, writing from Amsterdam, reported that 'Glauberus der Chymicus will erst vber 3 wochen von hinnen den Rein hinauff reisen, vnd sich an einen bequemen ort zu wohnen niedersetzen'.³⁷

All that has previously been known of Glauber's movements in the Netherlands is that besides Amsterdam he dwelt at some point in Utrecht and Arnhem. This information is drawn from the truculently incoherent *Glauberus Ridivivus*:

daß ich aber die Feuchte Lufft zu Amsterdam/
nicht wohl vertragen können/ vnd eine gesündere
Lufft zu Vtrecht vnd Arnheim gesucht/ ist wahr
[...] habe mich wieder vmb besserer Nahrung
willen nach Amsterdam setzen müssen/ aber
niemahlen zu Leyden gewohnt wie du [Fahrner]
auffschneitest/ vnd hette ich daselbsten
gewohnt/ waß wehre es dan gewesen/ wan Leyden
besser vor mich gewesen wehr alß ein anderer
Orth/ wer wurde mich verdacht haben daselbsten
zu wohnen?³⁸

Information in Hartlib's papers make it possible to establish the chronology of these movements with much greater accuracy, thanks to the regular news about Glauber sent by Moriaen and Appelius. Though the very vehemence with which Glauber denied a stay in Leiden inevitably arouses the suspicion that he had been there

37 Appelius to Hartlib, HP 45/1/9A. The phrase is rather odd, since the Rhine does not run through Amsterdam.

38 *Glauberus Ridivivus*, 65-6.

and had reason to conceal the fact, the absence from their reports of any mention of such a stay tends to suggest he was in fact telling the truth.³⁹ He moved to Utrecht in August 1644,⁴⁰ and was back in Amsterdam briefly from March to at least the end of August 1647 before decamping to Arnhem.⁴¹ He returned to Amsterdam probably between May and August 1648.⁴² Unfortunately, none of this sheds any light on the reasons for all these moves.

Both Pietsch and Gugel conclude that after leaving Amsterdam the first time, Glauber returned to the service of the court of Hessen-Darmstadt. This is because Glauber appears to cite the siege of Marburg by invading troops from Hesse-Kassel, which occurred on 2 November

39 Even Gugel, who generally takes Glauber at his word, states as a matter of fact that Glauber at some point lived in Leiden (*Glauber*, 17).

40 Appelius to Hartlib, 22 July 1644, HP 45/1/9A, stating he planned to depart in three weeks, and 5 Sept. 1644, HP 45/1/13A, saying he had arrived there.

41 See below, and no. 93 (27 Aug.) stating that he planned to set off the following day. Appelius also mentioned his imminent departure on 26 Aug. (to Hartlib, HP 45/1/33A).

42 When Benjamin Worsley arrived in Amsterdam in late Feb. 1648, Glauber was obviously not there as he was communicating with Worsley by post (no.98), but Appelius's letter of 2 August (HP 45/1/39B) indicates that they were in personal contact and mentions Glauber's 'verhäusung', probably meaning the move from Arnhem to Amsterdam. Since there is no mention of him in Moriaen's letter of 28 May 1648 (no. 99), though he knew Hartlib to be deeply interested in the progress of Worsley's contacts with Glauber, it seems likely the move had not yet happened. For details of Worsley's visit and contacts with Glauber, see Chapter Seven, sections 1 and 2..

1645, as his reason for leaving this employment. But as Link points out,⁴³ this does not add up. Glauber's account of the episode is jumbled together with the lurid tale of his first wife's adultery. Writing in 1656, he declared that

ich vor etlichen vnd Zwanzig Jahren [ie. before 1636] zu Giesen ein Weib genohmen [...] bin in die Fürstliche Hoff-Reichß Apotecken selbe zu versehen erfordert worden [...] nachdem aber Hessen Cassel/ mit Hessen Darmstadt einen Krieg anfangen/ vnd Marpurg mit Kriegs Macht nehmen wollen/ ist alles verendert vnd wer gekonnt sich in sicherung salvirt hatt/ wie ich dan also von dannen mich nach Franckfurt den Rein herunter nach Bon zu meinem Gnädigen Hern [= Georg II of Hessen-Darmstadt?] begeben/ vnd in wehrender zeit obgedachtes Weib von Giesen/ einmal in meiner Kammer/ bey meinem damaligen Diener in Ehebruch erdappt [...] bin nach solchem fall vbers Jahr darnach erst nach Hollandt [...] verreist [emphasis added].⁴⁴

The passage thus seems to place the siege of Marburg (1645) a year before Glauber's first move to the Netherlands (1640). Link suggests three possible explanations. Hessen-Darmstadt and Hesse-Kassel had been at war since 1618, and it is conceivable that the military threat to Marburg mentioned by Glauber was indeed merely a threat, not the actual siege of 1645. Or Glauber's memory may have been at fault. Thirdly and by far the most likely, it may be 'daß Glauber mit dieser Darstellung die wahren Gründe für sein Ausscheiden aus den Diensten für den Landgrafen verschleiern wollte'.⁴⁵

43 Glauber, 29-30.

44 Glauberus Ridivivus, 65.

45 Link, Glauber, 30.

As will be shown below, this would not make it the only piece of deliberate misinformation in his autobiography.

Gugel and Pietsch also both assume Glauber was back in Amsterdam by 1646, on the grounds that his first major published works, *Furni novi philosophici I* and *De auri tinctura* (often referred to as *De auro potabili*), appeared there that year.⁴⁶ It was not, however, necessary to be in Amsterdam to have works printed there. He could have sent or brought them over from Utrecht, either direct to the printer - Moriaen's old associate Hans Fabel - or to friends in Amsterdam, Moriaen being an obvious candidate. Book I was out by September 1646, shortly to be followed by *De Auri tinctura*.⁴⁷ Appellius told Dury that 'the Author protesteth by his friends, that hee intendeth to write nothing but what hee hath, and yet daily can doe without fallacie, not what he hath observed or lighted upon by chance',⁴⁸ a turn of phrase strongly suggesting that Glauber was not yet in Amsterdam to do the protesting in person. According to Moriaen, he was on his way to settle there again in early February

46 *De Auri Tinctura sive Auro Potabili Vero* (Amsterdam, 1646): the short title form *De Auri Tinctura* avoids confusion with the later *Tractatus de Medicina Universali, sive Auro Potabili Vero* (Amsterdam, 1657).

47 Appellius to ?, 13 Sept. 1646, HP 45/1/25A. *De Auri Tinctura* was not, therefore, as Partington states (*History of Chemistry*, II, 344), Glauber's first published work, having been narrowly preceded by *Furni novi I*.

48 Appellius to Dury, 16 Oct. 1646, HP 45/1/28A.

1647.⁴⁹ Appelius reported his arrival in March,⁵⁰ which accords well with this; Moriaen's own considerably later statement that he had arrived in May probably represents a lapse of memory.⁵¹

It was at just this juncture, it seems, that Moriaen's regular correspondence with Hartlib was resumed, and it is obvious that his relations with Glauber were now very close. He was able to give lengthy and accurate details about Glauber's various furnaces, based on personal experience. Though only part One of *Furni Novi Philosophici* had appeared in print, he was able to give detailed and accurate accounts of the ovens that were to be described in parts Two to Four (1647-8).⁵² Indeed, he planned to set up the 'second oven' (ie. the one described in Part Two) in his own house and to use it for the production of chemical medicines,⁵³ though there is no firm evidence as to whether he actually put this proposal into effect.

Moreover, it emerges that not only had Moriaen given the chemist lodgings at his house in Amsterdam, he and Odilia were the godparents of two of Glauber's

49 No. 91.

50 Appelius to Hartlib, 23 March/2 April 1647, HP 45/1/38A.

51 No. 93.

52 No. 93.

53 No. 91.

children.⁵⁴ This bears witness to the remarkable latitudinarianism of both men, since Glauber was, nominally at least, a Roman Catholic. It is barely conceivable Moriaen was unaware of this. One of the more irrelevant charges later laid against him by Fahrner was that he was a hypocrite in matters of religion, altering his allegiances to suit whatever set of circumstances he found himself in at the time and to ingratiate himself with people of influence. This elicited one of Glauber's most convincing and coherent refutations, indeed a fine and really quite bold defence of non-sectarian religion. He made no bones about having attended Catholic, Lutheran and Calvinist churches, nor about having had some of his children baptised Catholic and others Evangelical: he had, he said, simply done whichever was more convenient, seeing either as equally valid. He considered himself a Catholic, but pointed out that the Lord

an vielen Orthen außtrucklich sagt/ Kompt alle zu mir/ die ihr muheseelig vnd beladen seit/ ich will euch erquicken/ etc. Vnd ist Christus für alle vnd nicht allein für die Catholische/ Luterische/ Arminianische etc. sondern auch für alle Iuden/ Turcken vnd Heyden vollkomlich gestorben/ vnd ihnen den Himmel erworben.⁵⁵

If Glauber really had been playing the Vicar of Bray, he would hardly have published a declaration so calculated

54 This I take to be the sense of no. 91: 'hab [...] mit meiner haußfrau ihme 2 Kinder auß der tauffe gehoben' - unless it means that the Moriaens were themselves conducting unofficial baptisms.

55 *Glauberus Ridivivus*, 79.

to offend all the established Christian orthodoxies, which makes him sound more like a Behmenist or a Collegiant, or at any rate a free thinker very much of Moriaen's own stamp, than a kow-tower to any denominational authority.

The evident closeness of their relationship did not, however, make Moriaen an uncritical admirer of his friend. Already at this stage he was commenting on Glauber's inability to concentrate on a given subject or follow his experiments through to a definite conclusion. Later, this inconstancy of purpose would be a source of continual annoyance to Moriaen, though he always stressed that Glauber was genuinely talented and that 'Ihm in der Natur ein zimbleich liecht auffgangen ist' (no. 179). One feature of that inconstancy, as Moriaen saw it, was his habit of constantly uprooting himself and setting off for Germany, but then returning to Amsterdam instead. It was in 1650, a full decade after his first arrival in the Netherlands, that Glauber finally took his leave and departed for his native country.

* * * * *

6:3 Flight into Germany

As early as 1644, Glauber had been hankering to return to his homeland. Reporting his move to Utrecht that year, Appellius stated that he had intended to go to

Germany but was prevented by the continuing state of war.⁵⁶ Again when he moved to Arnhem in 1647, it was intended as the first leg of a journey home:

he would faine goe higher, in Germany, & set up their such workes whereby he might maintaine his family most liberally [...] so that hee expects onely [ie. is only waiting for] peace in Germany for this Country agrees not with his nature.⁵⁷

This is one of the reasons Glauber himself later gave for his eventual return to Germany in 1650: that he wished to see his homeland again after peace had been established.⁵⁸ Even his most sympathetic biographers have assumed that this was merely an excuse and that the real reason for his departure was a financial collapse and a bid to escape his creditors.⁵⁹ However, Moriaen's and Appelius's evidence suggests it was in fact the truth, albeit financial problems were almost certainly the immediate impulse. Glauber also claimed he was cheated in the selling of his house in Amsterdam, his laboratory equipment being wrongfully sold as part of the furnishings, and that it took him a two year legal campaign to reclaim his lawful possessions.⁶⁰ This perhaps accounts for his return to Amsterdam from Arnhem

56 Appelius to Hartlib, 5 Sept. 1644 HP 45/1/13A.

57 Appelius to Hartlib, 26 Aug. 1647, HP 45/1/33A. Moriaen's report in no. 93 (27 Aug. 1647) is almost identical.

58 *Glauberus Ridivivus*, 70.

59 Eg. Gugel, *Glauber*, 19: 'Diese Beschönigung sei dem leidgeprüften Mann gerne verziehen!'

60 *Glauberus Ridivivus*, 12.

in 1648 and the fact that instead of proceeding to Germany as he initially intended he did not, in the event, leave the Netherlands until two years after the signing of the Peace of Westphalia.

It has not previously been possible to establish whether Glauber made his move in the spring of 1650 or that of 1651. The latter has, reasonably enough, been favoured, on the grounds that Glauber's son Alexander was baptised in Amsterdam in 1651.⁶¹ But Moriaen's letters place the move squarely in March or April 1650. He told Worsley on 4 March that Glauber 'hath now finished all hee thinks to doe heere' and was preparing to leave. He planned initially to go only as far as the Rhineland (or so he told Moriaen), to Duisburg or Wesel.⁶² Brun had reported the previous year that he was planning to go to Cologne.⁶³ However, he soon changed his plans and plunged on north-east to Bremen, in the heart of Lower Saxony, where Moriaen thought him settled by the end of April.⁶⁴ He was still there in July,⁶⁵ but for unexplained reasons he set off again some time in the next two months, heading south this time, by way of Frankfurt to Wertheim, where he was living by 7 October

61 Wittop Koning, 'Glauber in Amsterdam', 2; Gugel, *Glauber*, 24; Link, *Glauber*, 35.

62 No. 107.

63 Brun to Hartlib, 13 June 1649, HP 39/2/9B.

64 No. 113.

65 No. 114.

1650,⁶⁶ though still considering a move back to Frankfurt or on to Nürnberg. Glauber's account of this implies that the whole journey was of a piece,⁶⁷ which would be barely credible even without the evidence of Moriaen's letters to prove it was a matter of fits and starts, of constantly revised plans. He may well genuinely have wanted to see his homeland again, but to plan such a circuit would be taking a preference for scenic routes to extremes. A likelier motivation for the bizarre route is an attempt to shake off creditors on the one hand and repeatedly frustrated hopes of employment or business opportunities on the other.

Glauber also claimed that, far from sneaking out of Amsterdam in secret to escape his creditors and a pending court case for debt, as Fahrner (very plausibly) charged, he had merely gone on ahead alone to check that the route was safe for his family, and that having found it was, he summoned them to follow him by boat to Bremen, from where they completed the rest of the journey together.⁶⁸ Even the cautious Link sees no reason to doubt Glauber's word in this matter.⁶⁹ But Moriaen's letters reveal that Glauber left Bremen in September 1650 at the latest,⁷⁰ whereas Helena Glauber was still in Amsterdam for the

66 No. 118.

67 *Glauberus Ridivivus*, 67-8.

68 *Ibid.*, 67.

69 Link, *Glauber*, 35.

70 No. 118.

baptism of her son the following year. When and how she and the children eventually did join him is not known, but Glauber's version of the story is pure fiction.

There are two possible reasons why Glauber should have bothered with this invention. The first is to gloss over the fact that he left a pregnant wife and nursing mother to fend for herself, and fend off the creditors, for at least the better part of a year. If, that is, Helena was pregnant when he left: and herein lies the second likely reason. Having admitted to one cuckolding already in this book, Glauber doubtless did not wish to draw attention to the fact that he had not seen his wife for a good nine months at least before the birth of 'his' son. The available evidence unfortunately does not reveal when in 1651 Alexander Glauber's baptism took place. If it was in early January, and if Glauber did not in fact leave Amsterdam until early April 1650, it is possible he was indeed the child's father, but the odds are not favourable. This would also help explain Glauber's apparently gratuitous remark, in the story of his first marriage, that in spite of her treachery he would not have cast his first wife off if they had had any children living.⁷¹ The comment was perhaps more relevant to the second wife than the first. This piece of disinformation has led Gugel to be consistently a year

71 *Glauberus Ridivivus*, 52.

out in his datings of Glauber's movements from this point until his final return to Amsterdam in 1656, since he assumes he cannot have left Bremen until after Alexander's birth.

In Wertheim, he rented a large house and set up a new 'öffentlich laboratorium [...] transmutationem metallorum publice zu docirn', and set about exploiting a mine, the nature of which is not clear. It was also at this juncture that he started claiming to have discovered the fabled universal solvent, alcahest.⁷² The initial funding for these new projects, which must have represented a considerable outlay, was presumably down to the prince whose patronage Glauber had attracted: 'hatt sonsten ein Bergwerkh daselbsten funden vnd mit einem fursten darob verglichen' (no. 118).

This was almost certainly Johann Philipp von Schönborn, Elector and Archbishop of the Imperial City of Mainz (some hundred kilometres to the west of Wertheim), though it has not previously been known that Glauber was associated with him this early. On 13 June 1651, Glauber specifically mentioned Johann Philipp as his patron, from whom he expected an unspecified advantage in exchange for the revelation of an unspecified secret.⁷³ Moriaen (if I am right in ascribing no. 122 to Moriaen) took Glauber to

72 Post script to no. 118 (7 Oct. 1650).

73 No. 122.

mean a privilege for his books, but it may be what he was after was the patent for his process of extracting tartar from wine lees. He later described this in his *Gründliche und Wahrhafftige Beschreibung wie man auß den Weinhefen einen guten Weinstein [...] extrahiren soll* (1654), which he dedicated to the Elector.⁷⁴ According to this dedication, he received a privilege for the process from Johann Philipp in 1652.⁷⁵

Faced with this large and diverse work-load, Glauber took on two students as apprentices-cum-assistants.⁷⁶ One of these was sent to Holstein on business, apparently to display some of Glauber's products or processes to the court there. He was supposed to deliver some alcahest to Moriaen on his way back, but failed to do so. Glauber immediately concluded there was some sort of treachery involved.⁷⁷ He was, probably with some justification, of a highly suspicious nature, which in later years developed into something approaching full-blown neurosis. Glauber started imagining his enemies to be bribing his children to reveal his secrets, or lurking in gangs at

74 An English translation of the dedication and the beginning of the book is to be found at HP 55/17/1A-4B.

75 HP 55/17/4A: 'I have submissively attended yr gracious favour for the space of 2 yeares, for yr gracious imparting of a Priveledge or Electorall leave that I might without molestation drawe out the tartar from the wynelees, The which yr Electorall favour did graciously permitt and consent vnto' (20 March 1654).

76 Link, 35-6; Gugel, 20; basing their accounts on *Glauberus Ridivivus*, 68; cf. no. 122.

77 No. 122.

street corners in the hope of killing him.⁷⁸ Even allowing for the wild overstatements habitual in seventeenth-century polemic, some of Glauber's outbursts, evidently written or dictated at great speed and quite extemporaneously, sound genuinely and alarmingly unhinged. Particularly impressive is the diatribe against one Anton Nissen, who at some point worked as assistant and copyist for Glauber,⁷⁹ and was perhaps one of the students in question. In any case he fell out with the master and later associated himself with the detested Fahrner. A propos nothing, Glauber abruptly launches into the following:

ANToni Nissen du Gottloser Vogel/ hastu mir nicht leidts genug angethan/ daß du al dasjenige/ so du bey mir gesehen/ gegen alles versprechen/ andern ohne mein wissen vnd willen/ zu meinem schaden Verkaufft/ dich zu meinen Feinden von den einen zu den andern gemacht schaden zu thun/ ja gar nach Leib vnd Leben getrachtet [...] fahr nur hin an den Galgen zu/ mit all dein bösen Mörderischen Gesellschaft vnd Bruderschaft.⁸⁰

Despite the quarrels with his apprentices, Glauber seemed comfortably placed in Wertheim, in favour with the Elector, his mine and public laboratory flourishing. This situation too, however, was soon to be disrupted, as the owner of the house he was renting sold it to a returning soldier by the apt name of Schreck, who

78 *Glauberus Ridivivus* and *De Tribus Lapidibus*, *passim*.

79 Link, *Glauber*, 102.

80 *Glauberus Ridivivus*, 92, 95. There is a good deal more in the same vein.

promptly evicted him. Glauber moved this time to the relatively nearby Kitzingen - still within the Elector's sphere of influence - and devoted himself more exclusively to his enterprises of manufacturing and improving wine and extracting tartar from wine lees.⁸¹ Here he also had a medical practice, for which (or so he later claimed) he made no charge, accepting only voluntary donations which he distributed among the local poor.⁸² He remained in Kitzingen for some three years, producing another daughter, Johanna, in June 1653, and publishing parts 2 and 3 of *Operis Mineralis* (1652),⁸³ part 1 of *Miraculum Mundi* (1653), part 1 of *Pharmacopoea Spagyrica* (1654) and the *Gründliche und wahrhaftige Beschreibung* of 1654 mentioned above.

Gugel describes this last work as Glauber's parting gift to the Elector and the district that had treated him well for some years. This may be true as far as it goes, but if so it is the first of many examples of Glauber's offering as a gift what had ceased to be of any use to him. The explicit motivation behind this and the ensuing torrent of publications was to forestall the attempts of

81 No. 43, and cf. Link, *Glauber*, 36-7, Gugel, *Glauber*, 21. Gugel dates the move late 1652/early 1653, but Glauber had decided to leave at the end of June 1651 (no. 122), and after changing his mind yet again about his next destination, which was initially to have been Hanau or Frankfurt (both much closer to Mainz), had arrived by 8 September 1651 (no. 123).

82 *Glauberus Ridivivus*, 48.

83 Part 1 had appeared before the move, by April 1651 (see no. 121).

his estranged assistant Christoph Fahrner to pass off what he had learned from Glauber as his own work.

Glauber had met Fahrner soon after his arrival in Kitzingen in mid-1651, and took him on as a trainee and assistant, under a vow of secrecy.⁸⁴ Fahrner later claimed that Glauber had duped him by promising to reveal the Philosophers' Stone and then refusing to do so. Glauber maintained he had taken Fahrner on only to work on his schnaps production, tartar extraction, vinegar making and wine improvement, and promised him no other secrets than these, 'mit welchem stuck wan du mir glauben gehalten hättest [...] wir beyde al vnsere Kinder in kurtzen [hätten] reichlich versorgen können': he had never offered 'in Metallicis ein guth Stück zu weisen/welchen ich nicht habe zeugen können oder wollen'.⁸⁵

This does not chime very well with Moriaen's earlier report that Glauber not only claimed to understand transmutation but had taught it publicly in Wertheim. It must be doubted whether Moriaen's report is an entirely faithful representation of what Glauber had told him - or

84 The exact details of the agreement are in some doubt. Fahrner in his *Ehrenrettung* (1656) cited a contract he had himself drawn up offering half his entire worldly possessions as surety, but it is not certain this was ever ratified. See Gugel, 22-5, and Link, 39-42, for fuller accounts. Gugel's difficulty (p.25) in understanding what Glauber was doing in Kitzingen at this time is resolved by the foregoing reanalysis of the chronology.

85 *Glauberus Ridivivus*, 15.

indeed whether what Glauber had told him was an entirely faithful representation of what Glauber was doing. If Glauber really was, as Moriaen stated, offering instruction to the general public in the transmutation of metals, this represents a breaking of the most sacred alchemical taboo. The 'great work' was not to be made available to all and sundry, or not at least until the world itself had been transmuted into a terrestrial paradise by direct divine intervention. It seems likelier that what Glauber was doing, as in his earlier public laboratory in Amsterdam, was demonstrating the results of his methods to the public rather than explaining the methods themselves, and that these supposed results now included the art of transmutation (to which he had not laid claim in *Furni Novi Utilitates*).

Gugel asserts somewhat defensively that though he believed in the possibility of transmutation, 'Glauber selbst hat [...] wiederholt darauf hingewiesen, ihm selbst sei nie eine solche alchemistische Verwandlung gelungen'.⁸⁶ However, while Glauber did indeed deny his own transmutational prowess when it suited him - as here, to make Fahrner's charge appear absurd -, he also repeatedly claimed precisely the opposite. Not only in the account of the Wertheim laboratory, but in other

86 Gugel, *Glauber*, 8.

reports from 1657 and 1659, Moriaen passed on unequivocal claims by Glauber that he could indeed turn base metals into gold:⁸⁷ in the latter case, indeed, Moriaen himself believed he had seen him do so.

According to Fahrner, not only did Glauber withhold his alchemical secrets, even his wine treatments were valueless. Glauber countered that any failures they had encountered were the result of Fahrner's incompetence. What truth there was in either account it is now largely impossible to determine. The polemics on both sides are almost exclusively ad hominem and obviously wildly exaggerated. Fahrner accused Glauber of being a time-server in religious matters, an adulterer and a bigamist; Glauber accused Fahrner of everything from inadequate facial hair to uxoricide.⁸⁸

Whatever the full facts behind the dispute, it is clear that Fahrner did indeed set about selling some of the secrets he had learned from Glauber. Whether he also, as Glauber claimed, incited other former employees to do likewise is not verifiable, but since Fahrner himself did not deny the main charge, claiming only that he had offered his knowledge to far fewer people than Glauber made out, it seems certain the accusation was

87 No. 164 (5 Oct. 1657), and a Latin translation of a letter to Hartlib, 20 July 1659, copies at HP 16/1/15A-16B and 17A-18B.

88 *Glauberus Ridivivus*, 74, 49, 50, 21 and 52 respectively.

substantially true.⁸⁹ This treachery, Glauber claimed, moved him to go to press with all his knowledge. The account is the more convincing for the fact that, far from painting an over-sanctified picture of Glauber himself, it frankly contradicts the purely philanthropic motivation he laid claim to elsewhere. If he was not to enjoy all the profit of his art for himself, he said, he could at least ensure, by making it public, that Fahrner would not do so either:

durch welche Invention daß gantze Menschliche Geschlecht/ große ergetzlichkeit vnd labe/ bey Alten vnd Krancken erlangen werden/ welches ich vielleicht nicht gethan/ wan es der Gottloser Farner nicht durch seine Vntreu Lügen vnd Schmeheschrifften/ von mir außgetrieben hette/ Farner aber wirdt einen Lohn bekommen wie Iudas Ischariot.⁹⁰

Starting with the *Gründliche und wahrhaftige Beschreibung*, exposing in some detail the process even Glauber stated he had originally contractually agreed to confide to Fahrner, works flooded from his pen in the following years, all purporting to make a gift to mankind of what Fahrner had tried to steal for himself.⁹¹ Moriaen at least found this self-projection entirely credible, and though he thought the quarrel reflected

89 See Link, 41, esp. n.168, citing Glauber's *Apologia* (1655), 19-30, and Fahrner's *Ehrenrettung* (1656), 44.

90 *Glauberus Ridivivus*, 99.

91 Besides writing four works explicitly against Fahrner, Glauber peppered all his subsequent publications with parenthetical attacks on him and denunciations of his 'Farnerischen Lügen'.

badly on both parties, he believed it would benefit the world in general by encouraging Glauber to publish.⁹²

When Glauber left Kitzingen is uncertain, but it was probably soon after publishing *Gründliche und wahrhaftige Beschreibung* in 1654. He gave as his grounds for leaving that the local distillers, envious of his success and under the influence of their own produce, had resolved to use violence against him: 'weilen ich dan gesehen/ daß ich leichtlich mit einen hauffen Trunckenen Pöltzen in action kommen möchte/ [...] habe ich getrachtet die meinigen an ein sicher Orth zu bringen'.⁹³ It was perhaps during this move that he suffered another setback to his health, reported in a lost letter from Moriaen to Hartlib and mentioned by the latter to Boyle:

Mr. Morian writes again of Glauber, that he hath had a very dangerous fall from a waggon, spitting much blood, and if the fever prevail upon him he fears for his life; which I pray God may be yet continued for giving many good hints, at least to the studiers of nature and arts.⁹⁴

He then spent some time in Frankfurt am Main, which he was forced to leave, he claimed, for fear of being

92 No. 152.

93 *Glauberus Ridivivus*, 71.

94 Hartlib to Boyle, 15 May 1654, Boyle, *Works* VI, 91. The punctuation is misleading: what Hartlib meant was surely that if his life was spared, Glauber would give hints at least, if not full revelations, to the students of nature and arts. Gugel gives the misleading impression that this incident occurred in Amsterdam after 1660 (*Glauber*, 27).

murdered by Fahrner's cronies.⁹⁵ Next, he worked for 'hohen fürstlichen Personen' as an assayer in mines near Cologne.⁹⁶ In this instance, Moriaen's letters provide confirmation of Glauber's own published statements, which have previously been the only evidence for his stay in Cologne, and suggest that by 'hohen fürstlichen Personen' Glauber meant the Elector himself. Link concludes, by correlating Fahrner's and Glauber's accounts, that Glauber spent about a year in Frankfurt, from mid-1654 to mid-1655; Moriaen, however, said he was on the brink of moving to Cologne in October 1654.⁹⁷ This remains another very obscure period of Glauber's life, on which Hartlib's papers otherwise shed no new light. He comes back into focus with his return to Amsterdam in 1656, this time for good.

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6:4 Last Years in Amsterdam

In *Glauberus Ridivivus*, published in 1656, Glauber declared - somewhat paradoxically in view of his statement elsewhere in the same book that one reason he kept moving was to escape Fahrner's murderous intentions - that

95 *Glauberus Ridivivus*, 105, and see Link, *Glauber*, 43-4.

96 *Glauberus Ridivivus*, 82; cf. no. 141.

97 No. 141: 'Er dann erstes tages für seine person nach Cölln kommen muß zu dem Churfürsten'.

nun bin ich allhier zu Amsterdam vnd wohne auff der Keyzers Grafft/ an einem bekanten Ort/ vnd in keinem Winckel/ hastu [Fahrner] oder ein anderer etwas zu sagen/ so komb hieher vnd thun [sic] es/ werde dir redt vnd antwort geben.⁹⁸

Here he continued working on his celebrated and much discussed aurum potabile, with which according to Moriaen he now claimed he could transmute all metals, 'aber ohne nuz und also unnötig darzue zue gebrauchen als allein die möglichkeit und warheit zue beweisen' (no. 164). It was also, more importantly, a universal medicine. He also experimented, apparently successfully, with a salt based fertiliser.⁹⁹ Potentially even more profitable were a method he claimed to have invented to convert common salt into saltpetre,¹⁰⁰ and his proudest achievement, 'sal mirabile'. This is sodium sulphate, known to this day as 'Glauber's salt' and still used in medicine, though the claims made for it by its discoverer are rather more dramatic. It is possibly the basis of the alcahest he had already claimed to have discovered in 1650,¹⁰¹ for he affirmed that

mein sal mirabile nicht allein die Metallen sondern alle steine und Beine ja die kohlen welche sonst durch kein corrosiv zue solvirn, radicaler solvirt [...] von welcher wunderbahren solution ich ein groß Buch machen könde.¹⁰²

98 *Glauberus Ridivivus*, 11-12.

99 Nos. 169 and 174.

100 No. 162.

101 No. 118.

102 *Glauber, De Natura Salium*, 94.

The excitement engendered by such ideas is well illustrated by Moriaen's pouncing on this passage after a hurried inspection of the work and communicating it at once to Hartlib.¹⁰³

Plans for Moriaen to visit Glauber, or vice versa, were constantly being renewed after the latter's return to the Netherlands in 1656, but were repeatedly frustrated by one or the other's ill health, or by bad weather.¹⁰⁴ Indeed, in July 1658, Moriaen reported that Glauber 'will mit gewalt aus Amsterdam', though why is quite unclear: he planned to move once again to Arnhem, where Moriaen had found him a 'gelegenheit', which from the context appears to mean an offer of accommodation rather than employment.¹⁰⁵ The letter is disappointingly short on detail, but in any case nothing came of the proposal.

Glauber was evidently soon thriving once more, for at least by 1659 he had yet again set up a new laboratory, part public and part private. Moriaen finally managed two visits to Amsterdam in the summer and autumn of 1659 in order to inspect this.¹⁰⁶ Another visitor that summer was Kretschmar, who told Hartlib:

103 No. 182. J.R. Partington also singles the passage out for quotation (*A History of Chemistry* II, 355).

104 Nos. 156, 169, 174, 182.

105 No. 188.

106 See Chapter Two, section four.

Herrn Glaubers Laboratorium publicum & Secretum ist nun hier angangen, und sind viel freunde beÿ ihm, insonderheit der gute alte H joh Morian von Arnheimb; mit welchem ich etliche mahl zusammen gewesen [...] logiret beÿ H. Glaubern selber im hause, und wird vielleicht, Meinem hochgeehrten H. ein mehrers, alß ich, von H. Glaubers dingen überschreiben.¹⁰⁷

Both Glauber himself and his new laboratory were described in some detail in a letter from the travelling French scholar Samuel de Sorbière to Monsieur Bautru, Chevalier de Sègre, dated 13 July 1660.¹⁰⁸ Sorbière, who, as Gugel points out, was no novice in scientific matters, was greatly impressed both by the chemist and his equipment. After a long passage expressing haughty rationalist contempt for 'les Panacées, l'Alkaest, le Zenda, Parendà, l'Archaec, l'Enspagoycum, le Nostoch, l'Ylech, le Trarame, le Turban, l'Ens Tagastricum, et les autres visions que Van Helmont et ses confrères nous débitent' ('... and the other visions Van Helmont and his fraternity serve up to us'),¹⁰⁹ he was careful to absolve Glauber:

Par tout ce discours, Monsieur, je ne prétends point offencer Glauber, ny aucun de ceux qui mettent comme luy la main à la paste, ausquels plustost je voudrois donner courage [...] Il

107 Kretschmar to Hartlib, Dury, Clodius and Brereton, 1 Aug. 1659, HP 26/64/3B.

108 In *Relations, lettres et discours de Mr. de Sorbière sur diverses matières curieuses* (Paris, 1660), and rather more accessibly in P.J. Blok, 'Drie Brieven van Samuel Sorbière over den Toestand van Holland in 1660', *Bijdragen en Nedeelingen van het Historische Genootschap* 22 (1901), 1-89; passage relating to Glauber 74-89.

109 Blok, 'Drie Brieven van Samuel Sorbière', 79.

est sans doute le plus excellent ou le plus noble de tous

(By none of this speech, Sir, do I intend to insult Glauber, nor any of those who, like him, set their hand to the work, and whom I should rather encourage. He is undoubtedly the most excellent or the noblest of them all).¹¹⁰

Indeed, so well-appointed was Glauber's laboratory that Sorbière, for all his scepticism about alchemy, was inclined to think he must have mastered the secret of transmutation in order to maintain it and his large family (eight children by this time) in such fine style.

But there is a telling detail in Sorbière's account: 'Son âge nous parut de 66 ans' ('we thought his age to be of about 66 years').¹¹¹ In fact, he was at least ten years younger than that.¹¹² The years of handling assorted poisonous and corrosive materials were taking their toll, and Glauber's health was soon to give way completely. Serrarius visited him in February 1662 and 'found him yet very sick, though in a recovering way for life though not for perfect health.'¹¹³ For much of the rest of his life he was bedridden. According to another travelling French scholar, Balthasar de Monconys, who visited him in 1663, he 'ne travaille plus, & n'a point

110 Ibid., 80-81.

111 Ibid., 81.

112 Gugel states mysteriously that Glauber was 'um 6-8 Jahre jünger' than Sorbière supposed. The exact date of Sorbière's visit is not known, but it was evidently some time before July 1660, so Glauber cannot have been over 56.

113 Serrarius to Hartlib, 3 Feb. 1662, HP 7/98/1B.

de fourneaux' ('no longer works, and has no ovens').¹¹⁴ In 1668 he offered what remained of his library and laboratory for sale, producing a catalogue of his books and equipment, which 'nun mehr aber man dehren nicht länger von nöthen hat/ [...] den begehrenden gegen ein billiges überlassen werden'.¹¹⁵ It appears from this that Monconys overstated the extent of Glauber's decline, since the catalogue includes sixteen ovens and stills. It does seem fairly certain, however, that Glauber's health prevented him almost entirely from further practical laboratory work.

Nonetheless, he managed in his last eight years, before being finally released from what must have become a very trying and dispiriting existence in March 1670, to produce a further eleven works besides the catalogue of his effects. In terms of numbers of titles this represents forty percent of his total output, though it should be said these are all short single-volume works, and in terms of bulk of content account for only half that proportion.¹¹⁶ But they still represent a significant section of his work, and though they have received less attention than his earlier productions on

114 Balthasar de Monconys, *Les Voyages de M. Monconys II* (Paris, 1695), 353, dated 28 Aug. 1663.

115 *Glauberus Concentratus, oder Laboratorium Glauberianum* (Amsterdam, 1668).

116 Cf. Link, *Glauber*, 99, n.358. Link assesses the output of his last decade as representing 19 percent of the total in terms of number of pages.

the grounds that they are less 'scientific', they are of considerable interest in assessing the development of his thought, as he turned perforce from practical experiment and consoled himself instead with mystical speculation.

He took to denouncing practical experiment as a superficial, mechanical operation, and to lauding instead the 'secret fire' he claimed to have discovered, probably an acid of some form, which could do more in a hazelnut shell than could be done by ordinary fire in the greatest furnace.¹¹⁷ He indulged too in various pieces of fanciful etymology and mystical anagrammisation to demonstrate his long-standing conviction, originally arrived at by experimental practice, that salt constituted the essence of life. 'Sal' and 'Sol', he decided, both derived from the same word in the original, divinely-inspired pre-Babelian language, lost to fallen Man, in which words perfectly and directly signified their objects. Furthermore, the only difference between them was A and O, Alpha and Omega.¹¹⁸

There can be little doubt that Glauber's rejection of laboratory work was to some extent at least a case of sour grapes. He was speaking figuratively when in *De*

117 *De Tribus Lapidibus*, 19.

118 *De Signatura Salium*, 13-15. Cf. Link, *Glauber*, 118-122, for a fuller discussion of Glauber's various notions of 'signatures' discernible not only in the physical makeup of things but in the words and symbols used to denote them.

Tribus Lapidibus (1668) he provided a cautionary 'Historia von dem gifftigen Stürtz/ welchen die gemeine Alchimia nach sich schleppt',¹¹⁹ but in his case a 'gifftiger Stürtz' was the all too literal consequence of his many years in the laboratory. One of the advantages of his 'secret fire' was that the adept did not even need to get out of bed to work with it:¹²⁰ it is surely pertinent that when Glauber wrote this, he had been physically incapable of getting out of bed for the best part of seven or eight years. Nonetheless, these musings of his old age were not a wholly new departure following his physical collapse, and should not be too lightly dismissed. Such ideas had had a place in his thought from the very first, from the promise in *Furni Novi Utilitates* to reveal the 'secret fire of the philosophers', and had gained rather than lost weight with him as his technical expertise increased. Long before he was forced to give up practical experiments, he was busying himself with isolating and analysing the 'soul of the world', interpreting the microcosmic 'signatures' of salts, and offering chemical accounts of Creation itself.¹²¹ This 'mystical' aspect of his thought was not separate from, let alone opposed to, his practical work, and only became divorced from it when the latter became impossible for him. Like so many of the

119 *De Tribus Lapidibus*, 9.

120 *De Tribus Lapidibus*, 19.

121 See Chapter Five.

figures associated with or promoted by Hartlib and his circle, Glauber has been widely praised as a precursor, or even a 'father', of modern science, but was in fact intent on guiding human enquiry onto paths utterly divergent from those that the most enduringly influential scientific thinkers (such as Boyle) opted for in the latter half of the century.

* * * * *

6:5 Glauber's Reception in the Hartlib Circle

The most valuable supplement the Hartlib Papers can add to the individual history of Glauber is a broader and more contextualised view of contemporary reaction to the man and his work. They also reveal much about the international dissemination of his writings and equipment, which Hartlib did a great deal to promote. Glauber's first public laboratory in Amsterdam first began to acquire a reputation in 1643, with the publication of *Furni Novi Utilitates*. This was precisely the time when Hartlib, after the failure of his plan to launch a pansophic reformation of learning by establishing a College of Light in England under the directorship of Comenius, began to turn more wholeheartedly to the study of nature as a means of achieving universal illumination, and he immediately latched onto Glauber's work as a possible means of promoting this. The earliest surviving mention of

Glauber in his papers is in Appelius's letter of 7 June 1644 mentioning the *Furni Novi Utilitates*,¹²² but it is obvious Appelius was returning to a subject that had been broached earlier.

Several extracts of Glauber's works are to be found among Hartlib's papers,¹²³ but Hartlib must have possessed all, or almost all, the Glauberian works that appeared during his lifetime. Appelius sent him Part I of *Furni Novi Philosophici* and probably *De Auri Tinctura*.¹²⁴ Moriaen sent the subsequent parts of *Furni Novi*, *Operis Mineralis*, *De Medicina Universali*, *De Natura Salium*, and the *Apologia* against Fahrner, as well as other unspecified books.¹²⁵ He also promised to send *Trost der Seefahrenten*, until he discovered that copies had already been sent directly to England by the publisher.¹²⁶ From 1658 onward he was trying to assemble a complete collection of Glauber's publications, to send

122 Appelius to Hartlib, 7 June 1644, HP 45/1/6A.

123 Besides the German and Latin versions of *Furni Novi Utilitates* already discussed, there are: a copy of the title page of *Operis Mineralis* (1651) (HP 63/14/17A); an incomplete manuscript of an English version of the *Gründliche und Warhafftige Beschreibung* (1654) (HP 55/17/1A-4B); two German copies of an extract from the *Apologia* against Fahrner (1655) relating to restoring sour beer (HP 39/2/142A and 63/14/39A-B); and a substantial extract from *De Natura Salium* (1658) in English translation (HP 31/8/1A-6B).

124 Appelius to Hartlib, 16 Oct. 1641, HP 45/1/28A.

125 *Furni Novi*: no. 95; *Operis Mineralis*: nos. 120 and 121; *De Medicina Universali*: no. 164; *De Natura Salium*: no. 185; *Apologia*: 20 July 1659, HP 16/1/15A-16B; other works: no. 97.

126 Nos. 153 and 154.

them bound together to Hartlib,¹²⁷ though whether he in fact did so is unrecorded.

Hartlib in turn distributed the works he received, or copies of them, to other chemical enthusiasts. He had *Furni Novi Utilitates* translated into Latin and recopied for circulation. He aroused the interest of William Petty, John Sadler and Cheney Culpeper.¹²⁸ In 1648 he sent a 'Glauberianus Tractatus' (probably *Furni Novi*, or part of it, possibly *De Auri Tinctura*), to Comenius's estranged assistant Cyprian Kinner in Poland.¹²⁹ Robert Child acknowledged receipt from Hartlib of the first two books of *Operis Mineralis* (1651) early in 1652,¹³⁰ about a year after Moriaen had sent them, and further works in August.¹³¹ Henry Jenney sought to obtain further information about Glauber through Hartlib, as did John Winthrop Junior in America.¹³² While he did not pursue the promotion and distribution of Glauber's work with quite the same wholeheartedness and zeal as he had done that of Comenius, Hartlib was probably the most important

127 No. 169.

128 On Petty and Culpeper, see below. Sadler declared himself eager to meet Hartlib to discuss Glauber and other matters (4 Oct. 1648, HP 46/9/25A), and asked Hartlib to give him an extract of 'Glaubers 4th part' (probably of *Furni Novi*, possibly of *Miraculum Mundi* or *Pharmacoepia Spagyrica*: Glauber wrote nothing else in more than three parts) (n.d., HP 46/9/11A).

129 Kinner to Hartlib, 23 July 1648, HP 1/33/41A.

130 Child to Hartlib, 2 Feb. 1652, HP 15/5/18A.

131 Child to Hartlib, 29 Aug. 1652, HP 15/5/14A-15B.

132 Jenney to Hartlib, 29 Sept. 1657, HP 53/35/3A-4B, and Winthrop to Hartlib, 16 March 1660, 7/7/1A-8B.

channel through which Glauber became known in England, and also encouraged his dissemination abroad.

Not only Glauber's writing but also his equipment was brought to England, or replicated there, by various of Hartlib's associates. However varied the judgments on his theoretical writings and chemical products, there has never been any doubt that his technological innovations were genuine and valuable: not even his fiercest detractors denied this, though some questioned their originality.¹³³ The *Ephemerides* of 1654, citing Boyle as a source, record that 'Dr Rigely an Auncient Physitian of the College [...] bought vp all Glauberian furnaces especially the 2d with a new Head, which also Mr Boyle hath'.¹³⁴ Clodius also used Glauber's ovens in his 'Chemical College'.¹³⁵ Moriaen sent a retort for Glauber's second oven to one Mr. Sotheby, with a wooden model showing how to instal it.¹³⁶ Culpeper was frequently on tenterhooks awaiting receipt of new models or specifications.

133 Brun, for instance, charged that 'Gl in Metallicis hath transcribed the best things out of Erker his booke vom Berg-wercke [ie. Lazarus Ercker, *Beschreibung Allerfürnemisten Mineralischen Ertzt vnnd Bergwercks arten* (Prague, 1574)]. Hee excels only in der Scheidekunst' (*Eph* 48, HP 31/22/8B). In fact, Glauber openly acknowledged in *Operis Mineralis* that he had learned a great deal from Ercker: cf. Link, *Glauber*, 51.

134 *Eph* 54, HP 29/4/27A.

135 *Eph* 55, HP 29/5/6B.

136 No. 109.

Hartlib was also instrumental in commissioning early translations of Glauber. The first published English version of any of his work was a compilation of *Furni Novi* and *De Auri Tinctura*, which appeared in 1651 or 52¹³⁷ from the pen of one 'J.F.M.D.'. This was John French (Medicinæ Doctor), a chemist associated with the circle at this period, and it is virtually certain that the impetus for his efforts came from Hartlib. French himself declared in the preface to his *Description of New Philosophical Furnaces* that he had found 'the greatest part of the treatise in private hands already translated into English by a learned German',¹³⁸ and had consequently been moved to complete the work. Given that Hartlib is known to have been collecting Glauber's works and was personally associated with French at the time, it is very likely that these 'private hands' were his. Whether he himself was also the 'learned German' who had already made a start on the translation is more doubtful: he is not otherwise known as a translator and it is difficult to see how he could have spared the time for such an undertaking. He cannot, however, be ruled out. Another possibility is that the 'learned German' was Haak, who was a prolific translator:¹³⁹ Moriaen had

137 The title page gives 1651 as the date of publication, but each individual part is dated 1652 (cf. Link, *Glauber*, 247).

138 French, 'Preface' to *A Description of New Philosophical Furnaces* (London, 1651/2).

139 Besides a number of shorter works, he translated the entire text of and annotations to the 1637 Dutch Bible

earlier suggested he translate Gabriel Plattes into German,¹⁴⁰ indicating that he was seen as suitable for such work, though there is no evidence that he in fact ever did so.

What is certain, however, is that Hartlib subsequently urged French to undertake further translation of Glauber, a fact which lends considerable weight to the hypothesis that it was he who suggested and supplied the original texts for French's version of the *Furni Novi*. Hartlib recorded that 'The 30. of Nov. 1652 I lent to Dr French the 2. et 3. Part of Glaub. to be translated into English'.¹⁴¹ This cannot mean parts 2 and 3 of *Furni Novi*, as these had almost certainly already appeared in French's own English version by this time.¹⁴² The reference is surely to *Operis Mineralis*, which Hartlib had received from Moriaen earlier that year, though if French did undertake this work it was never published.

Whoever the translator was, he must already have finished Part One some time before March 1647, as Cheney Culpeper had by then started, given up on and decided to

into English, and the first three books of *Paradise Lost* into German (cf. Barnett, *Haak*, 71-5, 114-119, 168-186).

140 No. 68.

141 *Eph* 52, HP 28/2/42B.

142 They came out either in 1651 or 1652 (see n.137 above), and even if it was the very end of the latter, they could hardly have been translated and printed in less than a month.

restart a translation of the English, presumably into Latin: 'truly', he complained, 'I finde it a greater busines to translate it out of Englishe then it woulde haue beene out of Dutche [ie. German] if I had vnderstoode that langwage'.¹⁴³ It had been handed over to William Petty for completion, but he had changed his mind or refused, moving Culpeper to take it up again himself.¹⁴⁴ Hartlib, rather untypically, seems to have worried about whether Glauber might object to this, since one of a battery of questions fired at Appellius must have concerned Glauber's attitude to translation of his work. Appellius answered reassuringly that Glauber had told another would-be translator that 'there was no necessity to aske leave of him, seeing the book were no more his, but all mens'.¹⁴⁵ Self-publicity being a major purpose of Glauber's going to press in the first place, he was unlikely to disapprove.

143 Culpeper to Hartlib, 7 Sept. 1647, HP 13/186A. This can hardly refer to any other part of *Furni Novi*, as the second book had not yet been published even in German. Clucas is mistaken in assuming Culpeper to be the author of the partial English translation mentioned by French ('Correspondence of a XVII-Century "Chymicall Gentleman"', 168, n.59).

144 Culpeper to Hartlib, 11 March 1647. Culpeper, an idiosyncratic speller even by seventeenth-century standards, calls the other translator 'Pettit', but this (or 'Petit' or 'Petite') is how he refers to Petty in contexts where no one else can possibly be meant, eg. HP 13/225A (to Hartlib, 6 July 1648) on his 'Agricultural engine' and HP 8/31/1A (25 Jan. 1647) and 13/206A (22 Dec. 1647), both on his double writing and modifications to the inventions of Harrison.

145 Appellius to Hartlib, 26 Aug. 1647, HP 45/1/33A.

In this case, the correspondence leaves no doubt whatsoever that Hartlib was the instigator of the project. The translation cost Culpeper much pains, and he apologised repeatedly to Hartlib for the fact that it was taking him far longer than he had expected.¹⁴⁶ He was perhaps feeling a little put-upon, for he added pointedly that he was doing it 'upon your desires'.¹⁴⁷ He would appear to have given up on the project in the end; at all events no Latin translation of the *Furni Novi* ever appeared in England.

Hartlib even nursed hopes of persuading Glauber to move to England to teach at Gresham College. In 1647, Appellius advised:

But to gett Gl. in Hunns.[*expanded by Hartlib to Hunniades*] place, that shall not bee, because hee is this summer gone from Amsterd. to Arnheim, to bee the nigher Germany, whither hee intends to goe up the next yeere, to settle him et so to live by his art.¹⁴⁸

Johannes Banfi Hunniades (1576-1646), also known as Hans Hungar, was a Hungarian alchemist and mathematician who had moved to England by 1633 and at some point taught alchemy and mathematics at Gresham College. He was described on engravings by Wenceslaus Hollar, dated 1644, as a former practitioner of the hermetic and mathematical

146 5? Aug. 1647, HP 13/182/5A; 7 Sept. 1647, HP 13/186A; 20 Oct. 1647, HP 13/196B.

147 5? Aug. 1647, HP 13/182/5A.

148 Appellius to Hartlib, 6 Nov. 1647, HP 45/1/37B. See notes to no. 91.

disciplines at Gresham ('Olim Anglo-Londini in Illustri Collegio Greshamensi Hermeticae Disciplini Sectatoris et Philo-Mathematici').¹⁴⁹ The astrologer William Lilly in 1644 spoke of his achievements as having been equalled 'by few else, if any at all, Professors in Chimistry',¹⁵⁰ adding that Hunniades was planning to return to Hungary. This move must have been in the air by April 1643, when Appelius asked Hartlib whether Hunniades was still in London or had gone back to Hungary.¹⁵¹ Since he left Gresham in or before 1644 (the date of Hollar's engraving), the suggestion of replacing him with Glauber in 1647 presumably means the post had been vacant since then.

Taylor and Josten in their article on Hunniades suggest that his post at Gresham was Professor of Mathematics, but Lilly's remarks and the evidence of the Hartlib papers suggest a stronger emphasis on chemistry. The legend on Hollar's engravings mentions his 'Hermetic' before his mathematical work at Gresham. Hartlib noted in 1640 that 'A Laboratory is erecting in Gresham-

149 The engravings are reproduced in F.S. Taylor and C.H. Josten, 'Johannes Banfi Hunyades 1576-1650', *Ambix V* (1953), 44-52, 44-6; cf. also the same authors' 'Supplementary Note' to the article, correcting some erroneous conjectures including the date of death, *Ambix V* (1956), 115. Jan Jonston mentioned him to Hartlib on 1 March 1633 as a mutual friend, clearly implying he was in London (HP 44/1/1A).

150 Dedication to Hunniades, dated 12 Dec. 1644, of *Anglicus, Peace, or no Peace* (London, 1645), cit. Taylor and Josten, 47.

151 Appelius to Hartlib, 22 April 1643, HP 45/1/45A.

Colledge by Sir K. Digby and others [...] Hunneades is the erecter or builder of it'.¹⁵² Most convincing of all is this suggestion of 'getting Glauber in Hunniades' place', for Hartlib was certainly better-informed about Glauber than to suppose him either qualified or likely to be inclined to teach mathematics. Glauber was no scholar and had no pretensions to be one: his expertise lay entirely in the field of chemistry. In a draft version of one of Hartlib's numerous proposals for the Office of Address, probably dating from this period, a number of concrete schemes are mooted including 'The Erecting and maintaining of Glauberus New Laboratorie'.¹⁵³ However, this item has been struck through, probably on account of the disheartening news sent by Appelius, and does not appear on what is obviously a later draft of the same document.¹⁵⁴

Hartlib's idea was in any case hardly realistic, if only on linguistic grounds. He had obviously considered this problem, as Appelius in the same letter reported that Glauber 'understands latyn well, et can also make his minde knowne therein, if I remember well',¹⁵⁵ which suggests something a good deal less than fluency. Moriaen mentioned that Glauber was uncomfortable

152 *Eph 40*, HP 30/4/12B, probably early on in the year.

153 'A Memoriall for the advancement of Vniversall Learning', HP 48/1/2A.

154 HP 47/15/2A-B.

155 HP 45/1/37A.

expressing himself in Latin,¹⁵⁶ and Sorbière later noted, though not unkindly, that on the occasion of his visit Glauber 'ne nous fit point d'excuses de sa mauvaise latinité' ('made us no excuses for his poor Latin').¹⁵⁷ It is certain he did not know English.¹⁵⁸ But the suggestion is a striking testimony of the extent of Glauber's reputation among the chemical fraternity in England only a year after the publication of his first two book-length works, as well as further confirmation of Hartlib's tireless activity in recruiting manpower for English education, and manoeuvring the educational ethos towards a concern with 'realia', with 'useful' knowledge and applied sciences.

Further evidence of this general early enthusiasm for Glauber is provided by the commendatory remarks by Appellius and Moriaen already noted. Glauber also inspired considerable interest in Boyle. Early in 1648, noting Boyle himself as the source, Hartlib recorded that

Helmont's stone wherby hee cured the stone in bladder kidney called Ludus Paracelsi is a stone which is found neere Antwerp prepared by Helmont. This stone one of Helmont's friends hath gotten and shewn or promised it to Morian, which hee hath promised for Mr Boyles sake to give to Glauberus that hee may prepare it and make the Ludus Paracelsi of it.¹⁵⁹

156 No.98.

157 'Drie Brieven van Samuel Sorbière', 81.

158 As is evident from his relations with Worsley, on which see Chapter Seven, section 1..

159 Eph 48, HP 31/22/2A-B.

Boyle had only just turned twenty when this was written, and it is a striking indication of how deeply imbued his early thought was with the convictions of the Spagyrist. Eight years later, he was still taking an approving interest in Glauber's work, maintaining that

In *Tractatus Glauberi de Prosperitate Germaniæ* [ie. *Teutschlands Wolfahrt* I, which came out that year], the annexed discourse of salpeeter De Nitro is the most substantial rational et real piece, wherin many secrets are discovered which himself [Boyle] had before.¹⁶⁰

Perhaps the most assiduous collector of Glauberian writings and equipment was Cheney Culpeper, whose complex and ambivalent assessment will be considered at more length in Chapter Seven.

However, in a striking re-run of the history of the Hartlib circle's responses to Comenius, initial high enthusiasm was increasingly displaced by scepticism and disillusion. Just as with Comenius, the more Glauber wrote, the less Hartlib's friends saw their initial expectations fulfilled. When Robert Child in 1652 received the first two books of *Operis Mineralis* from Hartlib, he could make little sense of them, though he nonetheless asked in April, 'pray let me se all Glaubers workes if possibly [sic]'.¹⁶¹ Henry Jenney failed to obtain the promised results from a Glauberian experiment

160 *Eph* 56, HP 29/5/92B: again, Boyle himself is given as the source.

161 Child to Hartlib, 2 Feb. 1652, HP 15/5/18A, and 8 April 1652, HP 15/5/10A.

relating to husbandry, but had the grace to admit it was perhaps a mistake on his part rather than dishonesty on Glauber's that had led to the failure.¹⁶² He was one of very few with the humility to adopt the stance later recommended by Moriaen, that people should not automatically blame Glauber for their inability to replicate his experiments.¹⁶³

Doubts about Glauber's honesty recur throughout the papers. The naturalist George Horne complained that Glauber was more assiduous in making promises than in keeping them.¹⁶⁴ At one point in 1648, even Culpeper's enthusiasm seems to have been briefly quenched by adverse reports, to the point of putting him off chemistry altogether:

Mr Petty his late carriage, & that Monsieur Glauberus is like to turne a Wheeler, hath bred in me a resolution, not to trouble my thoughts any farther with these kinde of people.¹⁶⁵

The following August, however, he was again excitedly looking forward to news about Glauber's 'ouens, & wayes of distillation; which I wonderfully approue'.¹⁶⁶

162 Jenney to Hartlib, 29 Sept. 1657, HP 53/35/3A-4B.

163 No. 162.

164 Horne to Hartlib, 24 March 1649, HP 16/2/23A.

165 Culpeper to Hartlib, 1 Nov. 1648, HP 13/247A.

Wheeler was an inventor of very doubtful probity, whom Culpeper invoked on several occasions as an archetype of the dishonest projector: for details about him, see no. 96, n.2.

166 Culpeper to Hartlib, 14 Aug. 1649 HP 13/260A.

A recurrent charge, and perhaps one of the weightier ones, was that Glauber was given to selling processes he had not in fact tested. Erasmus Rasch, for instance, declared: 'Glauber, meine ich, thut grose sunde, das er solche Sachen andern zu lehren unterstehet, die er selbst nicht weis. Sein [aurum] potabile ist ganz betrieglich'.¹⁶⁷ Earlier, however, he had been keen to learn Glauber's method of making aqua fortis and spiritus salis, and complained to Hartlib that Clodius, who was obviously very well up on Glauberian chemistry, or at least gave himself out to be so, had not sent him the promised recipes for these.¹⁶⁸

Moriaen himself, during the 1650s, became increasingly sceptical of Glauber's claims and suspicious of his motives. After reporting his friend's discovery of 'sal mirabile', he went on to remark that if what Glauber said was true, he had indeed discovered the alcahest or something very like it, in which case it would certainly cure Hartlib's bladder stone, an ailment Moriaen feared he was developing as well. But hard on the heels of this optimistic report came a sombre caveat: Glauber had promised to visit Moriaen soon and show him an even more important treatise,¹⁶⁹ but

167 Rasch to Hartlib, 25 July 1658, HP 26/89/19A. See also Chapter Seven, section 3, for similar comments by Moriaen.

168 Rasch to Hartlib, 26 Jan. 1656, HP 42/9/1A.

169 Probably the related *Tractatus de Signatura Salium*, which appeared the same year (1658).

Auff der gleichen weiße hatt Er mich nun lange zeit vertröstet und auff die Spitze des bergs Pisga gefuhret, ob nun noch einmal etwas daraus werden soll und was es guttes sein wird, daß er mitbringen will muß die zeit lehren, rechnung darff ich nicht mehr darauff machen, weil ich nun so oft und lang mich betrogen finde (no. 182).

And indeed, when Moriaen asked Glauber for some sal mirabile, so that he might try to prepare the alcahest and treat his stone, the usual story unfolded: Glauber claimed to have no sal mirabile to hand, and sent instead some 'tinctura nitri', together with the unhelpful remark that Moriaen's bladder stone was probably hereditary.¹⁷⁰ It was just the same with Glauber's much-vaunted fertilising salt ('fruchtbarmachendes saltz'): he promised to send Moriaen some, but by April 1658 'ich vernehme noch zur zeit nichts davon mittler weil laufft die saatzeit mehrentheils fürüber' (no. 176), and by July he was still waiting.¹⁷¹ By June 1658 he was thoroughly exasperated: 'kombt noch etwas von ihm dz wird wunder sein, dan seines gleichen in unbeständigkeit seines furnemens ist mir noch niemand fürkommen' (no. 182).

Nonetheless, the two men appear to have remained on basically friendly terms. In July 1657, the time when Moriaen was recovering from the violent fever he had fully expected would kill him, and was reflecting anxiously on what would befall Odilia if he died, Glauber

170 No. 189.

171 No. 190.

reassured him that should the worst happen, he would take it upon himself to guarantee her welfare, 'welches mir dan sehr gutt [thut?] und von ihm woll gefält' (no. 160). After his visit to Amsterdam in 1659, when he had an opportunity to view all Glauber's processes for himself, Moriaen wrote excitedly that all his doubts had been resolved, and that having personally witnessed Glauber's transmutation of metals into gold and production of medicines, he could no longer doubt the validity of any of his claims.¹⁷² Poleman, however, subsequently maintained that a friend of his had relieved Moriaen of some his delusions about Glauber, presumably during this visit:

Der H wisse, dass H Morian itzt nicht mehr so viel von Glauber halte als vor diesem, den er überzeuget ist, dass dasjenige gelbe metal, welches sein vermeintes aurum putabile [sic] gemachet, kein wahres golt, noch in allen proben bestehen könne, welchs mir ein vertrawter freundt gesagt, der dem H Morian solchs ex veris fundamentis demonstrirt, vnd H Morian ihm auch hat müssen recht geben.¹⁷³

Unfortunately, the lack of material from Moriaen himself after this date makes it impossible to judge whether there was any truth in this claim of a chemical conversion.

172 Moriaen to Hartlib, 20 July 1659, HP 16/1/15A-16B.

173 Poleman to Hartlib, 17 Oct. 1659, HP 60/4/194A.

In 1660, an anonymous correspondent who I believe is Kretschmar¹⁷⁴ evidently thought he was doing Hartlib and his friends (Clodius, Dury and Brereton) a great favour by sending - without Glauber's knowledge or consent - a very detailed description of the equipment in the last Amsterdam laboratory and the processes carried out there. If Glauber's laboratories can be seen as an early example of chemical industry, then this is an early example of industrial espionage, a world away from the ideal of the 'free and generous communication' of knowledge:

Ich hoffe ich hab es mit Gott meistens recht,
die Öfen hab ich auch wunderlich bekommen,
vngeachtet er das Laboratorium feste
zugeschloßen helt, nach dem sie nun gebawet
sind, vnd keinen Menschen hinein lest. Es
kostet mich alle mein armuth, vnd kan nun
nichts mehr thun, als daß ichs ihnen hiermitt
alles treulich offenbahre, vnd nochmahls umb
Gottes willen bitte, es in höchster
verschwiegenheit zu halten gegen iederman,
sonderlich gegen H. Morian, daß ichs ihnen
vbergeschrieben, vnd daß es ja Glauber nicht
erfahre.¹⁷⁵

If this is indeed from Kretschmar (who, like Moriaen, frequently incurred Poleman's scorn for believing Glauber's fairy tales), it may well be that he was offering these details as an added incentive to the addressees to participate in his own transmutation

174 The letter is another plea for cooperation with the same quadrumvirate approached by Kretschmar in August 1659 (Hartlib, Clodius, Dury and Brereton: see Chapter Five, section 1).

175 [Kretschmar?] to Hartlib, Dury, Clodius and Brereton, c. 1660, HP 31/23/30B.

project.¹⁷⁶ The response to this decidedly underhand piece of intelligencing is not preserved, but it is highly unlikely that Hartlib, at least, would have been impressed by such methods of gaining wisdom.

In 1660 and 1661, Fahrner's published attacks on Glauber were supplemented by three further polemical works. These were the *Glauberus Refutatus* of the self-styled 'filius Sendivogii', Johannes Fortitudio Hartprecht,¹⁷⁷ the *Sudum Philosophicum* of one 'Antiglauberus', whom an anagram in his title reveals as Johannes Joachim Becher,¹⁷⁸ and the *Gründliche Widerlegung* of 'C.D.M.A.S.'.¹⁷⁹ There is little comment on these works in Hartlib's archive, but two pieces of evidence about them are of some interest. Though Poleman was elsewhere less than complimentary about the 'filius Sendivogii', he was always ready to approve an attack on Glauber, and in telling Hartlib about Hartprecht's *Sudum*

176 As described in Chapter Five, section 1.

177 *Glauberus Refutatus* (s.l., 1660).

178 *Sudum Philosophicum* (s.l., 1660). See Link, 106. The 'Autoris Anagramma' is 'Hai soo muß ich ja berechnen! was deß Glaubers Facit macht?' The first sentence is a perfect (if somewhat contrived) anagram of Iohannes Ioachimus Becher, and though Link leaves the question open I do not think there can be much doubt of the ascription. There are several mentions of Becher in the Hartlib Papers, relating to his perpetual motion machine and 'new argonautical invention', but no direct reference to his controversy with Glauber. On Becher, see Partington, *History of Chemistry* II, 637-52.

179 *Gründliche Widerlegung etlicher Johan-Rudolf Glaubers zu Amsterdam herausgegebener Schrifften von Verbesserung der Metallen* (Leipzig, 1661). Fuller titles of this and the two texts mentioned above in Link, *Glauber*, 276-7.

Philosophicum he supplied the bibliographical detail that this work, which was published without indication of place, in fact came out in Amsterdam:

hat auch der filius Sendivogii dem Glaubero selbst grundlich [...] erwiesen, dz Er in vera Philosophia ein grosser Ignorant sey in seinem Ludo [sic]¹⁸⁰ Philosophico, welches izt alhier [Amsterdam] gedruckt wird.¹⁸¹

'C.D.M.A.S.' accused Glauber of being semi-literate, of employing an assistant to render his books readable, of not understanding Paracelsus properly, of atheism, and of having killed a number of people with his 'aurum horribile'. The author has so far remained unidentifiable, though as Link remarks it is not unlikely, given that his work was published there, that he lived at the time in Leipzig.¹⁸² An anonymous letter in the Hartlib Papers includes a quotation from one 'Charls de Montendon from Leipzigk concerning his Purpose and Booke against Glauber'. In the extract, which is dated 4 March 1661, Montendon speaks of being at the 'Altenburg-Court' (near Leipzig), where Glauber had 'fallen vpon' him. The reference appears to be to a

180 Obviously a misreading by Hartlib (the letter is a copy in his hand) of 'Sudo', probably brought about by confusion with the Paracelsian or Helmontian 'ludus'.

181 Poleman to Hartlib, 29 Aug. 1659, HP 60/4/111A. Cf. Poleman to Hartlib, 19 Sept. 1659, HP 60/10/2B, reporting that Hartprecht's work was shortly to be printed, and referring to a mention, presumably by Hartlib, of two others (obviously Becher and Montendon) who planned to write against Glauber.

182 Link, 106. For a fuller summary of the charges, see Link, *passim*.

legal accusation rather than a physical attack, and presumably he means that Glauber fell on him by proxy, since there is no other indication at all of Glauber's having gone to Leipzig at this period, and indeed it is very doubtful whether his health would have permitted him to do so. Montendon went on to declare (not very lucidly, at least to anyone unfamiliar with the details of the affair) that Glauber had cheated him and that he was publishing 'a Treatise on purpose entituled - A needful Refutation of Glaubers hitherto divulged Vn-Truths' - an unequivocal reference to the *Nothwendige Refutation auff etliche Johann-Rudolph Glaubers zu Amsterdam unwahre bißhero außgelaßene Bücher*.

We have, then, a name to put to 'C.D.M.A.S.', Charles De Montendon - perhaps Altenburgensis Studiosus? Unfortunately that is about all we have. Montendon mentioned himself in this extract that his mother tongue was French, and that he knew German well enough to write in it. The only other mention of Montendon in the papers is in the anonymous alchemical copy letter of 1660, quoted above, which I attribute to Friedrich Kretschmar.¹⁸³ The author mentioned that he was enclosing a copy of a letter in French from one Peter Mariceus in Amsterdam to 'Monsr Charle de Montendon von Yserton auß Saphayen, ietzt beÿ mir alhier sich

183 See n.174 above.

aufhaltende'.¹⁸⁴ But there is no indication where the letter is from, the enclosure has not survived, and I cannot identify either 'Yserton' or 'Saphayen'. That is as much as it has been possible to ascertain. However, it seems worth exposing this loose thread in the hope that someone will find something to attach it to. The extract from Montendon is given in full as Appendix 2 to this chapter.

All four men who published against Glauber in his lifetime (Fahrner, Hartprecht, Becher and Montendon) were themselves chemically inclined. So were the harshest critics whose comments survive in Hartlib's papers. Foremost among these was Poleman, whose diatribes are composed in a very similar spirit to those of Fahrner and the others, except that Poleman does not appear to have had any personal grudge against Glauber beyond the conviction that he brought discredit on the noble art of alchemy. Some of his comments have already been cited: there are a great many more. He reported with evident satisfaction that one Schöfler 'in Glauberi stinkenden vermeinten Alkahest sudelt vnd der gestalt darin sich vergriffen, dz es Ihme bey nahe sein leben gekostet'.¹⁸⁵ Despite his claim that 'eckelt mich auch der Glauberianischen betrugerey nun mehr zu gedencken',¹⁸⁶ he

184 HP 31/23/28A.

185 Poleman to Hartlib, 15 Aug. 1659, HP 60/10/1A.

186 Poleman to Hartlib, 6 Sept. 1659, HP 60/10/1B.

devoted a great deal of time and ink to vilifying his enemy.¹⁸⁷ 'Was aber Glaubers grillen sein,' he maintained, 'ist solches warhaftig nicht werth, dz man doch nur eine viertel-stunde damit zubringe sich darin aufzuhalten, dan es lauter betrugerey vnd grosse-sprechereyen sein'.¹⁸⁸

The range of opinions represented in the papers is spectacularly wide. The accusations of dishonesty and fraudulence somewhat outweigh the commendations, and the widespread enthusiastic interest of the 1640s tends to be replaced by disillusion and rejection in the 1650s. There is, however, no clear consensus at any point, and it should be added that even among Glauber's professed detractors a good many, like Rasch, were keen to obtain his works and, especially, his equipment. One of the more balanced judgments, which neatly sums up the tone of much of the polemic, is that of Appelius:

ich [habe] für meine person keine vrsache ihn für einen betrieger zu halten, sonst veracht er andere, vnd andere verachten ihn, wie aller artisten gebrauch ist, da niemand nichts lobet als seine eigene wahre.¹⁸⁹

Hartlib himself apparently remained perplexed as to which of the widely differing reports he should believe.

187 Poleman to Hartlib, 29 Aug. 1659, HP 60/4/111A. Cf. HP 60/10/2B, 19 Sept. 1659, reporting that Hartprecht's work was shortly to be printed, and referring to a mention, presumably by Hartlib, of two others who planned to write against Glauber.

188 Poleman to Hartlib, 5 Sept. 1659, HP 60/10/1B.

189 Appelius to Hartlib, 2 Aug. 1648, HP 45/1/39B.

Though he was still collecting Glauber's works assiduously at least as late as 1659, the stream of accusations from the likes of Rasch and Poleman, and news of the work of Becher, Hartprecht and Montendon, led him to become increasingly sceptical. In 1660, he told Winthrop:

our german adepti with whom I shall be better acquainted ere long, count no better of Glauber then a mountebank, one that continues to cheat all sorts of people by his specious artifices and one that knows nothing in the true Philosophical work Alkahest Elixir, &c &c There are some who are resolved to take him into task, to discover the error and falshood of his philosophy and experimentall knowledges & his willfull cheates and cousenages.¹⁹⁰

This, however, is followed by the quintessentially Hartlibian rider, 'I have suggested that some would also note whatever was true and good in all his writings'.¹⁹¹

It is obviously impossible to sum up such a broad spectrum of opinion into any simple formulation of the contemporary response to Glauber. It is noticeable, though, that the most savage attacks came from what one might call the 'old school' of Hermetic chemists: men such as Rasch, Hartprecht, Becher and Poleman, who were deeply committed to the notion of alchemy as essentially a mystic experience and a matter of personal revelation, from which it was important to exclude the common herd, even when publishing - indeed, especially when

190 Hartlib to Winthrop, 16 March 1660, HP 7/7/3B.

191 Ibid.

publishing. This peculiar ambivalence to the notion of publication finds striking expression in Poleman's comments on the manuscripts of Starkey,¹⁹² which were sent to him by Hartlib in 1659. Poleman was hugely impressed by these cryptic productions and wished to see them brought to press at once. There could be no harm in doing so, he declared in so many words, since they were so thoroughly obscure that there was no danger of anyone's understanding them: there were

keine Arcana darin mit solchem klaren verstand begriffen, dz sie einiger mensch darauss solte machen können. Vnd dz ist die wahrhaftige wahrheit drumb man sie auch sicherlichen publiciren kan.¹⁹³

Clearly, however, Poleman did not regard himself as 'anyone': these mysteries were not impenetrable to him. The purpose of publication, presumably, was to reach out to that tiny, elect body of similarly enlightened adepts whose learning and insight qualified them to share in this virtually sacred knowledge. The very fact that they were capable of understanding it guaranteed that they were worthy to do so. To the proponents of such an outlook, Glauber's direct, popular style and (comparatively) explicit terminology was anathema. This is not, to be sure, what they ostensibly attacked him for: the endlessly repeated charges were that he was at best mercenary and at worst a charlatan and confidence

192 See Chapter Seven, section 2.

193 Poleman to Hartlib, 9 Jan. 1660, HP 60/4/191A.

trickster whose fake medicines were lethal, whose writings led would-be adepts onto false paths and who brought the noble art of alchemy into disrepute by his association with it. However, the very vehemence of their onslaughts suggests they felt threatened by him in some way, and this concern for a gullible public whom they were themselves at such pains to keep in the dark is not overly convincing. What really upset them, I would suggest, is that Glauber was trying to make chemistry accessible to the common man.

Others such as Boyle, Hartlib and Moriaen, who took a rather less elitist view of the chemical art, were inclined to give Glauber rather more credit, and to acknowledge at least his practical achievements. Boyle, as has been mentioned, was keen to apply his furnace-making technology and thought highly of his work on saltpetre; Moriaen was particularly impressed by his contributions to agriculture and longed more than anything to learn the secrets of his fertilisers and artificial wines. Poleman, by contrast, sneered at such mundane achievements, remarking (not unreasonably) that if Glauber's aurum potable and alcahest were half so miraculous as he claimed, he would not waste his time on gardening, or on merely technical processes such as smelting copper ore:

der vnbedachtsame Mann verrathet sich eben
hiermit selbst: den so sein aurum potable ein

solch wunderthätig sache were, wie er es
ausschreyet, so dörffte er sich nicht bemühen
um die Mineram cupri zu schmelzen, vnd
dieselbige für geldt ausszubieten.¹⁹⁴

But among those who did not simply dismiss everything connected with the man as manifest charlatanism, his practical and technical achievements were generally esteemed, even when his more grandiose claims were mistrusted. What many increasingly came to find wanting in his work, however, was the spiritual element, the transcendent insights into God and the harmony of the universe that were the ultimate goal of the 'Chemical Philosophy'. Attempts to apply Glauber's more mundane achievements to these mystical ends provide the subject of the final chapter of this study.

194 Poleman to Hartlib, 17 Oct. 1659, HP 60/4/194A.

Appendix 1

Copy in Heinrich Appelius's hand of Glauber's 'Furni Novi Philosophici Utilitates' (Amsterdam, 1643.)

HP 63/14/48A-49B.

[63/14/48A]

Furni Noui Philosophici Utilitates oder Beschreibung der eigenschafften eines sonderbaren new erfundenen[altered] Philosophischen distillir ofens, auch was für Spiritus, olen, flores vnd der gleichen bisshero vnbekante Vegetabilische, Animalische vnd Mineralische medicamenten damit können zugericht vnd bereit werden. Der warheit vnd spagyrischen kunst liebhabern an tag geben durch Iohannem Rudolphum Glauberum, itziger zeit wohnhaft in Amsterdam.

Zu Amsterdam gedruckt bey Broer Ianß. Anno 1643.

Furni Philosophici a Ioh. Rudolpho Glaubero primum inuenti utilitates.

1. Die Nutzbarkeit dieses ofens ist diese, nemlich dz alles das sonsten durch retorten oder andere gewöhnliche vnd bekante glaserne oder erdene instrumenta destillatoria mit grossem <vielen> kosten grossen fewern, vnd langer zeit mus ausgetrieben werden kan in diesem mit wenig kosten vnd muhe, kleinem fewer vnd kurtzer zeit, sehr compendiosé gethan werden.

2. Dann in einer stund kan alhier mit 4 oder 5 lb Kohlen ein lb spiritu salis gemacht werden, da doch

sonsten durch die gemeine weiß per retortam solches in 30. oder 40 stunden kaum mit einem grossen sack voll geschehen kan.

3. Desgleichen kan mit 3 oder 4 lb kohlen in j stund j lb Antimonij in schöne flores sublimirt werden welches auf die bekante manier in etlich tagen nicht kan gethan werden.

4. Auch mag man in distilliren vnd sublimiren aufhören vnd nachlassen, auch wiederumb anfangen wann man will, hindert nichts in der destillation, Dann es kan kein retort oder recipient brechen, auch kan man alle stund einen besondern spiritum distilliren, also dz man in einem tag vnterschiedliche spiritus Olea vnd flores mit einem ofen machen kan. [63/14/48B]

5. Vnd alle Bergarten, nicht allein die bekanten mineralia vnd metallen oder alle lapides als Cristallen, Granaten, Kißling vnd dergleichen, sondern auch Talcum, zwitter, spath, Alabaster vnd ihres geschlechts, die sonst fast von allen Chymicis bißhero für fix vnd feuerbestendig seind gehalten worden, können in herrliche vnd nützliche spiritus, olea, flores, so wol zur Alchymia als zur Medicin dienstlich, in vnd eüsserlich zugebrauchen, destiilirt oder sublimirt werden.

6. Auch kan der flüchtige vnd volatilische spiritus aller salien als Vitrioli, salis communis, salis armoniaci etc wie auch aller mineralien vnd metallen spiritus sulphureus subtilissimus gefangen werden vnd

behalten werden, welches bißher von wenig laboranten erkant worden, dieweil an ihnen als ein vnsichtbarer geist durch ihr lucken entflohen ist, vnd sein corpus als einen spiritum acidum im recipienten hinterlassen hat.

7. Deren vnd noch viel mehr andere gute <vnd> nützliche vorthellen im distilliren werden alhier in diesem ofen gefunden.

8. Wer dann solchen hat, vnd den rechten gebrauch desselben weiß vnd verstehet; der kan dadurch gar leicht schöne vnd köstliche medicamenta erlangen, damit wunder ding in der medicina können gethan werden. Als zum exempel etliche derselben sollen angezeigt vnd verrichtet werden. wie folget.

9. Aus allen Vegetabilibus, als kräuter, wurtzeln, vnd höltzen gantz geschwind ein grosse quantitet Aceti oder spiritus acidi mit wenig kohlen zu distilliren also compendiosé, dz man auch in j tag viel lb aceti oder spiritus ligni. Hebeni, quercini, Iuniperi buxi, Quajaci oder dergleichen, nun mit j lb kohlen distilliren kan, dz auch die spiritus nit mehr kosten als das holtz oder kraut selbsten daraus der Spiritus gemacht werden.

10. Aus den Animalibus, in sonderheit Menschenhaar, hiernschetel, röhren, knochen etc. auch hirschhörner, Elephantenbein, Elandsklawen [etc] Spiritus vnd olea in grosser quantitet gar geschwind zu distilliren.

[catchword: 11.] [63/14/49A]

11 Alle olea Vegetabilium vnd Pinguedines animalium¹ so subtil machen, dz sie auch den Sulphur² oder Tinctur der Mineralien Metallen et lapidum extrahirn. [right margin, H: 10 Rthl³]

12. Aus den Metallen vnd mineralien ihr Elementum Igneum in forma spiritus subtilissimi zumachen mit welchem grosse dinge können gethan werden.

13. Ein sauren vnd scharffen acetum per se ohne addition aus dem Antimonio, wie auch aus andern mineralien vnd metallen zu distillirn.

14. Alle Metallen et Mineralien per se in spiritus, flores et salia zu sublimirn.

15. Alle lapides in flores zu zu sublimirn.

16. Aus den silicibus, cristallis alijsque lapidibus ein spiritum et oleum <zu distilliren.>

17. Aus dem Talco ein oleum zu distilliren.

18. Aus dem Bezoartico⁴ minerali oder Antimonio diaphoretico fixo, flores zu sublimiren.

19. Aus dem Antimonio, sulphure alijsque mineralibus flores zu sublimiren, welche sich in alle liquoribus soluiren vnd keine vomitus machen.

1 'vegetable oils and animal fats'.

2 In the Paracelsian sense of 'sulphur' as one of the three 'principles' (see Chapter Five, section 1).

3 These marginal notes of the prices are taken from Appellius's letter to Hartlib, 6 Nov. 47, HP 45/1/37A-B, though Hartlib's notes do not always correspond exactly to what Appellius told him.

4 Bezoar, a term possibly derived from Persian and meaning 'counter-poison', applied to a range of supposed mineral remedies in the early modern period. See Partington, *History of Chemistry* II, 98.

20. Sal tartari, auch tartarum Vitriolatum vnd andere salia fixa in spiritus zu distilliren.

21. Aus Vitriolo, Antimonio wie auch aus all andere mineralien vnd metallen ein liebliches vnd süßes roth oleum zu distilliren. [right margin, H: 10.]

22. Ein Menstruum welches der mineralien vnd metallen tincturam extrahiret vnd mit sich vbern helm führet.⁵
[right margin, H: 20.]

23. Ein Menstruum in welchem die Mineralia et Metalla in einem tag putrificiren vnd schwartz werden, den andern tag aufwachsen als ein baum mit wurtzeln, stam vnd vielen nesten,⁶ vnd zweigen, wunderbarlicherweis. [right margin, H: 30 oder 40⁷]

24. Ein spiritus oder Menstruum welches die olea distillata aromatum in liebliche Balsama coagulirt, die nimmer mehr ranzucht⁸ oder zeh werden, vnd sich in wasser, wein auch all andern liquoribus soluirn lassen.
[right margin, H: 10.]

25. Ein spiritus welcher die silices, crystallos oder andere harte stein in wenig stunden zu einem klaren wasser auf soluiret vnd solche mit sich vbern helm

5 Ie. the 'tincture' (or sulphurous 'principle') is distilled together with the 'menstruum' by passing over the helm, ie. the head of the retort.

6 Sic: surely a mistake for 'aesten'? The Latin gives 'cum stirpe, radicibus, ramis et frondibus multis' ('with a trunk, roots, many branches and much foliage').

7 Unambiguously 'XXX thl' on Appelius's list.

8 Not a word I have encountered anywhere else. It apparently means 'dry' or 'dessicated': the Latin is 'ut nunquam exsiccentur aut tenacia evadent'.

führet, auch sich wiederumb von den cristallis scheidet, dz die[*altered from sie*] selbe per se in forma olei seu liquoris bleiben. [*right margin, H: 20.*]

[*catchword: 26.*] [63/14/49B]

26. Alle Metalla vnd Mineralia astralisch machen, & purum ab impuro separare solo igne secreto Philosophico [*left margin, H: 100.*]

27. Aqua Vitæ Philosophorum, damit in 1 oder 2 stunden der sulphur oder tinctur fast aller mineralien, metallen vnd lapidum kan extrahirt werden. [*left margin, H: 20.⁹*]

28. Balneum siccum Philosophicum, mit welchem der mehrentheil Krankheiten nur von außershalb des leibs applicirt wunderbarer weiß können curirt werden. [*left margin, H: 100*]

29. Spiritum Vini¹⁰ also zu dephlegmiren vnd stercken, dz er nicht allein tincturas Vegetabilium, animalium et mineralium extrahirt, sondern auch silices, cristallos, talcum vnd der gleichen harte ding soluert. [*left margin, H: 10.*]

30. Solche vnd dergleichen noch viel vnzehlige gute medicamenta können in diesem ofen gemacht werden, welche vmb der kurtze willen vnvermeldet bleiben, auch ist es nicht möglich alles zuerzehlen, was damit kan gethan werden, dann es finden sich noch alle tag noch mehr vnd mehr neue ding so man damit laboriret, vnd ist gleichsam

9 Only 10 according to Appellius.

10 Ie. alcohol.

einen vnausschöpflichen brunnen gleich zu vergleichen, aus welchem zu allen zeiten vnauffhörlich frisches wasser heraus laufft, vnd dennoch nicht aufhöret zu rinnen.

31. Also habe ich Gott zuehren vnd dinste meines nächsten diese meine neue inuention wollen bekant machen, vnd vermeine dadurch vielen vrsach zugeben, hinfort die verborgene heimlichkeiten der Natur desto leichter zuergrüben; gäntzlicher zuversicht, es werde manchem frommen medico wol damit gedient sein: vnd ob schon der ofen sampt dem modo destillandi nicht gesetzt, soll er gleichwol dem liebhaber darumb nicht gewegert sein./.¹¹

Item er hat noch ein Menstruum, welchs man an allen orten ohne einige destilland haben kan, zeücht der metallen sulphura gar seltzam aus, vnd kan sie verbessern. für 40 Rtt.

NB. Er hat nur einen ofen erwehnet; hat aber doch zween, einen grossen vnd einen sehr kleinen, alle beide samt aller gesetzter sachen operation will er zeigen für 30 Rthl: ausgenommen etliche stücke beÿ welchen ihr pretium absonderlich gesetzt, vnd bedeuten alles Rthl.

¹¹ This clearly marks the end of Glauber's advertisement; what follow are Appelius's own remarks.

Appendix 2

Copy extract in Hartlib's hand, Charles de Montendon to
?, 4 March 1661.

HP 15/9/19A-B

[15/9/19A]

Leipsigk. March 4. 1661

Glauber is fallen vpon mee at the Altenburg-Court, where hee charges mee that I have beene the only cause, why his busines did not proceed having gotten the 24. Processe which I had entrusted to the Electoral Delegats of Mentz which I imparted to the Delegates from Altenburg, least [deletion?] <Hee> should have gotten the Monies which were promised, which indeed would have beene the highest Injustice, and therefore those of Altenburg had separated themselves from his Schoole, going away without taking their leaves, and keeping the Monies, which they also made the Bavarian to doe amounting to 4000. Rixd. All this I confesse I have done. by which meanes I have saved such Monies out of the Impostors claw's. Nor doe I care to attest this Truth¹ and to maintaine it, which also the Court hath approved. I am glad therefore that I have exercised myselfe in the Germane - Language, so that now I need not to put out my Refutation of Glaubere in the French Language <Tongue> which otherwise I should have

1 Ie. nor do I have any objection to attesting this trutn.

beene necessitated to doe. For having found the
 Deceivers (Glaubers) deceits by my owne losses, which
 <now> I know to bee nothing else but falshood and
 cousenage, I have [count?] it my duty to warne [others?]
 for their good by a Treatise on purpose entituled - A
 needful Refutation of Glaubers hitherto divulged Vn-
 Truths. I confesse I have beene somewhat sharp and
 passionat calling <him> Villaine Knave and Theefe yea the
 great and impudent Arch-Cheater. I have also certain
 writings vnder his owne hands, so that I shall bee able
 [15/9/19B] to enter into a course of Law with him[altered
 from them] either to performe what hee hath vndertaken
 and promised or to recover the Monies, which hee hath had
 from mee a Friend of mine. the fore-said Treatise is
 here printed and will bee ready against the Mart.² Thus
 far Charls de Montendon from Leipzig concerning his
 Purpose and Booke against Glauber.

2 Ie. the Frankfurt Book Fair.

Chapter Seven

The Dawn of Wisdom

'spero [...] ut Lux oboriatur mundo tam in naturalibus quam divinis: ita auroram jam videre mihi videor' ('I hope light will rise on the world, as well in things natural as in things divine: indeed it seems to me I can already see the dawn') - Moriaen to Benjamin Worsley, 19 May 1651, HP 9/16/5A.

7:1 Benjamin Worsley's Alchemical Mission to the Netherlands

This chapter traces the personal collaboration of a small group within the Hartlib circle on a quest to attain spritual enlightenment through practical experiment. It is the story of an entirely serious and scientific attempt to master the techniques of transmuting matter. As such, it shows just how literally these thinkers took the idea that the physical world is not so much the object as the medium of human perception rightly understood. All the preconceptions and preoccupations discussed in the foregoing chapters come to the fore in this episode, this attempt to open the 'gate of things' and gain a view of a reality beyond the material. The correspondence between the protagonists, their reflections on the undertaking and their reaction to its ultimate and inevitable failure, supply a great many insights into their understanding of the relationship between matter and spirit, of the operation of God in the created world, and of the nature and function of knowledge itself.

In 1647, at the same time Hartlib was canvassing the possibility of bringing Glauber to England to teach chemistry, Benjamin Worsley¹ was preparing for a visit to the Netherlands. Little has previously been established about the nature and purpose of this expedition, which lasted from the beginning of January 1648 to autumn 1649.² Hartlib's papers reveal much, though by no means everything, about this undertaking, proving beyond all doubt that the main prize Worsley hoped to bring home

1 On Worsley, see below, and also Charles Webster, 'Benjamin Worsley: engineering for universal reform from the Invisible College to the Navigation Act'; *SHUR*, 213-235; Antonio Clericuzio, 'New light on Benjamin Worsley's natural philosophy', *SHUR*, 236-246; J.J. O'Brien, 'Commonwealth Schemes for the Advancement of Learning', *British Journal of Education Studies* 16 (1968), 30-42. A handy summary of the known facts about his career, with an extensive list of sources, is provided by G.E. Aylmer, *The State's Servants: The Civil Service of the English Republic 1649-1660*, (London, 1973), 270-72.

2 Webster suggests late Feb. 1647 as the date of Worsley's departure (op. cit., 223), but this is far too early. He was still in England on 10 Dec. 1647, when Culpeper was trying to locate some recipes his wife had lost, and asked Hartlib to 'doe me the kindnes to search diligently at yourselfe & Mr Woorsly for them' (HP 13/206B). Culpeper on 20 Oct. 1647 did not, as Webster claims, 'express his admiration for Worsley's "trade of soe much ingenuity and knowledge"' (ibid., 224): he said he hoped Worsley would 'goe ouer' and engage in such trade (see fuller quote below): the letter is in fact evidence that Worsley was still in England at this date. Clucas, on the other hand, situates the visit 'some time in the summer of 1648' ('The Correspondence of a XVII-Century "Chymicall Gentleman"', 152): Worsley was indeed in the Netherlands that summer, but had been there since at least January. A letter to Hartlib dated The Hague, 14 Feb. 1648 (HP 36/8/1A-6B), gives a detailed account of Worsley's recent contacts and activities. He mentioned having arrived at The Hague on 'the 27th', presumably of January, before which he had spent some time in Rotterdam.

with him was a detailed knowledge of Glauber's chemical equipment and operations. The idea of recruiting Glauber for Gresham College perhaps reflected a hope of obviating the need for this, but if Glauber would not come to England, England would have to send to Glauber.

From at least August 1647, Hartlib was busy assessing the prospects for such an expedition, sending specific queries to Moriaen and Appelius, his principal sources on Glauber.³ Moriaen promised to arrange an introduction,⁴ which he was confident would prove useful: 'weiß auch woll das Ich so bald als iemand etwas von H Glauber erlangen kan' (no. 96). Appelius considered that Glauber would probably be prepared to put Worsley up during his stay.⁵ Both pointed out that there was no chance of obtaining anything from Glauber unless he were offered a suitable financial recompense. Appelius, who had commented wryly in the note he appended to *Furni Novi Utilitates* that 'bedeute[t] alles Reichstaler',⁶ thought £100 (roughly the sum he and his friend had paid some years earlier) would be enough.⁷ Moriaen was somewhat more emphatic about this point,⁸ though given Glauber's

3 Hartlib's letters do not survive, but it is obvious from the replies that they were full of detailed queries about Glauber.

4 See no. 94.

5 Appelius to Hartlib, 26 Sept./6 Oct. 1647, HP 45/1/37A.

6 HP 63/14/49B: see Appendix 1 to this chapter.

7 Appelius to Hartlib, 26 Sept./6 Oct. 1647, HP 45/1/37B.

8 No. 93.

reputation, it was advice which can hardly have come as much of a surprise.

This prerequisite was to be supplied by, or by means of, Cheney Culpeper, who had already pledged his support for the Office of Address scheme, and whose imagination had been fired by his labours on the translation.

Culpeper was

soe muche taken, with very many of his [Glauber's] ingenuities, that (yf Mr Worsley will take soe much trouble vpon him,) as (in the trade of soe much ingenuity and knowledge) to become the Factor, & to goe ouer to Glauberus, & to purchase his ingenuities of him), I shall willingly become a marchante venturer in the busines, & shall be glad to finde others to that number, as that the voyage may be vnder taken.⁹

Worsley (c.1618-1677) was evidently a man of considerable charm, with an acute brain and eclectic imagination. Together with Boyle, he was a prime mover of the 'Invisible College' in the 1640s.¹⁰ As Webster observes, if he had become a member of the Royal Society, his writings would probably have attracted a great deal more attention and respect than they have,¹¹ and Antonio Clericuzio has shown that the 'Physico-Astrological

9 Culpeper to Hartlib, 20 Oct. 1647, HP 13/197A. The illogical bracketing is Culpeper's. On Culpeper's offer of funding for the Office of Address, see Hartlib to Boyle, Nov. 1647, Boyle, *Works*, 76.

10 See Webster, 'New Light on the Invisible College', *Transactions of the Royal Historical Society* 24 (1974), 19-42; also *Great Instauration*, 59-67.

11 Webster, 'Benjamin Worsley: engineering for universal reform', *SHUR*, 213-235, 225.

Letter' found among Boyle's papers at his death and long supposed to be by Boyle himself was in fact written by Worsley.¹²

Biographical details are scarce, and a fuller investigation of his life and thought would present a very interesting and valuable field of study. He appears in the *DNB* only by default, as the incompetent Surveyor of Ireland replaced by the much more efficient William Petty in 1658, in the teeth of support for Worsley from 'the fanatical or Anabaptist section of the army'.¹³ Hartlib's papers present a rather more appealing picture both of the man and his abilities. He was probably Hartlib's personal favourite among all his many associates, certainly among those of the younger generation. Though Hartlib was never stinting of praise where he thought it due, his comments on Worsley are exceptionally warm. He used him as a yardstick of personal merit: long before any enmity between Worsley and Petty had arisen, Hartlib described the latter to Boyle as a fine linguist, very learned and 'of a sweet natural disposition and moral comportment', but for all

12 'General History of the Air', Boyle, *Works* V, 638-644. For the reattribution, see Clericuzio, 'New Light on Benjamin Worsley's natural philosophy', *SHUR*, 238-9.

13 *DNB* XLV, 113, and see nos. 178 and 190; also Webster, *op. cit.*, for a reappraisal of the *DNB*'s harsh judgment. Webster is to supply an entry on Worsley in the next edition of the *DNB*.

that 'not altogether a very dear Worsley'.¹⁴ He was proud to tell Boyle that this 'noble and high soaring spirit'¹⁵ had 'resolved, for time to come, to look upon me no more as a private friend, but as a father'. Hartlib accordingly took to referring to him as 'my philosophical son'.¹⁶ Boyle too obviously entertained the warmest affection for him.¹⁷

Worsley's formal education seems to have been limited, if not so severely as Glauber's. The clearest indication of his lack of a scholarly background is supplied by the shortcomings of his Latin. In a letter almost certainly to Worsley, Moriaen apologised for not being able to translate a message from Glauber into English,¹⁸ and later clearly indicated that he felt obliged to write English to Worsley: 'Er [Worsley] wolle mich excusiren das Ich an ihn selbsten nichts schreib bin im Englischen nicht so fertig'.¹⁹ Again in 1657, Moriaen apologised for not being able satisfactorily to translate a German enclosure for Worsley, and asked Hartlib to do

14 Hartlib to Boyle, 16 Nov. 1647, Boyle, *Works* VI, 76. Hartlib later became extremely disillusioned with Petty: see his bitterly humorous account to Boyle of 10 Aug. 1658, Boyle, *Works* VI, 112-113.

15 Hartlib to Boyle, 28 Feb. 1654, Boyle, *Works* VI, 79.

16 Hartlib to Boyle, 27 April 1658, *ibid.*, 104-5. Hartlib was about eighteen years Worsley's elder.

17 Cf. Webster, 'Benjamin Worsley', 220, and *Great Instauration*, 59-60 and the letters cited there.

18 No. 107.

19 No. 112. Cf. also no. 109: writing 'fält mir gegen H Worsley zue schwehr vnd langsam'.

so.²⁰ Since there is no question of Moriaen's competence in Latin, this can only mean that Worsley did not understand the language well. The ten letters from Moriaen to Worsley which are in Latin, all dating from 1651,²¹ were presumably intended to be translated by someone for the recipient. It is clear that Worsley replied in English.²²

This social and scholarly disadvantage did not prevent Worsley from becoming an autodidact of some distinction. He was also something of an entrepreneur. In the mid-1640s, when his association with Hartlib began, he was busy promoting a scheme for producing saltpetre by a method more profitable and less inconvenient than the usual²³ - an interest Glauber strongly shared. In about 1640 or 41 he had been an army surgeon in Ireland, and he was studying medicine in

20 No. 158.

21 HP 9/16/1A-13B and 63/14/13A-B.

22 In one of these letters Moriaen quoted Worsley back to him, with the telling comment that he had not initially understood his meaning: 'præcedentes Tuas ad me literas denuò inspexissem, diligetius ponderavi illa Tua verba de opere nostro Iovali [*I considered your last letter to me again and weighed more carefully those words of yours about our business of Tin*]. (If you thinke good to adde any thing of the way to us heere we may perhaps retourne you an even advantage by it.)' (Moriaen to Worsley, 26 May 1651, HP 9/16/6A. On the 'business of Tin', see below).

23 See his proposals for the saltpetre project at HP 71/11/1A-B and 17/11/12A-13A; a similar unasccribed document at HP 53/26/6A-B is probably also by Worsley. See also Webster, *Great Instauration*, 378-80, and 'Benjamin Worsley: engineering for universal reform', 215-17.

1647,²⁴ but though he later took to calling himself 'Dr Worsley', it seems he never obtained a degree.²⁵ In August 1649, shortly before his return from the Netherlands, he announced that he was thinking of giving up formal study. He envisaged instead going out to Virginiaia to help establish new plantations there or improve existing ones. Alternatively, he hoped to obtain some public office in Britain or Ireland through the influence of Dury, Hartlib, Culpeper and Sadler.²⁶ It was almost certainly on Hartlib's recommendation that he was appointed Secretary to the short-lived Council of Trade (1650-51), following which he spent most of the rest of his life in a succession of other official secretarial and administrative posts related to trade and economics.²⁷

Worsley's mission to the Netherlands ran into difficulties before it had even started. On 17 November 1647, Culpeper withdrew his offers of support both for Hartlib's Office of Address and Worsley's Dutch expedition. As a result of a family quarrel arising from Culpeper's support of the Parliamentary faction, he had been largely dispossessed, and was not in a position to

24 Moriaen, before getting to know him, in nos. 93 and 94 referred to him as 'candidatus medicinæ', this evidently being the description Hartlib had provided.

25 Aylmer, *The State's Servants*, 271; Webster, 'Benjamin Worsley', 213.

26 Worsley to Dury, 27 Aug. 1649, HP 33/2/3A-4B.

27 Fuller details in Aylmer, loc. cit.

contribute as he had hoped.²⁸ Nevertheless, Worsley set out, in December or January,²⁹ in a Micawberish trust that funds would somehow materialise in the course of the journey. Culpeper, perhaps feeling a little embarrassed, remarked in March that

I am extremely sorry for Mr Woorsly whome (to deale freely with you) I must judge somewhat erroneus, that wowlde not see him selfe well bottomed before hee vndertooke his journey. For my selfe I continue in my late condition.³⁰

Worsley was certainly well supplied with an assortment of commissions, and received more during his stay, but whether he was being paid for them is not clear. His first task was to try to find out what had become of the drainage mill William Wheeler had been granted a Dutch patent for in 1639.³¹ Dorothy Dury, who was thinking of taking up the production of 'cordiall waters', wanted an

28 Culpeper to Hartlib, 17 Nov. 1647, HP 13/204A. During a severe illness in 1641, which he expected to prove fatal, Culpeper had signed over the control of his estates to his father, Sir Thomas Culpeper. Sir Thomas was supposed to return control to his son in the event of the latter's recovery, but, outraged by Cheney's support of Parliament at the outbreak of civil war, he refused to do so. Furthermore, Sir Thomas's own debts were charged to the revenue of the estates he had taken over from his son. In the course of 1646-7, with the estates now apparently again under his control, Culpeper was trying to get the fine imposed on them reduced, and succeeded in having the charge cut by about a third, but was still confronted in Nov. 1647 with a bill for £844 1/-. He was consequently in financial straits throughout the rest of his life, and was heavily in debt at his death. For fuller details, see Greengrass, 'Introduction' to *The Correspondence of Sir Cheney Culpeper* (forthcoming).

29 See n.2 above.

30 Culpeper to [Hartlib?], 29 March 1648, HP 13/214B.

31 See no. 96, n.6

account of distilling techniques practised in the Netherlands, and Worsley duly sent her (via Hartlib) a long and detailed account of various processes.³² For her husband he investigated the charges made by Menasseh ben Israel for the productions of his Hebrew press in Amsterdam and the theory being put about in Menasseh's and Serrarius's circles that the native Americans were the lost tribes of Israel.³³ He also promised to supply intelligence to Robert Child, though exactly what about is unclear.³⁴ But he did not forget the principal object of the exercise: 'The next opportunity I send once more to Glauberus, and then I shall be able to give you a more full account of things'.³⁵ At the bottom of his copy of a letter from Dury to Worsley, Hartlib scribbled a quotation from *Isaiah* 60:17 which is very suggestive of the hopes invested in Worsley's intelligence-gathering expedition: 'For brass j will bring gold, and for iron j will bring silver, and for wood brass and for stones iron'.³⁶

32 Worsley to Hartlib, 22 June/2 July 1649, HP 26/33/1A-3B.

33 Dury to Worsley, 14 March 1648, HP 1/2/1A-B and 12 July 1649, HP 26/33/4A-5B, and Worsley to Dury, 27 July 1649, HP 33/2/18A-19B. On this theory and its ramifications, see Chapter Two, section 2, and the literature cited there.

34 Worsley to Hartlib, 14 Feb. 1648, HP 36/8/6A.

35 Ibid. Moriaen had already received a letter from Worsley to pass on to Glauber on 14 Feb. (no. 97).

36 HP 1/2/1B.

Worsley reached Amsterdam on 25 February 1648, where he made his first personal contact with Moriaen.³⁷ Here another disappointment was in store, for Glauber, contrary to Appellius's expectations, had written - presumably from Arnhem - to declare himself unwilling to put Worsley up in his house, as Helena Glauber was again in childbed, and Glauber himself was taken up twenty-four hours a day with a new experiment. Worsley found this very demoralising, and it would seem to have discouraged him from proceeding to Arnhem, though Glauber had offered to find him other accommodation there. At the end of May he was still with Moriaen in Amsterdam, experimenting on some exotic seeds supplied from America through the agency of Hartlib.³⁸ Moriaen was especially concerned about the language barrier, highlighting again that neither Glauber nor Worsley had a very good command of Latin:

Glauber versteht woll Latein wans auff hoch teutsch außgesprochen wird aber Er wird nicht Lateinisch reden wollen [...] das wird Ihme unlustig und die conversation zue wieder machen (no. 98).³⁹

The prospects for precise scientific communication of highly technical matters cannot have looked bright.

37 No. 98.

38 No. 99.

39 The problems in oral communication caused by different national conventions of Latin pronunciation were frequently mentioned by travellers of the period, and could be a hindrance even to those completely fluent in the language.

Moriaen did his best to keep Worsley's spirits up and to help him find his feet in Amsterdam, just as he had earlier done for Rittangel and Pell, and this time seemingly with rather more success. Language problems notwithstanding (they presumably communicated in English, in which Moriaen was less than comfortable), the two became good friends. Brun, after his visit to Amsterdam the following year, reported: 'Ich höre dz Er [Moriaen] Herrn Worsly sehr ehret vndt auf der Rechten handt läßet gehen', adding darkly and somewhat mysteriously,

welches Ihm aber von etlichen nicht zum besten wird aufgenommen, vnd zwar nicht ohne vrsach, dan H. Morian ist ein zimlich betagter Man, in vielen Künsten vndt wißenschafften erfahren.⁴⁰

What impropriety was seen in this age gap (about twenty-six or twenty-seven years) is unclear. The implication is perhaps that Worsley was suspected of trying to obtain the older and presumably frailer man's hard-won secrets by coercion or deception. As will become apparent, Moriaen did indeed later come to believe that Worsley was guilty of giving rather less than he gained in their scientific exchanges.

Appelius, who was living nearby in Purmerent at the time, spoke in May of unspecified 'hinderances' to Worsley's undertaking,⁴¹ and at the beginning of August sent a more detailed and not very encouraging report of

40 Brun to Hartlib, 13 June 1649, 39/2/9A.

41 Appelius to Hartlib, May 1648, HP 45/1/47A.

his doings (though making it clear that by this time he had at least met Glauber, who by this stage had returned to Amsterdam):

Mr Worsleys werck geht langsam fort, Glauber fühlt nicht dz ihm die zeit vnd kosten schwer fallen, man bringt viel zeit mit complementen zu, vnd sagt nit rund aus was vnd wie man ein ding begehrt, was oder wie man ein ding zusagt, vnd auf sich nimt: etliche fürchten Glauber werde seiner zusage keinen genügen können thun.⁴²

Some sort of negotiations were clearly in progress, and some suggestion will be given below of what they were about, but the details remain vague and uncertain. Most regrettably, hardly any letters survive from the whole period of the Dutch trip from either of the two men who were in a position to shed most light on such matters, Worsley himself and Moriaen.

Whatever the hindrances Worsley had to overcome, Culpeper was delighted to find him 'very intentiue in frawghtinge himselfe with riche ladinge', having been sent (through Hartlib) details of a 'very pretty' experiment relating to one of his favourite topics, the 'nature & vse of cold'.⁴³ Culpeper went on: 'yf hee meete with more in that nature, hee shall muche oblige me by them', and added once again that if he could bring his financial affairs into order he would willingly 'venter a

42 Appelius to Hartlib, 2 Aug. 1648, HP 45/1/39B.

43 See the quotes from Culpeper on this subject in Chapter Five, section 3.

share' in the enterprise.⁴⁴ At the end of July, though still prevaricating about the question of money to be supplied by him (apparently another source of funding had been secured by Hartlib⁴⁵), he was eagerly hoping 'that Mr Woorsly woulde make himselfe master of all Glauberus his furnaces'.⁴⁶

Glauber, however, was very far from being Worsley's only new contact in the Netherlands. Kuffler and his wife visited Amsterdam in the summer of 1648, and were introduced to Worsley by Moriaen.⁴⁷ Culpeper thanked Worsley for communicating 'Dr Kuffler's wife's experiments, especially concerning harty chocks [artichokes]'.⁴⁸ Worsley also discussed schemes for draining the English fens with various Dutchmen, principally Moriaen's 'cousin' Jacob Pergens.⁴⁹ Dutch achievements in land reclamation were the envy of the world, and even the standard anti-Dutch topos that the Netherlands were only a bog that ought by rights to be under water reveals a grudging admiration.⁵⁰ Worsley had

44 Culpeper to Hartlib, 5 April 1648, HP 13/215A.

45 Culpeper to Hartlib, 25 July 1648, HP 13/231A: 'I vnderstande from yourselfe that hee is (for the presente) otherwise supplied'. I can find no hint as to what this alternative source might have been.

46 Ibid.

47 Cf. Worsley to ?, 22 July 1648, 42/1/1A, recounting that he had dined with the Kufflers at Moriaen's.

48 Ibid., HP 13/217B.

49 On this subject, see H.C. Darby, *The Draining of the Fens* (Cambridge, 1940).

50 See Simon Schama, *The Embarrassment of Riches: An Interpretation of Dutch Culture in the Golden Age* (Berkeley, Los Angeles and London, 1988), esp. 257-288.

hopes of persuading Pergens and his friends to invest both money and expertise in the fens, but met once again with a dispiriting response. Pergens promised to spread word of the suggestion, but warned that uncertainty about or antipathy to the new regime in England was likely to discourage Dutch investors, and moreover 'many of the cheife of the Dutch, and of his owne freinds, had beene themselves dreynd by having a hand in our fenns already'.⁵¹

The inventor Caspar Kalthof was in Amsterdam at the same time, intending to demonstrate one of his perpetual motion machines,⁵² and Worsley made his acquaintance too. The device was burned down the night before the planned demonstration - by 'the dutch boores', according to Worsley's report, though Brun relayed a rumour that Kalthof had set fire to it himself, having realised it would not live up to his claims.⁵³ Worsley put Kalthof in touch with Petty, who planned to collaborate with him on a mine drainage scheme, or so at least Worsley thought.⁵⁴ In view of their later bitter dispute, there is a rather sad irony in Worsley's fervent admiration at this juncture for Petty, whom he apparently saw as an exemplar of the 'free and generous communication of

51 Worsley to Hartlib, 22 June/2July 1649, HP 26/33/1A.

52 See no. 7, n.4.

53 Worsley to Petty, 15 June 1649, HP 8/50/1A, and Brun to Hartlib, 13 June 1649, HP 39/2/9A.

54 Worsley to Petty, 15 June 1649, HP 8/50/1A-2B.

secrets' that was the whole Hartlib circle's ostensible goal:⁵⁵

you could not [...] easily haue given mee greater cause, passionatly to loue you, then you haue in that generous offer of yours, to conjoine your enedeauors with Mr Kalthofs [...] there being nothing amongst great or peeral witts, more frequent, tho nothing lesse manly, then æmulation, envy and detraction [...] and consequently nothing more rare or to bee admired then to find the contrary disposition.⁵⁶

In fact there is some doubt as to whether Petty ever really did intend to 'conjoin his endeavours' with Kalthof, and was not merely, à la Clodius, taking advantage of the other man's research to further his own. Already before 4 February 1649 - four months before Worsley's letter - Hartlib had noted that Petty 'will also within a few day's perfect Kalthof's Invention and will now not joine with him'.⁵⁷ In April or May the same year, so still before Worsley's letter, Petty was apparently convinced that

Kalthof will finde himself deceived as to this application or vse. Hee [Petty] conceives that hee can doe more in his way then Kalthof himself [...] as himself [Kalthof] shall bee made sensible of by his owne letter to him, which hee sends enclosed in Mr Worslys.⁵⁸

55 The phrase is from the description on the title page of Boyle's contribution to the *Chymical, Medicinal and Chyrurgical Addresses*, 'An Epistolical Discourse of Philaretus to Empyricus', which can virtually be read as the group's manifesto.

56 Worsley to Petty, 15 June 1649, HP 8/50/1A.

57 Eph 49, HP 28/1/3B.

58 Eph 49, HP 28/1/17A, giving Petty himself as the source.

There was some disparity, it would seem, between what Petty was telling Hartlib and what he was telling Worsley. At all events, no such collaboration ever did take place.

Worsley was particularly taken with the productions of the mechanic Fromantil or Fremantil, especially his microscopes.⁵⁹ These were a revelation to Worsley, unveiling to him an unimagined diversity in created matter. Far from confirming micro-macrocosm analogies, they brought home to him the individuality and disparity of the component parts of Creation:

wee may say not every man only but evey [sic] beast or fowle of the same, species, yea, every sand is knowne by its name [...] I beleeve it would imploy many yeares, & fill a good volume, to discover to the world this little Atlantis, or Vnknowne part of the Creation, hitherto not well looked after by Any.⁶⁰

59 Fromantil is a thoroughly obscure figure who appears to have been an all-round inventor. There are numerous mentions in the *Ephemerides* of 1649 on, and Hartlib's papers include a list of 'Ahasverus Fremantils Mechanical Vnder takings in his owne hand' (n.d., HP 71/19/1A-B), in all probability sent or brought over by Worsley. These include various clocks, an engine for levelling river beds and various engines for raising weights or water. He also invented a fire engine (HP 53/35/5A), an instrument for measuring the concentration of liquids in compound, and an 'art of making notches in Iron-wheels', perhaps meaning cog wheels (*Eph* 49, HP 28/1/32B and 35A). Worsley is the only correspondent to mention his microscpes.

60 Worsley to ?, 27 June or July 1648, HP 42/2/1A. Hartlib was obviously circulating this very interesting letter, which constitutes something of a manifesto for natural philosophy, as there are three copies in his papers, HP 42/2/1A-2A, 8/27/2B-7B and 8/27/9A-13B. The second of these is dated June, the other two July.

This moved Worsley to take up lens-grinding himself (probably with help and encouragement from Moriaen), and to declare 'Optikes' to rank alongside 'Chymia' as the most excellent branch of knowledge available to man. This passionate interest in optics remained with him for the rest of his life, and after his return to England, he became one of the best customers for the telescopes and microscopes of Wiesel sent into England by Moriaen.⁶¹

From these musings, Worsley proceeded directly to declare that he had 'abdicated much reading of Bookes, vulgare received Traditions & common or Schoole opinions', and had 'divided knowledge into Divine & humane'.⁶² It is highly suggestive of the intellectual and cultural climate in which Worsley's thought had been formed that he could so brashly suppose the idea of distinguishing secular from divine knowledge to be an original one, when Comenius a decade earlier had been taken to task precisely for failing (or refusing) to make such a distinction (see Chapter Four, section 2). Possibly betraying an influence of Moriaen on his thinking with regard to 'divine knowledge', he asserted no such knowledge to be

the necessary Rule of fayth but what the
spiritt of god hath sett doune plainely, in

61 See nos. 107, 108, 109, 111, 156; there are also repeated references to the delivery of optical instruments in Moriaen's Latin letters to Worsley of 1651, HP 9/16/1A-13B.

62 Worsley to ?, 27 June or July 1648, HP 42/2/1B.

symple & univocall tearmes & easy to the understanding of any, looking vpon all poynts controverted, as the opinions but at best, if not the Inventions & pryde of men [...] thinking it no shame to be ignorant of many places of Scripture I meane the infallible sence of them.⁶³

Such an attitude effectively declared comprehensive exegetical methods such as Dury's *Analysis Demonstrativa* wholly redundant. But neither was Worsley prepared to admit the other radical Evangelical standby of personal revelation as a certain means of Scriptural illumination: if it were, he pointed out, 'wee should have no difference of opinion among good men, which we see to the contrary'.⁶⁴ Indeed, on the face of it, this seems like a complete rejection of the sort of chemico-religious enlightenment that was the hallmark of the 'Chemical Philosophy'. The impression could be given of Worsley as moving towards a wholly areligious conception of science. It is quite clear that, having established 'his' division of knowledge, he himself was a good deal more interested in the 'human' than the 'divine' department. But it would be a mistake to take Worsley's terms too literally. It was certainly not his intention to dismiss God from the laboratory altogether.

In a much later letter, probably to Hartlib, on 'Vniversal Learning', Worsley asserted the interdependence of all subjects, singling out the

63 Ibid.

64 Ibid.

disciplines of astrology, medicine, chemistry and divinity.⁶⁵ All four were interrelated and no one of them could properly be understood without reference to the others, especially not to the fourth. Worsley was far from dismissing human knowledge as a means of gaining insight into the work and the ways of God, and was still firmly committed to the Pansophic notion of the interrelatedness of all disciplines, divinity not excepted.⁶⁶ Indeed, he still saw all learning, as Comenius did, as a means to raise men's minds to the contemplation of God. In the same letter about the microscopes in which he proclaimed the division of human and divine knowledge, he also affirmed that this discovery of infinite variety in the microscopic world 'more setts out the immensity of the wisdom of God than any other, & proves that nothing was done by chance or occasion'.⁶⁷

The 'divine learning' that Worsley wanted to distinguish and exclude from his physical, chemical and astrological studies was not divinity in its broadest sense, but the specific discipline of Scriptural

65 HP 42/1/7A-8B, 14 Oct. 1657. By 'astrology', Worsley meant not the art of divination but the study of the physical effects (direct or indirect) of celestial bodies on sublunary matter and motion, as he explained in his 'Physico-Astrological Letter' of c. July 1657 (copies at HP 26/56/1A-4B and 26/56/5A-8B; Latin translation at 42/1/18A-25B, and cf. n.12 above).

66 HP 42/1/7A-B. Cf. Clericuzio, 'New light on Benjamin Worsley's natural philosophy', 242.

67 HP 42/2/1A.

exegesis. All his somewhat dismissive comments on 'divine learning' refer exclusively to the understanding of the Bible, not to the understanding of God. Indeed, he very much implied that the understanding of God would be a good deal better promoted by the study of science than that of Scripture, with all its ambiguities and obscurities. Worsley's thought had already been developing in this direction before he went to the Netherlands and met Moriaen. The earnest young student John Hall, whom Hartlib cultivated as a contact at Cambridge and put in touch with Worsley, early in 1647 expressed to the latter his doubts concerning the question 'Whether the Scripture bee an adequate Iudge of Physical Controversies or no?'⁶⁸ Hall was frank about the derivativeness of his thoughts on this subject. The case against is that Scripture 'dos expresse some things contrary to the received Tenents of Nature' and is consequently, in such cases, interpreted by 'Men of great Authoritie' as being merely figurative. The arguments in favour are that, as Comenius points out in the 'Preface' to his *Physica*, 'Man can but teach one thing at a time God who is infinit all things at once', and that Moses' description of Creation 'questionles hath an End meant by the Holy Spirit'. Clearly conditioned to favour faith over reason, Hall found the latter view more convincing, but still had reservations.

68 Hall to Worsley, 5 Feb. 1647, HP 3/6/1A-B.

What is interesting about this document, and makes it illustrative of the intellectual climate of the times and of the conceptual problems facing the promoters of 'experimental philosophy', is not the rather flimsy argumentation put forward for either side, but the fact that a young scholar such as Hall, evidently struggling to establish his own intellectual orientation, saw this as a crucial point to be determined. It is significant too that Hartlib obviously thought the exchange worth preserving and (presumably) distributing: two copies each of Hall's letter and Worsley's reply are preserved in his papers.⁶⁹ Worsley's substantial and considered response also testifies to the seriousness with which he took the question, and contains arguments of rather more intrinsic interest. It would be presumptuous, Worsley opined, 'to affirme what primitive or materiall Truths the Scripture conteineth not',⁷⁰ but it was already quite clear to him that, with regard at least to practical and scientific knowledge, any such truths were expressed in Scripture in a manner that mankind in its fallen state was not capable of comprehending. Indeed, in an intriguing insight into a Puritan scholar's idea of Heaven, he envisaged Biblical study as a feature of the afterlife, suggesting that

it is not absurd to thinke. It shall be part as well of our happinesse, as of our employment in

69 Hall's letter at HP 3/6/1A-B and 36/7/2B-3A; Worsley's (16 Feb. 1647) at HP 36/6/3A-8B and 36/7/3A-6B.

70 HP 36/6/4B.

the other lyfe, to find that in it [Scripture], which the whole Ages of the world came short of discovering.⁷¹

In the meantime, however, humankind was thrown back on its own resources of empirical observation and experiment to supply those revelations about the nature of things that in holy writ were couched too obscurely, if at all, for mere mortals to comprehend. He neatly turned the literalist argument on its head, suggesting that the sin of presumption lay not with those who preferred the evidence of their merely human senses above the divine authority of Scripture, but with those who preferred their merely human interpretation of Scripture above the evidence of their God-given senses:

if any upon a probable phrase of scripture, shall build an axiome in physickes without thinking himsele afterwards obleiged (for the satisfaction of others) to hold strictly a Correspondency with the rules and lawes of Reason, and experience. I should not conceive my selfe tyed, by any any rule or law in Scripture, to believe or give credit to his Assertion: neither should I confound his allegation of Scripture, with the authority of Scripture, where any evidence of Reason or demonstration from experience did oppose him. As apprehending it much more safe, to bend the words of Scripture to truth, then to writhe truth so, as it may speake to such or such a sense of Scripture. For truth will ever, admirably cleere, open, and illustrate Scripture, whereas the Scripture it selfe, very oft, concealeth what Truth that is, it containeth.⁷²

71 HP 36/6/4B.

72 HP 36/6/5B-6A.

All this is very reminiscent of the argumentation 'ex lumine Naturæ' Moriaen commended in Boreel, and the Collegiants' rejection of all human attempt at Scriptural interpretation or commentary.⁷³ The remarks on Scriptural exegesis are very similar to Moriaen's repeated insistence that to commit oneself to a particular elucidation of any point of detail, or to expect such commitment from others, could only lead to schism and dissent, whereas freedom of conscience encouraged fraternity and union. While it should be stressed that Worsley is dealing only with 'physical Controversies', and not with moral precepts, prophecies or divine matters, his argument goes a stage further, bringing out what is at most only implicit in Moriaen's and Boreel's stance. The light of Nature is to be used not only to demonstrate but actually to interpret Scriptural truth. What Worsley was effectively saying was that, at least as far as our current imperfect condition goes, Scripture is ambiguous, that it may be necessary to 'bend the words of Scripture to truth'. Boreel was another new contact Worsley made in Amsterdam,⁷⁴ presumably through Moriaen, and the three men must have found one another's company most congenial.

73 See Chapter One.

74 Eg. Dury to Worsley, 2 May 1649, HP 4/1/26A-B, thanking Worsley for obtaining from Boreel or Moriaen a catalogue of Menasseh's Hebrew books, and sending regards to both. Dury also hoped Boreel could learn from Menasseh or another rabbi whether there were any Jewish refutations of Islam to be had.

Worsley had plenty to keep him occupied, then, but the principal object of the exercise, the investigation of Glauber's laboratory and techniques, does not seem to have been achieved until Worsley had been in the country for nearly a year and a half. On 11 June 1649, however, Moriaen wrote that he and Worsley were at long last preparing 'mit H Glaubern ein vnd anders ins werkh zuestellen damit H Worsley nicht vergeblich herkommen oder so lange zeit vnnützlich zuegebracht habe' (no. 102).

Worsley's attitude to the project was highly ambivalent and changeable. At the beginning of July, he had 'no heart at all to come over' to England, evidently seeing brighter prospects in the Netherlands, unless he could be found 'a place or settled employment in England'.⁷⁵ So at least he told Hartlib: the following month he flatly contradicted this in a letter to Dury, declaring that 'For my Coming over/ As to my naturall Appetite, It is there already;/ This place not perfectly agreeing with my health, & as little, or lesse, with my affection'.⁷⁶ However, his hopes were rising of a profitable outcome from the Dutch venture: 'some thing is <still> further <expected> in our metallicke Busynesse;

75 Worsley to Hartlib, 22 June/2 July 1649, 26/33/2B.

76 Worsley to Dury, 27 July/6 Aug. 1649, HP 33/2/19B (misdated '27 July 165?' in the HP transcript: though the MS gives no year, the letter is obviously a reply to Dury's of 12 July 1649, HP 26/33/4A-5B).

which if I may speake my owne thoughts in/ I lesse
despayre about than ever/'.⁷⁷

It is not at all clear when Worsley finally did leave the United Provinces. By the middle of August 1649, both Dury and Culpeper were expecting him any day,⁷⁸ and according to Appelius, he had already left, or was about to, by late September, in a state of high dudgeon:

D. Worsley zeügt wieder nach haus [...] ich kan nicht genug verwundern, woher es komt, dz er von Glauber so lang aufgehalten worden, vnd nun auch mit lehrer hand nach haus reiset, nach dem er so lange schwehre kosten gethan [...]
Glauber sagt alle zeit, es mangle an ihn nicht so [word missing] auch H Worsley, vnd gleichwol verstehen sie ein ander nicht, es wundert mich dz Glauber so hart [word missing] gegen ihn ist, da er sich doch so resolut vnd liberal gegen ihn vor anfang erzeigt hat.⁷⁹

Yet a month later, Henry More was still speaking of his arrival in England in the future tense.⁸⁰ Perhaps he had left Amsterdam but was engaged on other business on the Continent. The first clear indication of his being back in England does not occur until late January 1650, when Moriaen sent his regards and More expressed a hope of

77 Ibid.

78 Dury to ?, 8 Aug. 1649, HP 1/31/1B; Culpeper to Hartlib, 14 Aug. 1649, HP 13/260A-261B.

79 Appelius to Hartlib, 20 Sept. 1649, HP 45/1/41A.

80 More to Hartlib, 21 Oct. 1649, HP 18/1/35A. Moriaen later mentioned that Worsley had intended to observe the solar eclipse of 4 Nov. with him (no. 109), but whether it was his departure or something else that prevented him from doing so is not stated.

visiting Worsley and Hartlib in London.⁸¹ What is clear, however, is that he and Glauber parted on very bad terms. The following March, Moriaen sent over something he described as Glauber's 'declaration', evidently a proposal of some sort, but Worsley was no longer interested:

Ich hab gemeint mit H Glaubers furschlag ihn [Worsley] sehr zueerfrewen aber es falt ganz wiederartig aus seine einbildung die Er von Ihm hatt ist so ganz schlecht das Er alles zum argsten auffnimbt (no. 109).

In his usual even-handed way, Moriaen tried to act as peacemaker, at once blaming Glauber's coarse and overly forthright manner and Worsley's melancholy and oversensitivity for the falling out. He also tried to clarify the terms of the offer, which he thought Worsley had misunderstood.⁸² His intervention seems to have mollified Worsley sufficiently for him to respond offering his own terms for the proposed deal, since the next month Moriaen wrote that Glauber was willing to accept Worsley's conditions.⁸³

This proposal or 'declaration' sent by Glauber via Moriaen to Worsley was, I believe, an offer to reveal a

81 No. 105 (21 Jan. 1650), and More to Hartlib, 29 Jan., HP 18/1/25A.

82 He stressed in particular that Glauber's method had been tested using large quantities of material (for the greater the quantity experimented on, obviously, the greater the reliability of the results: this distinction between operations effected 'ins groÙe' and 'ins kleine' is regularly drawn in chemical texts of the period).

83 No. 113.

process of extracting gold from tin scoria (ie. the residue of the ore after tin has been extracted from it). This is described in the usual vague terms in a document attributed to Glauber and preserved in Hartlib's papers, which sets the charge for a full revelation at 2000 ducats (in the region of £1400). Together with it is an account of another method of extracting silver and gold, this time from lead ore, valued at 1000 ducats (see Appendix to this chapter). The strongest evidence that this is indeed the project under discussion is Moriaen's remark in his letter accompanying the proposal, 'you may consider if this will serve the Commonwealth of England as I hope it will. For a great store of this matter of Tin must needs be there to no vse at all' (no. 107).

It was at just this time that Glauber made his abrupt departure from Amsterdam to escape his creditors, and, temporarily abandoning his wife and children, disappeared into Germany. It may well be that this strategic withdrawal was financed by the sale of this secret to a small alchemical consortium including Moriaen, Worsley, Johann Sibertus Kuffler and a very shadowy figure going by the suggestive name of 'Aurifaber' ('Goldmaker'). For in 1651, despite being in two different countries, these four were engaged collaboratively on a variety of ambitious projects to

transmute metal, including this very process, the extraction of gold from tin.

* * * * *

7:2 *Moriaen and the 'Great Work'*

Moriaen and Worsley had almost certainly have come to an agreement, either formally or informally, to pursue the 'metallicke Busynesse' in their separate countries after Worsley's return to England, and to pool the results of their experiments. Ten Latin letters from Moriaen to Worsley, dating from 1651, deal almost exclusively with alchemical experimentation, and feature detailed accounts of the work Moriaen was engaged on and repeated requests for information and materials from Worsley. Among the materials requested, there is specific mention of English tin scoria.⁸⁴ The letters are an excellent example of how linguistically precise alchemists could be, when it suited them, in their private correspondence. Here are no dragons, white doves of Diana or black crows' bills: substances are named by their names, quantities specified, processes described in detail and the type and intensity of heat required specified as accurately as possible. The only limitation on full and clear communication is that imposed by language itself, by the boundaries of the scientist's own knowledge and the capacity of contemporary instruments to

84 Moriaen to Worsley, 27 Jan. 1651, HP 9/16/1B.

give precise readings - limitations, of course, that apply to the scientific discourse of any period.

Moriaen was himself conscious of the linguistic limitations he was confronted with. He promised to explain an operation to Worsley 'quoad fieri per literas potest, namque maxima eius ratio in methodo et manuali dexteritate posita est' ('insofar as this can be done in writing, for indeed the greatest part of its explanation lies in method and manual dexterity').⁸⁵ Describing one of his transmutational projects, he repeatedly stressed the need to obtain the 'right sort' of ore as a raw material; a goal he attained only by oral communication concerning 'quo in loco, imo cujus in fodinâ (nam in uno eodemque loco illæ differunt) debita et ad opus nostrum idonea minera antimonij invenienda sit' ('the place, yea the very mine (for in one and the same place there are different sorts) in which the right sort of antimonial mineral, suitable for our work, is to be found').⁸⁶ Given the tone of the rest of the letter, it is highly unlikely Moriaen would have concealed the exact nature of this mineral from Worsley if he had himself known what it was and been able to express it. Like Clodius when enquiring 'what sort' of silver Kretschmar was making gold from,⁸⁷ Moriaen had the technical knowledge to

85 Moriaen to Worsley, 26 May 1651, HP 9/16/6A.

86 Moriaen to Worsley, 16 June 1651, HP 9/16/8A.

87 See Chapter Five, section 1.

discern a difference between two similar substances, but lacked the vocabulary to define it.

Glauber was back in Germany by this point, making alcahest, aurum potabile and artificial wine in Wertheim. Moriaen's main collaborators in Amsterdam were Kuffler (who paid regular visits from Arnhem to take part in the experiments) and the mysterious 'Aurifaber'. This is a somewhat surprising pseudonym for an alchemist, given that its German translation 'Goldmacher' was a stock term of derision for mercenary or false adepts,⁸⁸ but perhaps the pejorative connotations were deemed to be expunged by use of the more dignified Classical tongue. Another figure who was originally intended to feature in the business was Moriaen's brother-in-law Peter van Zeuel, from whom he received the vital information about where to obtain the mineral, but van Zeuel died shortly after passing on this piece of knowledge.⁸⁹

Very little is known of Aurifaber except that he lived in Amsterdam and was rich. Besides mentions in Moriaen's letters, there are only three references to him in Hartlib's papers, all from the *Ephemerides* of 1650 and 51, and all citing Worsley as informant. Worsley was evidently rather more impressed by him than by Glauber: 'The Aurifaber at Amsterdam is the best mechanical man

88 See Chapter Five, section 1.

89 Moriaen to Worsley, 9 June 1651, HP 9/16/7A.

that ever hee [Worsley] met withal i.e. purely mettallical'.⁹⁰ According to another entry, his real name was 'Gralle',⁹¹ but this appears to be a mistake by either Worsley or Hartlib. Aurifaber was the Antony Grill mentioned twice by Moriaen,⁹² and from whom Moriaen sent an extract on Swedish copper mines for Worsley.⁹³ The identification occurs in a letter from Moriaen to Worsley describing the two processes being used in the tin experiment: 'Unam Kufflerianam, alteram Grillianam appellabimus' ('one [way] we will call Kufflerian, the other Grillian'). After a long account of Kuffler's method, he then proceeded to 'Alteram quæ est Aurifabri via' ('the other way, which is Aurifaber's').⁹⁴ However, nothing else whatsoever seems to be known about this Antony Grill.

Moriaen was highly impatient to receive, in return for the extensive reports he was sending, details of an experiment Worsley and an unnamed nobleman ('nobilis') had conducted to fuse gold and mercury indissolubly. Moriaen also wanted some of the materials sent to him. It is not possible to identify this 'nobleman' conclusively. Culpeper is an unlikely candidate: it is

90 Eph 51, HP 28/2/15A.

91 Eph 50, HP 28/1/49B: 'The Refiners name at Amsterdam worth 10 thousand lb. is Gralle. Hee is the Aurifaber of which hee [presumably Worsley or Moriaen] speakes in his Letters.'

92 Nos. 119 and 157.

93 No. 158.

94 Moriaen to Worsley, 26 May 1651, HP 9/16/6A.

very doubtful whether his imaginative enthusiasm for alchemical theory was matched by his practical expertise, as also whether he had access to the material resources necessary to carry out many of the processes mentioned. Worsley's collaborator apparently knew more even than the forty-two medical preparations of antimony Moriaen himself laid claim to.⁹⁵ A likelier suggestion is Brereton, or Worsley's close friend Boyle. But I very much suspect that there was a misunderstanding, and that Worsley had employed some such formulation as 'noble spirit', which Moriaen had taken to mean someone of noble birth. If this was indeed the case, the American alchemist George Starkey fits the bill perfectly. There is in any case no doubt that Starkey became involved in the project.

Starkey had come to London in 1650 and been welcomed into the Hartlibian fold, and in 1651 was working as Boyle's assistant-cum-collaborator.⁹⁶ Just eleven days

95 Moriaen to Worsley, 19 May 1651, HP 9/16/5A.

96 On Starkey, see William Newman, 'Prophecy and Alchemy: the Origin of Eirenæus Philalethes', *Ambix* 37 part 3 (Nov. 1990), 97-115; 'Newton's *Clavis* as Starkey's Key', *Isis* 78 (1987), 564-574, and 'George Starkey and the selling of secrets', *SHUR*, 193-210, 204, an excellent account of Starkey and his relations with the circle. See also Turnbull, 'George Stirk, Philosopher by Fire', *Publications of the Colonial Society of Massachusetts* 38 (1959), 219-251, and R.S. Wilkinson, 'George Starkey, Physician and Alchemist', *Ambix* 11 (1963), 121-152. I have not been able to consult Newman's *Gehennal Fire: The Lives of George Starkey, an Alchemist of Harvard in the Scientific Revolution* (Harvard, 1994).

after Moriaen's first reference to this 'nobleman',⁹⁷ he was persuaded by the circle to contact Moriaen with a view to the pooling of their antimonial wisdom.

Starkey made his overture to Moriaen on 30 May 1651, in a long and florid Latin letter which has been analysed in some detail by William Newman in the course of his superb historical detective work on Starkey.⁹⁸ Newman shows how the letter forms an early stage in Starkey's elaborate programme of self-mythologisation. Basing his story on a legend current in alchemical circles about the early seventeenth-century magus Michael Sendivogius (one of Culpeper's favourite authors), Starkey portrayed himself as an eager student of the Hermetic art and the disciple of a mysterious 'Cosmopolite' he had known in America, from whom he had received a number of priceless manuscripts and a small quantity of the true elixir. Starkey, however, had squandered this through his incomplete knowledge of the processes to be applied to it, and found himself plunged into poverty.

Newman traces the various refinements this story went through between 1651 and 1654, with the 'Cosmopolite' fading gradually into a mysterious distance and becoming the author of works that were in fact by

97 Moriaen to Worsley, 19 May 1651, HP 9/16/5A.

98 William Newman, 'Prophecy and Alchemy: the Origin of Eiranæus Philalethes', *Ambix* 37 (1990), 97-115, 101. The letter in question is Starkey to Moriaen, 30 May 1651, HP 17/7/1A-2B.

Starkey himself, principally George Riplye's *Epistle to King Edward Unfolded and Introitus Apertus ad Occlusum Regis Palatinum*. This strategy offered a number of advantages: it conferred great value and authority on the manuscripts, while at the same time relieving Starkey himself of the onus of actually performing everything he claimed was possible. Yet it also recommended him as an initiate who had progressed a good way down the path of wisdom, and deserved support and patronage to enable him to complete the journey. As Newman puts it, he perhaps 'realised that it was far too uncomfortable to be an adept, and just as useful to have one for a friend'.⁹⁹ So successful was Starkey's self-projection that not only were Hartlib and his friends completely taken in, but attempts to identify the 'Cosmopolite',¹⁰⁰ continued until 1990 when Newman finally established him as Starkey's fictional creation, and his works as Starkey's own.

Starkey's letter to Moriaen retails the story of the lost elixir in some detail, and also speaks of some 'sophic mercury' given him by the adept, who at this stage appears in relatively concrete guise as 'a certain young friend, still living' ('quodam amico juvene [...]

99 'Prophecy and Alchemy', 111.

100 Eg. R.S. Wilkinson, 'The Problem of the Identity of Eirenæus Philalethes', *Ambix* 12 (1964), 24-43. 'Eirenæus Philalethes' is a pseudonym subsequently applied to Starkey's fictional adept, though not one he used himself.

adhuc vitali').¹⁰¹ This too he lost in an unsuccessful attempt at 'multiplying' it. 'Aflame with desire of imitating that mercury', Starkey had subsequently succeeded, after great expense of time, money and pains, in extracting from antimony something he was not confident to call true sophic mercury, but which came very close to it. By means of this he had further produced 'the mercury of life of the great Paracelsus' ('mercurij vitæ Paracelsis magni'), with which he could cure gout, consumption, paralysis and other supposedly incurable diseases.¹⁰² Though no specific terms are mentioned, the general aim of this extremely obscure and convoluted letter was plainly to arouse Moriaen's interest in a collaboration or trade of alchemical lore, for by this juncture, Moriaen and his associates in Amsterdam had added to their projects the transmutation of antimony, the very substance that was supposed to be the source of Starkey's 'sophic mercury'. In 1651, probably in late April or early May, so just before Starkey sent Moriaen his letter, Hartlib noted that

Mr Dury saw Stirky really to extract silver out of Antimony, which was in weight equal to Gold, and out of Iron Gold of a most high colour as your Rosenobles are. Hee may easily make of it 300. lib. a year. Mr Dury.

Worsley, Morian and Aurifaber vndertake to turne that Antimonial silver into Gold. Also to extract Gold out of Tinne (for which they have set up their great Work) and Gold out of Iron in great quantity. [...]

101 Starkey to Moriaen, 30 May 1651, HP 17/7/1A.

102 Ibid., 17/7/2A.

Stirke is now pidling and toiling for smal quantities, wheras if hee joine, hee cannot but bee a vast gainer by them. Worsly.¹⁰³

Moriaen was obviously impressed by Starkey's approach. From this point on, antimony rather than tin became his favourite subject, and it was from this project that he hoped for the greatest rewards. On 30 June, in the first letter he sent after receiving Starkey's, he specifically mentioned that 'the other work concerning tin' ('alterum opus [...] ex Iove') was also proceeding successfully, but that he was so taken up with his work on antimony that he barely had time to attend to it.¹⁰⁴ It seems likely that the 'right sort' of antimony he had at last obtained did indeed contain traces of gold, for Moriaen was entirely certain he was extracting gold at the rate of one pound per hundredweight, and that once he had learned to 'lead the material on to greater maturity' ('si materia [...] ad majorem maturitatem perducatur'), the yield would be greatly increased.¹⁰⁵ In June and July, Moriaen was positively ecstatic about his success in transmuting metals, particularly antimony, and even more excited about the prospect of revelations from Worsley concerning mercury, which in all probability relates to the 'sophic mercury' of Starkey.¹⁰⁶

103 Eph 51, HP 28/2/18A. 'Dury' and 'Worsly' are the sources of Hartlib's information.

104 Moriaen to Worsley, 30 June 1651, HP 9/16/9A.

105 Ibid.

106 Especially the letters of 30 June, HP 9/16/9A-B, 2 July (9/16/10A-B) and 9 July (9/16/11A-12B).

No letters from Moriaen to Starkey survive, but he wrote effusively to Worsley about the new contact, lauding Starkey's exceptional learning and generosity, hoping he would prove himself worthy of such a contact, and telling Worsley that he would 'have a poor nose indeed if he could not smell the recommendations of his friends' behind this desire on Starkey's part to take him into his confidence.¹⁰⁷ (This was not in fact particularly perceptive of him, since Starkey had specifically told him it was Worsley who had brought Moriaen's 'truly heroic virtues' ('virtutis vestræ verè Heroicæ') to his attention.¹⁰⁸) However, Moriaen rather pointedly added that the reward Worsley could expect from communicating his secrets would be the satisfaction of helping Moriaen live up to the commendations Worsley had himself given.¹⁰⁹ There is a distinct impression that Worsley was failing to match Moriaen's candour and forthcomingness in the scientific exchange, and was trying to set a price on the knowledge he was acquiring. Worsley for his part perhaps felt that he and Starkey were making better progress than their colleagues in Amsterdam, and deserved a more tangible recompense for

107 30 June 1651, HP 9/16/9B: 'obesæ naris sim si amicorum commendationes non suboleam'.

108 Starkey to Moriaen, 30 May 1651, HP 17/7/1A.

109 30 June 1651: 'operæ pretium fuerit eum, quem commendare non erubuistis, vestro consilio et auxilio juvare ut aliquo modo virum se præstare possit ne aliquando commendationis vestræ vos pudeat'.

imparting their results than news about less successful experiments.

Moriaen's letters chart a growing disillusion with Worsley, as requests for information and material were repeatedly ignored. The tin scoria he had asked for in January 1651 had still not materialised by the beginning of August.¹¹⁰ Neither had the 'miraculous silver fused with mercury' which Worsley had apparently also promised.¹¹¹ The information Worsley had sent him about oils he considered to be 'common knowledge' ('illud vulgare esse existimo'). It was evidently not God's will, Moriaen observed with lugubrious predestinarian irony, that he should be able to rely on Worsley.¹¹²

Late 1649, the date of Worsley's disgruntled return home, was precisely the time of Moriaen's bitterly lamented financial crash. This helps to explain the sudden overt enthusiasm for an alchemical process with obvious implications of financial gain, a motive that had previously been viewed with such disdain. Repeated mentions of specific projected profit levels and considerations of the likely return on a given outlay suggest that while he may indeed not have been

110 Moriaen to Worsley, 4 Aug. 1651, HP 9/16/13A.

111 'Lunam vestram mirabilem unam cum mercurio anxie desidero' - Moriaen to Worsley, 7 July 1651, HP 9/16/11B; 'de non missa luna nullam video excusationem' - 4 Aug. 1651, HP 9/16/13A.

112 'Ego ulterius non Urgebo, sed in voluntate Divinâ acquiescam' - Moriaen to Worsley, 4 Aug. 1651, 9/16/13A.

contemplating starting up an industrial business in the Glauberian fashion, the thought that the pious labour might incidentally provide some material relief was becoming more of a consideration.

This is not to suggest that the spiritual dimension had ceased to matter. The frequent and lengthy outbursts of thanks to God, and attribution to His personal intervention of any success the experiments were having, were not mere pious rhetoric. Worsley's 'nobleman' apparently criticised Glauber's mercenary attitude (again this is consistent with the suggestion this means Starkey, who in his letter to Moriaen roundly upbraided Glauber for precisely this fault¹¹³). Moriaen agreed: 'judicium Nobilis, de Glaubero prorsus rectum est. [...] Turpis ex hoc negotio mercatura est' ('The nobleman's judgment of Glauber is certainly correct; commerce is unseemly in this undertaking').¹¹⁴ Just as in the later case of his dye-works, Moriaen saw nothing wrong with making money provided it was being made for the right reasons, 'to serve the good of many'. As in all the reports of Moriaen's scientific activity, delight in experimentation and discovery shines through his reports, and the very fact that he was so frank about hoping to make a profit as well confirms his good faith in

113 HP 17/7/1A: 'Venalia nulla secreta habeo, quod et abominor, eoque solo nomine, Magister Iohannes Glauberus (vir sane inclytus) mihi vituperandus censetur'.

114 Moriaen to Worsley, 2 July 1651, HP 9/16/10A.

rejecting the profit motive as the be all and end all of the enterprise. The real excitement was akin to that engendered in Comenius by his supposed discovery of perpetual motion: by demonstrating transmutation, Moriaen was confirming the metaphysical basis of his whole world-view, proving that man could indeed comprehend the universal, harness cosmic forces, and discern the true pattern, the divine method, underlying Creation itself.

But the project - rather predictably - was a failure. The *Ephemerides* of 1653 record that

Morian disbursed once 12 thousand Rixdollars upon one Experiment, in which he miscarried, his wife knowing nothing of it. Upon another Experiment he spent 2 or 3 thousand Guilders, which yet hee hath to shew of Gold and Antimony of which he might get back some ounces of gold, but in hope that some will yet be found to transmute the rest of the Antimony into Gold he wil not doe it.¹¹⁵

These are almost certainly the tin and antimony projects respectively. It would obviously be rash to assume that the figures quoted are entirely reliable, but given the quantity and nature of the materials referred to by Moriaen in his letters to Worsley, they do not seem excessive. There is talk in these letters of importing three hundred pounds of ore from Hungary, of casting tin in quantities of a hundred pounds at a time, and antimonial ore by the hundredweight, with an unspecified admixture of silver. There can be little doubt that

115 HP 28/2/64B: no source is given for the information.

these alchemical undertakings, which Moriaen had so hoped would restore his prosperity, in fact proved the last nail in his financial coffin.

Moriaen's financial problems at the time raise in turn the question of how he had obtained funds for experimentation on this scale. Certainly a major contributor was Aurifaber, who as Moriaen reported was spending 12,000 guilders (about £1200) on buying or building a house near Moriaen's, which was to be equipped with no less than six laboratories for the perfecting of the 'great work'.¹¹⁶ Worsley obviously passed this on to Hartlib, who noted in the *Ephemerides*:

Aurifaber [...] hath gotten an estate of 60. thousand lb. Now hee adventur's 12. hundred lb. vpon an Experiment of Tinne and something else in which Mr Morian hath also an Adventure and is a very promising busines.¹¹⁷

Kuffler can hardly have contributed much, for he was himself in difficulties by this date and already in debt to Moriaen.¹¹⁸ But some sponsorship at least, and probably a substantial amount, had come from that tireless supporter of lost causes, Comenius's patron Laurens de Geer.

116 Moriaen to Worsley, 31 March 1651, 9/16/4A.

117 *Eph* 51, HP 28/2/15A.

118 Moriaen to Worsley, 4 Aug. 1651, with reference to 'debitor meus Kufflerus' ('my debtor Kuffler'), HP 9/16/13A.

Six years after the alchemical debacle, with Moriaen still in deep financial difficulties, and Kuffler making no headway with the promotion of his inventions in England, Hartlib suggested that Comenius petition de Geer for fresh support for Moriaen. Comenius duly made the representation, but met with little sympathy:

legi nuper illi epistolam Tuam etiam quæ de Moriano, illiusque misera sorte, & quomodo illi subveniri posset, si Patroni D. L. de G. animum excitaret Deus, scripsisti: ad quæ ille nihil, nisi Er hat sich mit Alchymisterey gestürzt, vel ruiniret.

(I recently read him your letter and what you wrote about Moriaen and his unhappy lot, and how he might be helped if God would arouse the sympathy of my Patron L.D.G.; to which his only response was: 'He has caused his own downfall, or ruined himself, with alchemical nonsense'.)¹¹⁹

The reasons for de Geer's sudden and uncharacteristic coldness are revealed in a later letter from Comenius's son-in-law Petr Figulus to Hartlib:

Mons de Geer may bee will write unto you what hee resolves to doe about your projects. But all what I saye and endeavour to encline him to some resolution about yours & Mr Morians &c publicke Concernements, hee seemes to haue some secret feare & doubtings of all the like Inventions and Endeavours. And as a child that hath burnt himselfe feareth the fire. For hee seemeth to haue beene engaged in the like promotion both with Mr. Morian & especially with Glauberus, but all his moneyes lost: & hee neuer bene able to see any the least effect of all their Inventions. Glauberus having prooued

119 Comenius to Hartlib, 10 August 1657, HP 7/111/23A, also in Blekastad, *Unbekannte Briefe*, 49.

to bee a deceiuer, & neuer meaning uprightly to
reveale any thing.¹²⁰

Figulus repeatedly tried to reassure de Geer about Moriaen and to arrange a meeting, presumably in the hope of persuading him to renew his patronage, but seemingly without success.

Neither personal profit nor transcendent enlightenment had resulted from Moriaen's involvement in the 'great work'. Just as with the Pansophic scheme, to use an analogy he was himself fond of, he had climbed like Moses to the summit of Mount Pisga and beheld the Promised Land, but it had not been granted him to enter into it.

* * * * *

7:3 *The Gate of Things*

Understandably enough, Moriaen's enthusiasm for Glauber cooled somewhat in the immediate aftermath of this debacle. There may well be a personal twist to Hübner's report the following year that

Von Glaubern sagte H. Morian mir im vertrawen
das Er damit sich nicht wenig shaden [sic]
gethan hätte, das er sich grosses geld fur
gewisse vermeinte kunst-stucklein geben lassen,
die er doch selbst niemals versuchet, vnd sie
in der that also befunden, dannenhero er dan

120 Figulus to Hartlib, 6 Nov. 1650, HP 9/17/45A-B, also in Blekastad, *Figulus Letters*, 236.

ettliche mahl mit shanden [sic] bestehen
müssen.¹²¹

On 8 May 1654, Hartlib told Boyle that 'Mr Morian writes no more of him [Glauber], or his other promised magnalia'.¹²² However, Moriaen did not lose faith in alchemy and was later reconciled with Glauber himself. It says much either about Moriaen's good nature or his gullibility that in 1657 he was once again prepared to give Glauber the benefit of the doubt, and to suggest that those who failed to replicate Glauber's processes should not automatically condemn the author, but consider whether the error did not perhaps lie with themselves.¹²³

Fahrner subsequently claimed that Glauber had sold De Bra a worthless recipe for making vinegar for 1000 guilders and also swindled a certain 'Herrn Mörian'.¹²⁴ But Moriaen obviously came to the conclusion that he had not been cheated, and two years after the publication of Fahrner's attack was back on friendly terms with Glauber. Indeed, it was Fahrner he considered to be the liar when it came to alchemical claims: 'Farner gibt fur wie Er aus 100 lb bleÿ 12 lot Silber bringen könne gieng es aber mit nuz zue wurde Ers woll schweigen und selbst practisiren' (no. 162).

121 Hübner to ? (copy in Hartlib's hand), 24 March 1652, HP 63/14/21A.

122 Boyle to Hartlib, 8 May 1654, Boyle, *Works* VI, 86.

123 No. 162.

124 Christoph Fahrner, *Ehrenrettung* (1656), 75; cf. Link, *Glauber*, 33.

It might be pointed out that the same strictures could be applied to Glauber: if he was so confident of his tin experiment, why did he not conduct it himself instead of selling the process to Moriaen and his friends? The explanation would probably have been - and it is not implausible - that he lacked the necessary capital. It would in any case be unfair to convict Glauber of bad faith without more conclusive evidence. The kindest interpretation is that he thought it likely the process would work, but preferred to see others risk their money on finding out for sure, making do for his part with the smaller but more certain profit of selling his secret rather than applying it. In spite of all his losses, Moriaen was by 1657 considering a fresh collaboration with Aurifaber and Glauber, though there is no sign that anything came of this.¹²⁵

Worsley responded similarly to the affair. At first, he was plunged into deep disillusion, and for a while would seem to have lost faith in the very notion of alchemy. Moriaen, who in turn was out of sorts with Worsley at the time, put this down to the instability of Worsley's character. He himself was not to be shaken from belief in a truth he had seen proven with his own eyes simply because he had lost twelve thousand Imperials by it:

125 No. 156.

das H W keine transmutation mehr glauben will,
 ist mir ein zeichen seines wanckelbahren
 gemuehts, darumb wird kein pflug zwerg gehen,
 vnd warheit doch woll warheit bleiben.¹²⁶

However, Worsley subsequently revised this jaundiced view, and in later life exhibited an even stronger interest in alchemy. Some five years after his return from the Netherlands, he took to declaring himself an adept, and making grandiose alchemical declarations entirely typical of the most committed 'Chemical Philosophers'. He invoked a favourite topos: just as in the Puritan view of Scriptural understanding, no amount of human endeavour and learning could lead to true insight without the spark of enlightenment that could only be imparted by divine grace. The failure of his undertakings during and just after his alchemical mission, he decided, were due not to any inherent error in the processes he had learned, but to the fact that God had not yet seen fit to bless him (or, presumably, Moriaen) with the means of understanding them. Subsequently, it was granted him to see what before he had only looked at:

I further professe honestly to you, that upon a deepe consideration of some of Glaubers writings & other discourses, I mett with when I was in Holland, it pleased god to discover the thing [ie. the art of transmutation] so clearely to me, that I sett downe the very thing in my Adversaria, as a matter to be weighed & experimented, & yet understood it not.¹²⁷

126 No. 129, 3 May 1652.

127 Worsley to ?, 14 Feb. 1655/6, HP 42/1/5A.

Worsley cast his younger self in the role of a competent technician who had not received insight into the hidden mysteries of his own knowledge:

nor should [I] have been ever able to have applied any of these hints, so as to have made any use of them unless God had (as he did) further as it were imposed the consideration of it upon me, by bringing my observation to a non plus, upon a kind of fortuitous experiment made by me, which I speak even to this End to shew; that the Lord hath his seasons, & that it is not of him that wills, or of him that runs, but of God only who in this as in more higher things enlightens whom he will.¹²⁸

This retrospective self-image strikingly parallels the response to Glauber within the Hartlib circle, insofar as a consensus can be defined. Glauber burst onto the scene with his great promises of a 'secret philosophic fire' a 'menstruum' for extracting the 'principles', and something at least approximating to the universal solvent. Eye witness accounts from Moriaen and Appellius vouched that there really were extraordinary physical and technological achievements on show in Amsterdam to support such claims. On closer inspection, however, the innovations were found to be merely technical. Glauber had made genuine progress in

128 Ibid. Cf. *Ecclesiastes* 3:1 and 9:11: 'To every thing there is a season, and a time to every purpose under the sun [...] the race is not to the swift, nor the battle to the strong [...] but time and chance happeneth to them all'. This is an unascribed copy letter, but the style, the subject matter, the autobiographical details and the fact that it is from Dublin leave virtually no doubt of Worsley's authorship.

manipulating the outward, physical body of Nature, but when it came to penetrating her soul, he had provided no new insights. If anything, his exaggerated or bogus claims were positively counter-productive. He did not know how to apply his own expertise to the deeper mysteries.

An anonymous Dutch contact of Clodius's exemplifies this attitude. This individual, described as one who 'hath all manner of Arcanas [sic] and is an Adept', and so was obviously qualified to comment, considered that Glauber had indeed discovered 'the true Alcahest'. Unfortunately, however, he did not know what to do with it: 'if Glauber himself knew how to vse it by it great things might bee done'.¹²⁹ Moriaen himself expressed the same opinion: 'bin noch der meinung wie vor diesem das ihm in der Natur ein zimlich liecht auffgangen ist dz Er Ihm aber selbsten nicht zue nuz machen kan' (no. 182).

This ambivalence towards Glauber finds its clearest and most fully worked out expression in the letters of Culpeper. Culpeper distinguished more clearly than any other commentator represented in Hartlib's papers between the merely utilitarian and the philosophical aspects of Glauber's work - between the chemical and the alchemical, in the contemporary sense of those words suggested in Chapter Five. In complete contrast to later

¹²⁹ Eph 59, HP 29/8/5A.

progressivist historians who have either derided Glauber because of, or admired him in spite of, the alchemical component in his works, Culpeper became increasingly concerned that they were not nearly alchemical enough. For all the initial excitement inspired by his work on translating *Furni Novi*, he became more and more suspicious in the course of Worsley's visit to the Netherlands that Glauber had failed to probe beyond the mere external shell of created matter in his chemical investigations.

From his gleanings from Lull, Sendivogius and (above all) Nuysement,¹³⁰ Culpeper had concluded that to attain an 'excitation of the spirit of nature', some impurity had to be added, since matter in its natural state had no cause further to perfect itself: 'without an apposition of impurity (rightly chosen) there can nothinge be done in that woorke'.¹³¹ What Culpeper seems to have had in mind, though he would obviously not have understood the comparison, was something akin to the practice of inoculation. By being infected with a judiciously chosen trace of a given disease or 'impurity', the body is stimulated to enhance its own innate powers, to attain a higher level of perfection. A medical image is not

130 For a summary of Nuysement's chemico-religious doctrines and their direct influence on Culpeper, see Clucas, 'Correspondence of a "Chymicall Gentleman"', 153-4.

131 Culpeper to Hartlib, 14 Aug. 1649, HP 13/260B.

inappropriate, for alchemists frequently spoke of 'curing' the body of Nature, raising base metals to the perfect 'health' of gold. Following Nuysement, Culpeper fused this account of transmutation theory with his understanding of theology, and considered the necessary impurity or infection to be analogous to sin, the imperfection in humanity that was a prerequisite for the operation of grace which transmuted the human soul.

In the midst of Worsley's alchemical mission, Culpeper sent him a long letter full of citations from Hermetic authors and his own abstruse reflections on the 'exaltation of the Sprits of Nature'. Among the extremely diverse and somewhat rambling meditations that comprise the letter is the following prime example of analogical thinking, an indissoluble alloy of practical experiment, alchemical allegory, micro-macrocosm theory and religious metaphor. Culpeper had been brewing some beer, and found that low temperatures slowed the process down. This, he declared, in a characteristic leap from the mundane to the metaphysical,

agrees with what Nicholas Flammell saith (viz.) that when the 2. dragons have siezed upon one another they never cease from fightinge if the cold hinder them not) till they bee all on a gore blood, and till that in the end they have killed one another, and out of these putrified carcasses arises our puissant King; I pray yf from my scriblinge you now apprehend me try whether Glauberus can and will give an Answer what this Canaanite is that exercises our spirits of Nature, and what that is in Nature, which like sinne to a gracious soule, serves to

encrease repentance and all the other graces for thus (by the mercifull and wise God) doe the sinnes worke where the Spirit of grace hath taken roote, & thus if my Philosophy faile not) doth something in nature (analogicall to sinn) worke upon the Spirit of nature.¹³²

This philosophical principle was very clear to Culpeper's mind, but what he was not at all sure about, as the confusion of his terminology abundantly bears out, was the exact physical nature of this necessary impurity, and this more than anything was the question he hoped Worsley would resolve for him:

now what this Sulphur externum, this Agent [...] this Ignis contra naturam, these feces grossieres or impurités, this Ignis non de materia, is. This is my question, which if Glauberus either cannot or will not understand; I say againe that you may expect other pretty or vsefull experiments from him; but he will proove to seeke in the greate worke.¹³³

There was a parallel here not only with the operation of grace but also with the Paracelsian notion that poisons correctly treated and administered were conducive to increased health and vigour in the human body. It was precisely such parallels that appealed to Culpeper's analogical imagination. Separating substances into their constituent elements (or 'principles') was, Culpeper thought, a trivial occupation: mere chemistry, that would produce no 'exaltation' but leave nature

132 Culpeper to Worsley, 9/19 April 1648, HP 13/219B-220A; the illogical parentheses are again Culpeper's.

133 Culpeper to Worsley, 9/19 May 1648, HP 13/219A. Whether the writers he was citing here were indeed, as Culpeper maintained, all talking about the same thing is a moot point.

essentially what it had been in the first place: 'this wrackinge of nature, is not the helpe that shee expectes from us, but onely a putting her into reiterated newe motions'.¹³⁴ Glauber failed to provide the enlightenment, the vistas onto infinity, that Culpeper had hoped for. Re-reading the first part of *Furni Novi*, he declared that in it

I finde a ready way to more discoueries of nature by outwarde fire onely, than hathe beene heeretofore helde forthe by any, but, in philosophy as well as Christianity, it is the inwarde fire or Spirit, to which wee ought principally to looke & this inwarde spirit yf excited into motion, will make life to diffuse from the center to the outwarde parts; Oh where woulde this divinity & philosophy ende, this other of Glauberus is, but to discover, not to exalte, what wee finde in nature.¹³⁵

This identification of 'divinity & philosophy' is a logical extension of the world-view that begat Comenius's Pansophy. The dissatisfaction with Glauberian chemistry is in turn illustrative of the metaphysical unease that inspired Pansophy. It represents a refusal to believe that the world can be reduced to a collection of physical phenomena and their interreaction, that everything might be explicable in terms of the so-called 'secondary causes'. The true investigation of matter had to entail the revelation of its spiritual and divine components.

134 Culpeper to Hartlib, 14 Aug. 1649, HP 13/260A.
 135 Culpeper to Hartlib, 4 July 1649, HP 13/155A.

Glauber's chemistry was altogether too empirical for Culpeper's tastes. His style, so plain and direct by the standards of the day, failed to supply the spiritual nourishment Culpeper obtained from Sendivogius and Nuysement. Though there are pious invocations enough in Glauber's writing, they are extraneous to the experimental details. What Culpeper wanted was a chemical Epiphany, an exact analogy of the 'inward fire of the spirit' that was so crucial to Puritan theology, and a fully worked out scheme of sin, grace and redemption reflected in the operation of nature.

Culpeper was expressing these reservations about Glauber in the early years of the latter's career, the years that saw the publication of what his progressivist admirers have considered his most important work, *Furni Novi Philosophici* (1646-9), which of all Glauber's writings was the one based most directly on his laboratory practice and most fully describing his technological innovations. It is rich in 'pretty or usefull experiments', but decidedly short on 'inwarde & centrall fire' and 'operation of the spirit of grace'. His only other production during the period was *De Auri Tinctura* (1646). There is, unfortunately, no evidence available of Culpeper's, Worsley's or Moriaen's reaction to Glauber's work after 1662, the work which dismissed his earlier merely physical studies and turned wholly to

mystic spiritualism and alchemical prophecy. The spirit of these late works seems much closer to their notion of attaining the metaphysical through the *Janua Rerum*, the Gate of Things, than his earlier and more empirical productions.

It is a measure of how similarly alchemical and Scriptural texts were interpreted by the more devoted 'chemical philosophers' that the former as much as the latter were frequently invested with prophetic significance. One great enthusiasm of Glauber's last years was the interpretation of Paracelsus's supposed prediction that the hidden mysteries of Nature would shortly be revealed by a mystic figure called 'Elias Artista'.¹³⁶ This was a prospect that greatly excited many alchemists of the day, some of whom even claimed to be Elias.¹³⁷ Glauber resolved the prophecy by relating it to his lifelong obsession with salt. 'Elias Artista', he realised, was an anagram of 'et artis salia' ('and the salts of [the] Art'): 'ein Herrlicher/ Glorioser, vnd

136 The prophecy occurs in the *Liber Mineralium* which is probably not in fact by Paracelsus.

137 Pagel, 'The Paracelsian Elias Artista and the Alchemical Tradition', *Kreatur und Kosmos: Internationale Beiträge zur Paracelsus-Forschung*, ed. Heinz Dillinger (Stuttgart, 1981); Newman, 'Prophecy and Alchemy', 97-99. See for instance Poleman's caustic account of one such pretender, Elias Johann Hesling: 'dieser Elias gibt sich aussdrucklich auss für den Eliam Artistam vndt ludirt anagrammatice gewaltig auff sich, vndt seinen nahmen, ziemlich lächerlich zu lesen' (to Hartlib, 15 Sept. 1659, HP 60/4/192A).

Triumphirender Monarch ist/ ELIAS ARTISTA, wenigen
bekant, ET ARTIS SALIA, Vielen genant'.¹³⁸

Worsley, after his initial disillusion with alchemy had been overcome, became a great enthusiast of the Elias prophecy, which he took a good deal more literally than Glauber. The obscure oracle stated that the unfolding of Nature would occur in 'the fifty-eighth year'. There were various interpretations of what was meant by 'the fifty-eighth year': earlier it had been widely seen as 1602, the fifty-eighth year after Paracelsus's death, but this had obviously had to be readjusted. By the early 1650s, there was an obvious appeal in reading it as meaning simply 1658, an interpretation that also accorded well with many predictions of the date of the millennial dawn. On 4 Feb. 1659 (ie., as he pointed out in his own dating of the letter, the end of 1658 in the old style), Worsley declared with the greatest confidence that 'The Devill [...] shall shortly fall before the greate Elias & his ministry which is suddainly to surprize part of the world' and even claimed to be personally acquainted with 'some that are really (at this present) of the said schoole of the said Elias Artist the great'.¹³⁹ Culpeper too was very taken with the prospect of Elias's advent.

138 From the full title of *Miraculum Mundi Ander Theil* [in fact the fifth part] *Oder Dessen Vorlängst Geprophezeiten ELIÆ ARTISTE TRIUMPHIRLicher Ein Ritt. Vnd auch Was der ELIAS ARTISTA für einer sey?* (Amsterdam, 1660).

139 Worsley to ?, HP 33/2/16A-B.

Writing in 1645 with regard to attempts to secure a patent for the Hartlib-backed inventor Pierre le Pruvost, he suggested that there was not much point in holding out for a patent of over fourteen years: 'truly yf others had my faithe concerning the change that will be in the worlde before 59: they wovld not mucche seeke for a perpetuity in any thinge but heauen'.¹⁴⁰

Stephen Clucas suggests that 'For Culpeper, chemistry seems largely to have been a literary experience'.¹⁴¹ It is certainly true that he almost invariably supported his chemical speculations not with any original or even second-hand experimental evidence but with a barrage of rather tenuously connected citations from his favourite chemical authors. The linguistic jumble of the terms to be found in his alchemical musings results from his citing them directly from a range of English, Latin and French tracts, principally those of Nuysement, Lull and Sendivogius (or 'Zengiuode', as Culpeper regularly called him in perhaps the most imaginative piece of spelling in the whole Hartlib archive). It is also true that imagination played a much greater role than logic, either inductive or deductive, in the establishment of his world-view. At least, this is true if 'imagination' is used in the

140 Culpeper to Hartlib, Dec. 1645, 13/112A: Culpeper goes on to cite the 'Paracelsian' prophecy verbatim.

141 'Correspondence of a "Chymicall Gentleman"', 154.

modern sense of a faculty clearly distinguishable from the 'rational' or 'logical'. Comenius would have called Culpeper's approach 'syncretism', and would not have regarded it as in the least illogical. I would suggest that Culpeper, and a great many others of his day, Comenius and Moriaen among them, simply did not distinguish between a 'literary' and a 'scientific' response to the world about them. When thinkers of this period speak of the 'book of God's works', it is a mistake to take them over-metaphorically. Just as words were supposed to be symbols by which a single, definable, extra-linguistic 'meaning' was represented, so things were symbols representing the ideas of God, which mankind was capable of reading. God was the author of Creation - and it is significant that the Latin term 'auctor', meaning 'creator' in any sense, has in all modern Romance languages, English and even German, come specifically to mean 'writer'. Mankind was in the somewhat ambivalent position of being at once part of the text and the intended readership. Looking in nature for sin, repentance and the operation of grace, Culpeper was not so much inventing his own metaphors as interpreting God's.

Clucas further draws attention to the fact that Dury's 'analytical method', his Pansophic system of Scriptural exegesis, was taken up by chemical

philosophers like Culpeper and applied to their subject: 'It is interesting that although the *methodus Duræus* was essentially a tool for scriptural analysis, it became applicable to any textual corpus.'¹⁴² I have to quibble here with the letter, though not the spirit, of Clucas's analysis. What Culpeper was asking for was fresh commentary by Dury on the alchemical texts Culpeper favoured, not application to them of the specifically theological exegesis Dury had proposed in the *Analysis Demonstrativa*. However, it is reasonable to assume that what Culpeper expected from Dury was a very similar type of analysis. Alchemical texts were viewed as scarcely less sacred than the Bible itself, and their apparent obscurities were supposed, like the Bible's, to contain a simple, fundamental, underlying truth. Dury's talent for minute, detailed exegesis was seen as appropriate for the elucidation of both. Whether Dury's method was regarded as applicable to 'any textual corpus' whatsoever is debatable, but it was certainly deemed applicable to any divinely sanctioned corpus, and hence to the writings of any true alchemist.

Clucas proceeds to argue that 'Culpeper's urge to apply the analysis to chemistry was symptomatic of a wider secularization of the methods of theological

142 Stephen Clucas, 'The Correspondence of a XVII-Century "Chymicall Gentleman": Sir Cheney Culpeper and the Chemical Interests of the Hartlib Circle', *Ambix* 40, part 3, 147-170, 157-8.

systemizers.¹⁴³ I would suggest, however, that to practitioners such as Culpeper and Dury, this represented not so much a secularisation of theological method as a theologisation of science - or, more precisely, it exemplified the pansophic conviction that demarcations between disciplines are arbitrary and artificial, that all things are related and mutually illuminating, and that 'right method' is universally applicable, its ultimate aim in all parts of learning being to lead men to God.

The intellectual histories of Worsley and Moriaen, the two main protagonists of the alchemical tragicomedy recounted in the previous section, were dominated by trends that have become something of a refrain in this study: disillusion with Scriptural analysis, withdrawal from confessional allegiance, commitment to seeking transcendental enlightenment not in verbal formulations but in the practical study and physical manipulation of Nature. They became, if anything, more religious as they became less religiose.

It should be stressed that while Culpeper, Worsley and Moriaen were certainly highly individual, they were by no means eccentric or unrepresentative. A host of other thinkers who have featured in this study, such as F.M. Van Helmont, Brun, Rasch, Kretschmar, Glauber,

143 Ibid.

Hartprecht, Poleman, Clodius and Starkey were engaged on a similar synthesis of divinity with philosophy, practical experiment with theosophic enlightenment. However violent their personal differences and their disagreement on matters of detail, they all belonged to the same distinctive and highly influential school of thought, a school that was long overlooked or dismissed and is still in the process of being discovered and defined.

The whole purpose of of their intellectual - or, as they saw things, their spiritual endeavour was to attain a truer, more direct, more universal understanding of God than had proved possible through the old orthodoxies they were rejecting. The driving impulse behind their alchemical thought was precisely the same as that behind Pansophy: the fear of relativism, the fear of losing control and comprehension of the world through sheer overload of knowledge, the unfathomable complexity of the universe. This was countered by a determination to find in micro-macrocosm analogies and the notion of man as the divine image an underlying unity, harmony and pattern in all things.

In alchemy as in Pansophy it was 'right method' that would provide the key to unlock the 'Gate of Things'. Nowhere is this more apparent than in Worsley's reconversion to alchemical faith in the late 1650s. His

letter of 1657 on 'Vniversal Learning' asserts the interconnection of all subjects and concludes by proclaiming all human knowledge to be but a shadowing of spiritual understanding. From the Pansophic 'Temple of Wisdom' to the alchemical 'Shut-Palace of the King', the vision is barely altered. Worsley's declaration could have been penned by Comenius himself. It provides an elegant summation of the underlying faith he shared with Moriaen, Hartlib and Culpeper, the notion that more than any other is the defining and unifying characteristic of the nebulous 'third force':

he that knoweth any thing in the lawes, course, & motions, of nature itselſe, & ſeeth not a harmony, Image & reſemblance between theſe & the lawes, myſteryes, Revelations, & diſcoveryes of things ſpiritually; either doth not know them at all, or doth but yet thinke he knoweth them, yet he knoweth them not comprehenſively, analytically, originally & exemplarily: for if he did he would in all things ſee one face, viz. Conſtancy, ſimplicity, Identity, Homogeneity, Vnity./.¹⁴⁴

144 Worsley to [Hartlib?], 14 Oct. 1657, HP 42/1/7A-B.

Appendix

*Glauber's 'undertaking', or offer of alchemical secrets
for sale, undated: partial English translation and copy
of German original
HP 67/15/1B and 3A*

[67/15/1B]

[Hartlib:]

The trial of the Tin-scoriæ
or refuse

Note that by the Tin-scoriæ is vnderstood that matter
which at the Mines is thrown away, when the Tinn is no
more in it.

When the Scoriæ are reduced with a good flux the hunderd
weight heelds from 25. to 30 ob. a kind of vnformed
blackish and impure Tinne. But if the said Scoriæ bee
first fixed (which may bee done within 3. or 4. days the
Hundred weight requiring about 10. or 12. gilders char
for charges) they yeeld in afterward in the melting of it
from no such vnformed Tin; but from 2. to 2½ loth of good
Gold. And when all the required charges for fixing
melting etc and taking-of <drieing out> from 2½ loth of
Gold are deducted there remaines richly of every hundred
weight 1 loth gold, which is to bee accounted for the
gaine of it. And both [67/15/2A] as well fixing melting

as drieing out may bee performed in great with many hundreds of weight at once, so that the profit will bee ~~very-rich~~ considerable. For this Art after j had haue shown it in great quantity I demaund the sune of 2. thousand Ducats./

[16/15/3A]

[another hand:]

Gethane prob über das Bleÿ Erz aus Engelland.

Erstlich das Erz, nach dem kleinen Zentner-gewicht versucht, gibt der Zentner wan es genaw gesucht wird uber 60 lb bleÿ doch nicht recht geschmeÿdig, So mans aber so genaw nicht außschmelzt, so gibt der Zentner 50 biß auff 56 lb geschmeÿdig vnd gutt bleÿ, vnd der Zentner von diesem Bleÿ hält 6 Loth Silber

<left margin: NB> So man aber diß Erz zuevorn cimentirt oder figiert so gibt der Zentner Erz 48 oder 50 lb Bleÿ, 5 loth Silber vnd ein halb Loth Goltt. Die vnkosten so auff dießes Stößen oder figirn an kolen vnd zuesaz erfordert werden, kommen auff j zentner vngefähr 2 oder auffs höchste dreÿ gülden. vnd läst solche figirung sich so groß thun als man will. Vnd wans figiert ist auch so leichtlich schmelzen in großer quantitet gleich ein Iedweder gemein Bleÿ Erz. Vnd so es begehrt wird soll eine prob oder etliche so viel nötig sein wird von 10, 20 oder mehr pfunden dauon gemacht werden Fur die

communication derselben wißenschafft soll mir ein Tausend ducaten bezahlt werden

Prob vber die Zinnschlacken *

<* Nota Zinnschlacken/ Ist die materia die man auff den bergwercken hinweg wirfft was das Zinn heraus ist.>

Wan solche schlacken mit einem guten fluß reducirt wird so gibt der Zentner zue 25 biß auff 30 lb vnartig, brüchig, schwarzlicht oder vn sauber Zinn. So man aber zuevorn dieselbe schlacken figiret (welches innerhalb 3 oder 4 tagen geschehen kan) vnd der Zentner vngefähr 10 oder 12 gulden vnkosten dazue von nöthen hatt,) So gibt Er hernach im schmelzen kein vnartig Zinn mehr sondern zue 2 biß auff 2½ Loth gutt Goltt. Vnd wan alle angewandte Kosten, auff s figirn, schmelzen vnd abtreiben von den 2½ Loth goltt abgezogen sein So bleibt reichlich von Iedwederem Zentner j Loth goltt welches fur gewin gerechnet wird. Vnd läst so woll das figiren als schmelzen vnd abtreiben sich im großen thun mit viel Zentnern zuegleich also das es reiche außbeut geben kan. Darfur Ich begehre 2 Tausend Ducaten wan Ich solche Kunst ins große zue thun gezaiget hab.

Glauber

Iohan: Rudolph:

Conclusion

Correspondence such as Moriaen's, sifted, edited, transcribed and disseminated by Hartlib or at Hartlib's behest, initiated no new ideas, but played an essential role in broadcasting new ideas and stimulating discussion and reassessment of them. To borrow the mercantile imagery so often employed by members of the circle, he was not a producer of 'ingenuity and knowledge' but he was a major trader in it. His critical assessments of Dury's and Comenius's pansophic endeavours, his distribution of Comenius's *Prodromus* and Pell's *Idea of Mathematics*, his reports on the religious innovations of Felgenhauer and scientific ideas of Glauber and Bonet, his shipping across to England of Wiesel's optical instruments and Glauber's specifications for his new ovens, all contributed to the accelerating international traffic in philosophical theory and practical science.

There is an unavoidable danger, in the assessment of any historical period, that a skewed picture will be presented on the basis of fortuitously preserved fragmentary evidence. The very existence of Hartlib's papers, or at any rate a substantial part of them, is at once a boon and a pitfall for the historian. On the one hand, they present an enormous fund of primary evidence about the intellectual life of the period. On the other, they present only one person's individual collection of

contemporary documentation, and as such represent an inevitably partial view. The task is to assess the extent to which they can be regarded as representative, and what exactly they can be regarded as representative of. It is virtually a truism that the discovery of this archive has entailed the rewriting of the history of the period, but it should always be borne in mind how different that rewriting might be if it were someone else's papers - Moriaen's, for instance, or Hübner's, or Glauber's - that had been discovered instead. For Hartlib's papers to be assessed as a document of their time, it is necessary to determine whether they chart an individual obsession or are a random jackdaw selection of interesting tidbits, whether they were collected purely for the sake of being collected or serve a particular agenda, whether they document an individual or a society, or a given group within a society.

It is, therefore, of some significance that Hartlib can be shown to have been recognised by a particular group of people as their organiser and spokesman. The term 'Hartlib circle' is not merely a convenient tag. It was, however, a very large and diffuse group which cannot be reduced to any such simplistic formulation as 'Puritan', 'experimental', 'Hermetic', 'Baconian' or the like. As the foregoing study illustrates, there were radical differences of approach and priority, and

sometimes bitter conflicts of opinion within the circle. But there was a circle, and its members were conscious both that they belonged to it and that Hartlib was its centre, 'the hub of the axle-tree of knowledge', as [Dury?]* called him. Moriaen's first surviving letter to Hartlib vividly conveys both Hartlib's centrality and the sense of community among his supporters. Urging his new friend to take at least some thought for himself and not to pay for the promotion of Comenius with his own financial ruin, Moriaen provided a neat vignette both of Hartlib's discreet but crucial role in the operation and the sense of community among his supporters:

Der herr obligirt vnß andere doch vnd thut eben
genug daß er das werckh dirigirt die
Correspondentz pflanzt vnd erhält vnd einem
Ieden das seinige verschafft vnd zuesendet was
die kosten belanget die behören von den
Liebhabern gesambter hand getragen zue werden
(no. 1).

Given that the group existed, a more difficult task is to define it, in terms both of its membership and its ideology. Obviously, no rigid demarcation is possible. At its nexus, it was an association of personal friends. Hartlib and Dury were the two key figures: Comenius, despite their best efforts, always remained a cause they were supporting rather than a fellow co-ordinator. Around them were Hübner, Haak, Pell, Moriaen, Rulice, Hotton and Appellius, later to be joined by Sadler, Culpeper, Worsley, Boyle and Clodius. But as soon as one

looks any further than this from the centre, the lines of communication begin to branch and cross, threading their way into the entire intellectual community of Europe and America. It is a circle with a definable centre but an almost infinitely extendable periphery.

The most obvious common feature of the men who formed this definable centre is a background in the Reformed faith combined with a marked dislike of confessionalisation. The intense but resolutely non-doctrinaire piety so characteristic of Moriaen is equally apparent in the other core members of the circle. Their other principal unifying characteristic was a fundamental optimism about the nature and value of knowledge. It was perhaps this optimism, rather than any genuine methodological debt, that was most authentically 'Baconian' in their outlook. They expected the increase of knowledge to alleviate man's lot in every respect from the most mundane to the metaphysical, by improving living conditions, by producing wealth, by curing disease, by promoting consensus, by bringing humanity closer to God and by preparing for the Millennium.

Their guiding ideals in all their undertakings were unity and universality. Dury laboured to be 'all things to all men', Comenius to 'teach all things to all people in all ways'. Warning against Pell's involvement with

parabolic lenses and in favour of his pursuing his study of analytical method, Moriaen urged:

was Er suchet ist noch vngewiß vnd darzue nur ein particular stuckh. Was Er aber bereit weiß vnd præstirn kan in elaborando Logistica speciosa das ist ganz gewiß darzue ein Uniuersal werckh dareus [sic] dergleichen vnzehliche particularia von sich selbst entspringen werden (no. 30).

The image of a key, or of an opened door, recurs significantly in their own writings and their favoured texts in all their fields of interest, from Comenius's pansophic *Janua Rerum* through Mede's chiliastic *Clavis Apocalyptica* to Starkey's alchemical *Introitus Apertus in Occlusum Regis Palatinum* (*An Open Entrance to the Shut-Palace of the King*). Entry to the citadel of wisdom was to be gained not by siege but painlessly and peacefully, by finding the key to it. Finding the key required great labour and diligence, but once it was found, all else would follow virtually of its own accord.

This well-nigh obsessive harping on unity and universality was symptomatic of a profound sense of disunity and fragmentation. This was a period of unprecedented division and diversity of opinions and ideologies in all fields, the religious, the political, the philosophical and the scientific. Christianity had always had its schisms, but never had it shattered so quickly into so many distinct and mutually antagonistic groups as between the mid-sixteenth and the mid-

seventeenth century. Nor had there ever been a conflict as widespread or as destructive as the Thirty Years War. In intellectual matters, the rise of specialisation, so abhorrent to Comenius, threatened to hedge in every intellect with an impenetrable mass of detail. Mankind - or so it seemed to these thinkers - was in danger of being left like so many people trapped in a maze, each gazing down a different blind alley and unable to communicate with the others, while an overview would easily discern the one true path that would lead them all out of it. Moriaen provided a rather tortuous geometrical metaphor for this:

Der im Centro stehet mag totam circumferentiam leichtlich vbersehen vnd seines gefallens formirn welches denen die in peripheria herumb wandern entweder muhesam oder gar vnmuglich ist vnd so geht es mit allen scientijs biß her aber sind wir nur in Circumferentia vmb dz Centrum herumbgefuhrt worden vnd haben das fundament nie ersehen weniger erlangen können, wolte nun Gott vnß so lieb haben vnd freye Ingenia erweckhen welche solche mängel entdeckhen vnd verbeßern könden (no. 6).

Yet the quest for 'true method' could itself prove divisive. 'Hobs, White, Gassendus, Cartes. Every one of them is about a new Philosophy differing one from another'.¹ The reaction of the thinkers of the 'third force' to this widespread sense of intellectual crisis was not to take refuge in conservative nostalgia, to hanker for or attempt to recreate a mythical past of cosy

1 Eph 42, HP 30/4/82A, citing Mersenne.

consensus and spritual certainty. Instead they looked forward resolutely, albeit not without a hint of desperation. In impeccably Paracelsian fashion, they sought the cure for the disease in its cause, and set out to solve the sceptical crisis of their age by means of the very explosion of learning and technology that had caused it in the first place.

It is in this context that their fascination with new pieces of technology and apparently trivial or even downright absurd snippets of information must be viewed. Modern readers are likely to find a comic incongruity in Glauber's turning directly from the subject of pest control to that of transmutation, or Moriaen's leaping from a reference to a new book on arithmetic to a prophecy of the Dawn of Wisdom.² What this reveals, however, is not that they lacked any sense of proportion, but on the contrary that they saw every such fragment as having its place in the broader picture and helping to clarify the overall pattern. The example of Culpeper's being inspired to one of his most high-flown meditations on the 'exaltation of the spirit of Nature' by a study of the technicalities of brewing beer³ is entirely typical of their trust in finding patterns, coherence and mutual illumination in every department of knowledge.

2 No. 20.

3 See Chapter Seven, section 3.

Both Moriaen and Hartlib provide classic examples of personal intellectual histories that appear, superficially, to represent a progressive secularisation of interests. Moriaen began his career as a servant of the Reformed church but was later at pains to distance himself from any formalised religious allegiance. Hartlib, though never professionally involved with theology, displayed in the early volumes of the *Ephemerides* a lively and well-informed interest in the subject which had all but disappeared by early 1640s.⁴ Both became intoxicated in the late 1630s by the notion of Pansophy, a philosophical scheme which, while emphatically relating all human learning to the study of God, equally emphatically distanced itself from any doctrinal allegiance, and claimed indeed to provide the means of transcending all partisan division within religion. A decade later, with the hopes of Pansophy seeming to be endlessly deferred, both men began to immerse themselves more exclusively in science and technology, especially chemistry and optics; to seek reconciliation and enlightenment in the practical study of Nature rather than in Scripture or in verbal formulation of philosophical method.

4 The *Ephemerides* of 1634 and 1635 contain over a hundred references each to the subject of theology; this plummets to just over twenty each in 1639 and 1640, and there is no more than a handful of references to it in any volume from 1641 onward.

However, as this study has striven throughout to make plain, doctrinal non-specificity is not to be confused with secularisation, and the notion of scientific enquiry as a distinct field from religious study is rarely appropriate to the thought of this period, and certainly not to the representatives of the 'Third Force'. All these different lines of enquiry represent different routes to the same goal, the discovery of the true method that would, quite literally, make sense of everything. The notion of pansophic method and that of the Philosopher's Stone have much in common. Both have more than a whiff of the miraculous about them. Both were deemed attainable only by divine grace: 'it is not of him that wills, or of him that runnes, but of God only who in this as in more higher things enlightens whom he will'.⁵ Both were quite explicitly presented as the means to restore humankind to its prelapsarian state, perfectly understanding Nature and exercising dominion over it. Both were articles of faith clung to with perceptibly mounting desperation as relativism, materialism and scepticism began to gain ground in Western thought. They were embodiments of faith in universal harmony, order and purpose, in providential guidance of the universe by an ultimately benevolent deity. They were envisaged as a sort of *deus ex machina* to close the final act of the human comedy.

5 Worsley to ?, 14 Feb. 1655/6, HP 42/1/5A.

The impulse and rationale behind Moriaen's alchemical undertakings, and his manner of expressing them, were if anything even more explicitly religious than those behind his involvement in Pansophy. Whatever their actual effect may have been, these men fervently believed that their intellectual endeavours were guiding the world forward to an apotheosis after which everything would become clear and coherent to all people, illuminated by the divine light of true religion in the New Jerusalem where

they shall see his face; and his name shall be in their foreheads. And there shall be no night there; and they need no candle, neither light of the sun; for the Lord God giveth them light.⁶

They were guiding it, of course, not according to their own volition, but only in the way God had preordained: they were only secondary causes. But that is the role they felt themselves called to play, and they played it with the utmost conviction.

There is still much to be established about this body of thought and its reflection in the intellectual and political life of the day. The appearance simultaneously with this thesis of the whole of Hartlib's papers in an electronically readable and searchable edition will, it is to be hoped, greatly facilitate and

6 *Revelation*, 22:4-5.

stimulate such research. Many individual figures well represented in the papers, such as Benjamin Worsley, Joachim Hübner and Heinrich Appelius, remain very little known and would richly repay closer attention. It will also become possible to relate the Hartlib circle's agenda and activities more broadly to those of other groups and other contemporary trends of thought. This study is intended as an example of the range of subject matter available and a small contribution to the continuing enquiry.

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Prepositions appearing as separate words within surnames (eg. de, von) are ignored for the purposes of alphabeticisation: thus E.G.E. Van Der Wall appears under W, not V. Standard German practice is followed in regarding 'ae' and 'oe' as variant forms of 'ä' and 'ö'.

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List of Abbreviations

ADB: *Allgemeine Deutsche Biographie* (Leipzig, 1875-1912)

BL: British Library

Blekastad, Comenius: Milada Blekastad, Comenius: *Versuch eines Umrisses vom Leben, Werk und Schicksale des Jan Amos Komensky* (Oslo and Prague, 1969)

Eph 55 (etc.): Hartlib, *Ephemerides 1655 (etc.)*

Figulus Letters: Milada Blekastad (ed.), Peter Figulus. *Letters to Samuel Hartlib 1657-58*, (Lychnos, *Lärdomshistorika Samfundets Årsbok*, 1988)

Bruckner: J. Bruckner, *A Bibliographical Catalogue of seventeenth-century German Books Published in Holland* (The Hague and Paris, 1971)

CSPD: Calendar of State Papers (Domestic Series)

Doorman: G. Doorman, *Patents for Inventions in the Netherlands during the 16th, 17th and 18th Centuries* (abridged trans. Joh. Meijer, The Hague, 1942)

DNB: *Dictionary of National Biography* (London, 1885-1903)

DSB: *Dictionary of Scientific Biography* (New York, 1970-80)

Hessels: J.H. Hessels (ed.), *Ecclesiæ Londino-Batavæ Archivum* (1887-97)

Grell: Ole Peter Grell, *Dutch Calvinists in Early Stuart London: The Dutch Church in Austin Friars 1603-1642* (Leiden, New York, Copenhagen and Cologne, 1989)

HDC: George Turnbull, *Hartlib, Dury and Comenius: Gleanings from Hartlib's Papers* (Liverpool, 1947)

HP: Hartlib Papers

Kumpera: Jan Kumpera, *Jan Amos Komensky: Poutník na Rozhraní Veku* (Ostrava, 1992)

KK I: Jan Kvacala, *Korrespondence Jana Amosa Komenského I* (Prague, 1897)

KK II: Jan Kvacala, *Korrespondence Jana Amosa Komenského II* (Prague, 1902)

MCG: Monatshefte der Comeniusgesellschaft

MGP I: Jan Kvacala, *Die Pädagogische Reform des Comenius bis zum Ausgange des XVII Jahrhunderts I: Texte: Monumenta Germaniæ Pædagogica XXVI* (Berlin, 1903)

MGP II: Jan Kvacala, *Die Pädagogische Reform des Comenius in Deutschland bis zum Ausgange des XVII Jahrhunderts II: Historischer Überblick, Bibliographie, Namen- und Sachregister: Monumenta Germaniæ Pædagogica XXXII* (Berlin, 1904)

NDB: *Neue Deutsche Biographie* (Berlin, 1953-94)

NBW: *Nieuw Nederlands Biografisch Woordenboek* (Leiden, 1911-37)

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Serrarius: E.G.E. Van Der Wall, *De Mystieke Chiliast Petrus Serrarius (1600-1669) en zijn Wereld* (Leiden, 1987)

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UBA: Universiteitsbibliothek Amsterdam

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