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Technology and Tolerance during the Commonwealth: Samuel Hartlib and the Republic of Letters

The historiography and bibliography of political argument in seventeenth-century England, and especially at its mid-century, has a large terra firma composed of regions termed: 'republicanism', 'toleration', 'radicalism' and 'liberty'. This morning I want to visit one of the off-shore islands and, to a degree, depoliticize the discussion – although I shall not succeed because the terra firma is in the midst of a political revolution and everything eventually returned in one way or another to politics. The offshore island that I shall be discussing is the Republic of Letters, which is what it would become known as by the end of the seventeenth century.[1] The toleration is that mode of discourse appropriate to scientific discourse. There will, as it happens, be some technology in our modern sense of applied scientific endeavour, but I will generally be using the term in the meaning that it had in the mid-seventeenth century, namely that of the disposition of the arts and sciences (the *techne*) in general. *Technologia* was information science, seventeenth-century style, the study of knowledge systems in the context of how we know what we know and how we teach it to others. It was the subject of whole volumes, or parts of encyclopaedic works in

the first half of the seventeenth century, of which perhaps the best-known example now is William Ames' *Technometria* of 1633.[2] I shall be concentrating my attentions on Samuel Hartlib, returning 'vel canis ad vomitem' (as it were) to England's 'first information scientist', or so I have rather rashly termed him in print on a previous occasion. So, in this paper, I want to begin with a brief review of Samuel Hartlib's life, career and aspirations before, secondly, considering at greater length the nature of his knowledge system and the characteristics modes of discourse that the latter generated. Then, finally, I want to return to the parallels and consequences that were drawn between, and from, this world of letters to the wider political and ecclesiastical spectrum.

Samuel Hartlib, intelligencer

Of Samuel Hartlib's life, there is not much known now that we did not know from the studies published on him by G.H. Turnbull in the first half of this century.[3] He was born around 1600 in the Baltic city of Elbing (Eblag) in Polish Prussia into a notable merchant family. He was brought up and educated in the atmosphere of what some German historians have characterised as the 'Second Reformation'.[4] The term refers to that small, but growing, clutch of German states and principalities that became attracted to Calvinism, despite its being formally outlawed as an accepted confession in the Holy Roman Empire by the peace of Augsburg of 1555. Calvinism was most influential initially in Rhineland states and cities that had been, for one reason or another, influenced by events and individuals in the Low Countries and France. From Rhineland Germany, however, it had spread to Oderland Germany where, from the turn of the century, the Elector of Brandenburg attempted to

introduce Calvinism to his court, his universities and (despite vigorous opposition) to the church at large.[5]

Hartlib studied first at the Calvinist Academy at Brieg in Silesia before going on to the University of Königsberg, a battleground for the Calvinist enterprise of the Brandenburg elector in this, his newly acquired territory. Come the Thirty Years War, however, and the Calvinist states of the Rhineland found themselves particularly vulnerable to a process that one might these days describe as religious cleansing and, by the latter years of the 1620s, imperial troops and the war-theatre had moved towards the Baltic.[6] Many Calvinist protestants took refuge in the Low Countries; Hartlib came to England (perhaps because his mother had been English) and settled in London. After a brief and unsuccessful venture as a schoolmaster of an academy for gentlefolk in Chichester, Sussex, Hartlib returned to London. There he lived more or less permanently, up to his death in March 1662, first at Dukes Place, then Angel Court, Charing Cross, before finally settling in Axe Yard, Westminster with his son in 1658, a close neighbour of the diarist Samuel Pepys.

What could a 'stranger' in London do? The possibilities were limited. 'Strangers' were subject to punitive taxation, restricted in their legal rights to own and transfer property and conduct a trade, and at moments of political tension, the victims of zenophobic outrages.[7] Hartlib exploited to the full the advantages afforded by his knowledge of languages, his education and his access to a network of foreign contacts. Having tried his hand at education, he established a manuscript newsletter service in the 1630s, employing copyists to despatch weekly bulletins of news to pre-paying subscribers. It circulated apparently to those, especially amongs the gentry of the puritan-minded phalange of 1630s England, who were keen to have such news. We know relatively little of this aspect of his activities but the news carried was

apparently a mixture of the latest reports from the war-zones of continental Europe coupled with novelties of various sorts, including new books published and new inventions. The sources he employed included his contacts amongst the mainly protestant exiles from Germany and those of others who had come to London and whom Hartlib befriended.[8] They were supplemented crucially by the information fed back to him by John Dury, a protestant divine of Scottish origins whose self-appointed mission was to attempt to reconcile the confessional differences between the various protestant states as a prelude to a more general Christian reunion. In July 1631, Dury set off from London on what would eventually turn into half a lifetime of peregrination and negotiations with the rulers and representatives of church and state in protestant Europe.[9] As he went, he sent back names and addresses of possible contacts as well as news and information of the kind Hartlib could make use of in London.

At the same time, Hartlib began to act as a literary agent, editing and translating works as well as developing his contacts with publishers.[10] He also became known as an agent for acquiring patents for new inventions or innovations, a significant role amongst the London stranger community for whom technology transfer was one of the passports to financial security and local social integration. On the eve of the English civil war he came to the fore with ambitious proposals for the reformation of learning and, with the success of the Parliamentary forces, he hoped to see some of them implemented. The scheme to which he devoted most of his efforts was, however, the Office of Address. Proposed by Dury and Hartlib in 1647 (and then again after the second civil war in 1648) it was named after, and incorporated some of the elements of Théophraste Renaudot's *Bureau d'Adresse* in Paris, about which Hartlib had been kept informed by his contacts there (principally Arnold

Boate). Through the Office Hartlib aimed to ensure that 'all that which is good and desirable in a whole Kingdome may be by this means communicated unto any one that stands in need thereof'. The proposed Office had various branches to its activity. One part, the 'Office of Address for Accommodations' was designed as a counterpart to the Renaudot scheme. It would function as an employment, goods and services exchange. The other part, of greater long-term interest to Hartlib and Dury, was the 'Office of Address for Communication'. This was the branch of the Office that would keep registers of, and distribute information concerning 'matters of Religion, and of all Ingenuities, which are objects of Contemplation and delight unto the Mind, for their strangeness and usefulnesse unto the life of Man'.[11]

Despite his lobbying on its behalf, Hartlib never succeeded in having the Office established on any formal footing under the Commonwealth and Protectorate. Instead he strove to advance it unofficially on the basis of some quite substantial emoluments that he received from Parliament, ones that would have made him (had they been regularly paid) one of the highest paid civil servants of the day. Aided by a Latin secretary and numerous copyists, Hartlib maintained a substantial and regular correspondence throughout Europe. He organised summaries of letters to be circulated for comment by those whom he knew to be interested in their subject-matter. He sought copies of manuscripts on subjects as various as astronomy, optics, agricultural reform, commerce, chemistry, currency, colonisation, cryptography, universal language, medicine – the list is almost endless. He collected together the comments that he received back from individuals and put them together in various (largely collective) publications in order to promote the development of new ideas and inventions. He was respected in high places as a source of intelligence – known at one period in the 1650s to have a regular audience with the Lord Protector once a

week. He used his influence with the Secretary to the Council of State to assist in the promotion of practical innovations and patents of invention as well as schemes of charitable endeavour in London. Many of the natural philosophers of England in this period of intense scientific change had good cause to be grateful to Hartlib (though only a few chose to say so publicly). Robert Boyle, the chemist, owed his microscopes to Hartlib. John Ray, the Cambridge naturalist, was sent a manuscript copy of the botanical taxonomy developed by the Hamburg philosopher Joachim Jungius (and upon which he developed his own) by Hartlib. Henry More, the Cambridge platonist and greatest adherent of Cartesianism in England, was put in touch with Descartes through Hartlib. These are just a few examples.

But by the Restoration in 1660, Hartlib was politically compromised, his health was broken, and he died in distressed circumstances on the eve of the incorporation of the Royal Society of London in 1662. Like many intermediaries and agents, he was quickly forgotten. His publications had often been anonymous. Many of his aspirations were easily parodied in the cultural climate of the Restoration, or assumed in a different and more formal institutional setting by the Royal Society. Even those who had been his close associates sought to distance themselves from him. Hartlib's reputation is almost exclusively a phenomenon of this century and emerging from the discovery of his manuscript papers in a trunk in a solicitor's office in London in 1933. These papers – over 25,000 pages of them – constitute what remains of his Office of Address. From them, we can reconstruct the characteristics of his knowledge-system.

Hartlib's Technology

Hartlib saw himself as an 'intelligencer'. In 1640, he spoke of his desire to create a 'vniversal learned, corresponding Intelligency'.[12] He talked of himself as a 'conduit-pipe' of knowledge 'towards the Publick'.[13] Others referred to him as 'a Common servant of Ingenuitys' and as 'hub of the axletree of knowledge'.[14] The term that he most frequently used to describe his correspondents in his personal diary or *Ephemerides* was that they were a 'lover of ingenuity' or a 'mighty lover of all manner of Ingenuity'.[15] In the little utopian work *Macaria*, which we now know almost certainly to have been written by Gabriel Plattes but which Hartlib edited and published in October 1641, the dialogue is between a scholar and a traveller. It takes place as they walk away from Westminster to the park at Moorefields. The moral of the dialogue is that the real reformation of the kingdom does not lie in Westminster, or in institutional change, but in a free-trade economy of information about inventions and technical change to the benefit of the whole commonwealth.[16] The commodification of knowledge, and the consequential images of the 'commerce of letters', are regular conceits in Hartlib's correspondence.[17] To John Dury in 1642, such free commerce had something heavenly about it, writing of 'the liberty of publique communication of the best things, which in the kingdome of God must alwais bee inviolably observed'.[18] With the English Republic in place, but scarcely secure, Hartlib published the *Reformed Commonwealth of Bees* in 1655. In form, it was a collection of the letters, information and discussion that Hartlib had received from all quarters of his network on apiculture. He carefully excised all political and spiritual analogies that had accompanied the correspondence and which were common stock of the political thought of the day.[19] But this left an informatics analogy all the more evident. The bees are like Hartlib's correspondents. They collect the pollen of

information in a providentially bountiful and free nature and bring it back in a spirit of public service to the hive of the office of address. There it will become the sweet rewards of the industrious commerce of letters, so much more virtuous than the slave sugar from New World colonies, the equivalent of inquisitorial knowledge-systems.

What were the common modes of discourse in Hartlib's network? In the 1640s and 50s (as in the later Republic of Letters), belonging to Hartlib's circle was a matter of self-election, a reflexive response to an ideal. The coherence of their discourse (which is considerable) comes, in part, from a common (and widespread) reaction to inherited systems of knowledge, especially Aristotelianism. They would be free of the pedantic constraints of Aristotelian logic, liberated from the old arts curriculum of the universities, free to pursue new ways of looking at the world, and with new methods for the advancement of learning. Hartlib's publication, *the Reformation of Schooles* (1641), in reality a translation of a treatise by the Czech educationalist Comenius whom Hartlib had invited to London on the eve of the English Civil War, began with the common stock of complaints about traditional learning and its inadequacies.[20] Traditional learning encouraged idle speculation, contentiousness and division. Old knowledge was divided into old specialisms, so many quasi-monopolies, each with their own technical terms, mysteries and protections. Herein lay the origins of all intolerance. In its place must be constructed a new learning that encouraged free enquiry, the pursuit of real knowledge about the real world, one that would have utilitarian benefits. Language teaching must be reformed, a new logic developed. With it must come a new division of the sciences, a new technology in short. And, in the *Reformation of Schooles* of 1641, Comenius provided the second of his beguiling prospects for an organic process of human

knowledge acquisition, starting out from simple self-evident propositions and growing little by little into that fruitful omniscience that he termed *pansophia*.[21]

Hartlib's diary, the *Ephemerides*, reveals how earnestly Hartlib struggled to define that new technology.[22] He went back to the *Novum Organon* of Francis Bacon. Equally importantly, he drew on the reformed logics of the German Calvinist Ramists that he had been taught at Brieg and Heidelberg and an intense study of the German encyclopaedic system-builders, Clemens Timpler, Bartholomaeus Keckermann and, of course, the greatest encyclopaedist of them all, Comenius' tutor and mentor, Johann Henrich Alsted. These were the distinctive products of the German *Zweite Reformation*. But he also found himself particularly attracted to the knowledge systems of an early protestant generation, especially that of Jacobus Acontius (Giacomo Aconzio) (c.1520-1567), whose *De Methodo* of 1558 he regularly refers to glowingly, and extracts of which occur amongst his papers.

In the end, however, he could commit himself to none of these. 'It is not good' he wrote in his diary in 1639, 'to enslave ones-selfe to any kind of method or meditations'. It was most prudent 'to observe a certaine generosity and liberty in all our studys. This will bee found to bee far more profitable. As the overflowings of rivers doe bring in a world of things with them, which they never would have done if they hadde always runne in their wonted channels. Yet some mens wittes have [*so*] bounded themselves within certaine limits, that they can doe nothing'.[23] 'All Rules whatsoever serve but to little purpose and it is far better to follow once [*i.e. one's*] free and natural swinge, by this means hee will get further by many degrees. Therfore Acontius affirmes that the whole Art of Meditation consists in few and most contemptible Principles. Logick, Rhetorick, Grammar, etc as now they are farre better never to learn them. For they will come out of their own accord and as they are

now proposed are most Pedantick and ridiculous. Therefore the chiefest of all is to labour to get abundance of matter into ourselves as soone as wee can. Then wee shall have something to worke upon by ourselves whether it bee in the ways of Meditation or expression by letters, orations and discourses etc'.[24] And again: 'In Meditation a world of thoughts will escape one if one bind's himself to one Method. Therfore Acontius not always too precisely to bee vsed lest wee bring a slavery vpon vs.'[25] The best technology was modest, eclectic, undogmatic, experiential, piecemeal and tolerant.

And these are the qualities reflected in the common parlance of Hartlib's 'invisible' commonwealth of letters. 'Libera Philosophia et ingenua' was the phrase used in the petition for the reform of the University of Oxford submitted by Thomas Gilson to Hartlib in October 1649 – and much echoed in the prefaces to reform proposals from Hartlib's circle.[26] Hartlib's correspondent in The Netherlands, Johann Moriaen, was not alone in praising the model of freedom of thought and expression for the republic of letters afforded by the Dutch: 'hie matt man freyheit zue glauben vnd zue schreiben was man nur will oder kan'.[27] When Moriaen wanted to indicate to Benjamin Worsley that he wished to continue their correspondency, he wrote effusively about he he was in favour of their 'free and ingenious communication'[28]. Such ingenuities had to be set free from the constraints of ignorance, prejudice and the old learning. When Cressy Dymock came to justify his 'Proposition for a College of Husbandry' he called on those 'two deer & neer friends', 'Ingenuitye and Industry' to release the 'almost infinite & inexhaustible treasure' (Hartlib would have read this as a silent reference to Gabriel Plattes' publication of that title) in the English kingdom. But this would only happen when a college of husbandry was established 'that therefore Ingenuitye may bee ransomed from her tedious imprisonment &

industrye awakened from a kind of lethargie occasioned through disconted discontent to see how few freinds there are that will administer any releife to him or his dear captiue-sister'. There was a sense of eager anticipation of what the new knowledge would bring once these shackles were released, of snatching at the snippets of knowledge as they passed. Listen to Robert Child writing to Hartlib on 11 March 1651: 'I thinke I saw in the newes book some peeces of Glauber translated into English, about minerals. I hope to heare from you concerning his writings, for I very much respect the ingenuity of the man. I desire likewise to heare what other ingenuous things are written of late. I thinke these times very fruitfull & that the great secrets which have a long time bin hid, will shortly be manifested. I grieve much that I went not to Gilford to see Mr Weston & his Flaunders husbandry, I am persuaded, it would be very usefull in these parts, if he haue lately published any thing, pray let me know of it . . .'[29]

Overt modesty, politeness, charity and decorum were also notable features of the *lingua franca*, essential concomitant elements of the republic's toleration. They referred to each other as 'ingenui', from the later 1650s occasionally as 'virtuosi'. William Rand explained to Hartlib the etymology of 'ingenuity' thus: 'I would define Ingenuity to be an uprightnes & gallantry of mind, making a man owne truth & justice though to the prejudice of his owne interest. In the Roman Commonwealth, where they had slaves who being extremely kept short would often filtch & sharke & to save themselves from whipping, would rrequently & grossly lie, it was counted the property of a freeman & one of an honest & generous nature, to acknowledge the truth upon all occasion; hence from ingenuus, which noted a free man, came the abstract ingenitas, noteing that candid disposition of owneing freely the truth upon all occasion, which quality is founded principally next the freedome of a mans civil

condition, in a love of the faire idea of Truth & Iustice, an abhorring of fraud & injustice, with an undervaluing of all Things desireable or formidable that are wont to allure or scare men'.[30] They ascribed to one another the 'virtues' of charity and modesty that the term 'virtuoso' was a natural extension of the same. Here is Robert Wood, writing to Hartlib from Ireland on 16 June 1658 having received some interesting (but anonymous) information on toads via Hartlib from someone (no doubt John Beale) in Hereford. 'That from Hereford . . . . speakes your friend the Author so much a Vertuoso, that I (would) take it no small additional favour to know his Name, to the end I might love & honour it as really I should do'.[31]

In this invisible college of letters, it was important to be seen to obey the unwritten rules of decorum. A gentleman's study was an intensely private space, a place where a conscience should if it wished be allowed to express itself as it wished. An intermediary should make the first contact. So John Hall, translator of (amongst other things, Andreae;s *Christianopolis*) wrote to Hartlib from Cambridge; 'I had a loving & Modest express from Worthy Mr Milton, I desire to be enformed from yow whether yow suppose him willing to entertain a Constant Correspondence or noe . . .'.[32] A short while later he wrote again in December 1646, asking Hartlib to see if he could not get the mathematician John Pell to write a 'Direccon for the study of the Mathematicks'.[33] He added becomingly: 'If I thought it were not a piece of boldness I shold by yow Address my self to him for that end, I pray yow let me know your opinion of this in your next . . .'.[34] Others displayed their credentials more overtly. Benjamin Worsley learnt from Hartlib that John Winthrop in Massachusetts wanted to begin a correspondency with him. He quickly assured Hartlib: 'That he will mee every way a civill Man and one that you will know will shew him a respect for the character Mr Worsle hath received from him That in all things relating to publicke

good Iust Liberty of Conscience and any sort of ingenious kinde of improvement he will finde Mr Worsley as you beleeve according to his owne hearts desire.'[35]

Becoming modesty extended, also, towards the presentation of knowledge and inventions. Modesty meant containing curiosity within the bounds of sobriety, the virtues 'which God prescribes' as one of Hartlib's correspondents put it, and which should 'satisfy modest minds concerning this soe abstruse a question . . .'.[36] Books are praised when they are modest, when they do not rush to offer a master-narrative, a complete explanation. This was why the majority of Hartlib's correspondents were suspicious of Descartes. 'He also is too much bragging' recorded of the *Discours sur la Méthode*. 'For hee promises more in his general discourse then hee dose performe'.[37] Mathematics was to be distrusted for similar reasons. Such overarching explanation smacked of the Fall of Man and the Tower of Babel – the abiding and still-powerful Biblical analogies of the sin of human pride. Such criticism could also be launched against some of the more ambitious reformation of learning schemes. This, for example, is what Henry More had to say about William Petty's precocious *ergastula literaria* (or 'Literary Workhouses', proposed in 1648 as a compulsory national scheme of education); 'great projectes seem to me, like the building of Babell against a second expected deluge, and the highest heapes of Lucriferous experiments as he calles them, but the growndwork of Luciferan knowledge, which the divine Light in just indignation may well thunderstrike and confound'. Yet, in conformity with the expected modesty of a virtuoso, More adds: 'for mine own part though I cannot pretend to wisedome, yett I have so much smattering of justice or civility, that I hold my self bound to lett other thinges grow besyde what are of own sowing, if they will gro, and let every man enjoy his own conceites be they never so fine or clumzy'.[38] The new experimental philosophy, on the other hand, was readily adopted

because it satisfied the social demands of the invisible college. Henry More, whilst criticising Petty, readily conceded: 'I do very highly approve of that experimentall way that this gentleman is so zealous for . . .'. The experimental method invited modesty before Nature. The experimentalist was encouraged to report experiments that failed and the greatest of the experimentalists in Hartlib's circle, Robert Boyle, duly obliged. The faithful reporting of the difficulties he had in undertaking his great vacuum experiment with the 'Machina Boyleana' in 1659 were taken as additional proof to those who had not witnessed the experiments for themselves of the veracity of the other observations he recorded.[39] The experimental method was apparently tolerant of criticism. It welcomed witnesses to its proceedings; it invited replication of its results that were themselves piecemeal and contingent.

Hartlib himself organised experimental demonstrations and testimonials of new inventions and was involved with others. He was particularly intrigued, given his office of address, by news recipes for ink, new writing pens, engraving acids and a machine for 'double' or 'multiple' writing. In essence, the latter device was a pantograph equipped with two or more automatically refilled quill pens to make the copies. The first prototype machine was produced by William Petty and tested before nine witnesses, one of whom was the famous developer of a 'common writing' or new language, Francis Lodwick. The witnesses watched whilst Petty transcribed the first chapter of St Paul to the Hebrews – perhaps chosen because it was very short and also contained a significant verse (v.6): 'That the communication of thy faith may become effectual by the acknowledging of every good thing which is in you in Christ Jesus'. But this would be followed by numerous other experiments – including Cressy Dymock's famous engine 'inking strength with time' and Johann Sibertus Kufler's torpedo which, when it was tried out the second time on the 4th August 1658, blew a

satisfactory hole 9 years wide in the ship at which it was aimed. The ship promptly sank but it also smashed the windows in the houses on the Thames river-bank at Deptford nearby.

The style and language amongst Hartlib's communicants, too, is important. They encouraged one another to keep common-place books or diaries. And, like Hartlib's own, these reflected the methodological advice of Acontius to express self-evident truths plainly and simply in an aphoristic fashion if possible. Hartlib was particularly keen on the process of abstracting knowledge. He particularly warmed to a kind of filing-card device or filofax invented by a poor schoolmaster called Harrison. He wanted libraries to abstract the contents of books so that they could become useful to the commonwealth at large; he was particularly scathing of the shortcomings of university librarians who seemed to regard their tasks as no more than making sure that the books under their charge were neither stolen nor used. He was excited by the possibilities of shorthand writing and encouraged the efforts of those who tried to develop a new universal language. Accompanying all this was a rhetoric of the non-rhetorical, a desire to express things plainly and simply without adornment, a toleration of the plain and simple.

The elements that we have just delineated in Hartlib's knowledge system should not come as much of a surprise to us.

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[1] . See Anne Goldgar, *Impolite Larning. Conduct and Community in the Republic of Letters, 1680-1750* (New Haven and London: Yale U.P., 1995).

[2]. William Ames, *Technometria, omnium & singularum Artium fines adaequatè circumscribens* (London, Milo Flesher [Miles Fletcher?], 1633); translated (with introduction and commentary) by Lee W. Gibbs, *Technometry* (Philadelphia, University of Pennsylvania Press, 1979); for Ramus, the term 'technologia' had a precise, Ciceronian, meaning of the 'systematic treatment of grammar' as well as a more general sense to mean the disposition and distribution of the sciences and our ways of understanding it. Clemens Timpler's treatise on *Technologia* (1606) was fundamental in the formulation of the subsequent knowledge systems of the German systematic knowledge-builders, in particular Bartholomaeus Keckermann and Johann Heinrich Alsted. I do not claim a detailed knowledge of these works; but I rely especially on the excellent study of Howard Hotson, *Johann Heinrich Alsted; Encyclopaedism, Millenarianism and the Second Reformation in Germany* (Unpublished D.Phil Thesis, University of Oxford, 1994).

[3]. G.H. Turnbull, *Samuel Hartlib. A Sketch of his Life and his Relation to J.A. Comenius* (Oxford: Oxford Univerity Press, 1920); G.H. Turnbull, *Hartlib, Dury and Comenius. Gleanings from Hartlib's Papers* (London: University Pres of Liverpool. Hodder & Stoughton, 1947).

[4]. The most convenient starting-point for the literature on the 'Second Reformation' is the volume published following a conference on the subject in 1985: Heinrich Schilling, ed., *Die reformierte Konfessionalieserung in Deutschland. Das Problem der 'Zweiten Reformation'* (Gütersloh: 1986).

[5]. Bodo Nischan, *Prince, People, and Confession. the Second Reformation in Brandenburg* (Philadelphia: University of Pennsylvia Press, 1994).

[6]. Mark Greengrass, "Samuel Hartlib and International Calvinism," *Proceedings of the Huguenot Society* 25.5 (1993), 464-475 provides additional details of the problem of displaced calvinists from central Europe in this period – an interesting question that has yet to find its historian.

[7]. Irene Scouloudi, *Returns of Strangers in the Metropolis 1593, 1627, 1635, 1639*, Huguenot Society Quarto Series, vol. 57 (London: Huguenot Society of Great Britain and Ireland, 1985), introduction provides an anlysis of the legal and other restrictions on strangers. Hartlib apparently never sought an act of naturalization.

[8]. Hartlib's contacts in London amongst the stranger community are sketched out in Greengrass, *op.cit.*, pp. 467-469.

[9]. On Dury's activites, besides Turnbull (1947), above, there is also John Minton Batten, *John Dury, Advocate of Christian Reunion* (Chicago: Chicago University Press, 1944).

[10]. See Sanderson.

[11]. HP [Hartlib Papers, University of Sheffield] 63/7/8A [?check]. All the manuscripts cited in this paper can be consulted in transcription and in facsimiles of the originals in the published database: M. Greengrass and M.P. Leslie, "*Samuel Hartlib: The Complete Edition*," (Ann Arbor, Michigan: UMI, 1995), 2 CD-ROM set.

[12]. HP 30/4/67B (Ephemerides, 1640).

[13]. ' . . . I finde my selfe obliged to becom a conduit pipe . . . towards the Publick', Samuel Hartlib, 'Preface to the Reader' in *Discourse of Husbandrie used in Brabant and Flanders* (London, 1650).

[14]. HP 60/14/32A-B (John Hall to Hartlib, 20 April 1647).

[15]. E.g. HP 29/4/23A.

[16] . ‘Trav. Well, doe you know any man that hath any secrets, or good experiments? I will give him gold for them, or others as good in exchange, that is all the trade I have driven a long time, those
riches are free from Customes and Impositions, and I have travelled through many Kingdomes, and paid neither fraight nor Custome for my wares, though I valued them above all the riches
in the Kingdome.
Sch. I know a Gentleman that is greatly addicted to try experiments, but how hee hath prospered I am not certaine; I will bring you acquainted with him, perhaps you may doe one another
good.’
See Charles Webster, ed., *Utopian planning and the puritan revolution. Gabriel Plattes,*
Samuel Hartlib and Macaria (Oxford: Wellcome Unit for the History of Medicine, 1979); Ibid., “The authorship and significance of Macaria,” *Past and Present* 56 (1972).
[17] . Kevin Dunn, “Milton among the monopolists; Areopagitica, intellectual property and the Hartlib circle,” *Samuel Hartlib & Universal Reformation,* eds. Mark Greengrass, Michael Leslie, and Timothy Raylor (Cambridge: Cambridge U.P., 1994), pp. 177-192.
[18] . John Dury, *A Motion tending to the publick good of this age, and of posteritie* (London, 1642) – *check STC ref and page.*
[19] . Timothy Raylor, ...
[20] . ‘tis the common complaint of many, that the learning which is now taught in Schooles, is a thing too tedious, and long in regard of the shortnesse of life, too laborious for common
capacities, too narrow in respect of the amplitude of things, and in regard of the subtilty, and solidity of their truth many ways defective. And the wiser sort have noted, that it is not answerable to the proposed end; seldome attaining to any substantiall uses of life, but rather ending in the smoake of opinionative brawlings, and contentions: which that they are not idle sayings and surmises, but even reall defects, we must first declare, before we undertake to seeke remedies to redresse them.
We must, I say, make it good, that the studies of learning, as they are now managed, and commonly taught in Schooles, are not well proportioned . . .’. See Jan Amos Komesnky [Comenius], *A Reformation of schooles, designed in two excellent Treatises:the first whereof summarily sheweth, The great necessity of a generall Reformation of Common Learning. . .* (London, 1641; reprinted Menston, Scolar Press, 1969).
[21] . ‘But that which we desire, is to have a living tree, with living roots, and living fruits of all the Arts, and Sciences, I meane Pansophy, which is a lively image of the Universe, every way closing, and agreeing with it selfe, every where quickning it selfe, and covering it selfe with fruit’ . . . ‘The generall precepts of Pansophy ought to be nothing but reall and practicall axioms, that is, sentences gaining credit of themselves, not to be demonstrated (a priori) but onely to be illustrated by examples: as which, so soone as they are understood, cannot but be allowed by all men for a rule of truth. For such generall notions naturally stamped upon our minds, will be like fire-brands to kindle the light of truth, that it may shine unto us in all particulars, and withall will be the first

moving wheeles in all our operations' . . . 'as we see it comes to passe in the growth of trees, and living creatures, new boughs, or members are not brought forth ever yeere, but the former onely grow towards perfection.' – all from Comenius, *Reformation of Schools*.

[22]. The surviving sections of the *Ephemerides* for 1634, 1635 and 1639-40 require a detailed knowledge of the knowledge systems referred to in this paragraph for their elucidation. See also Stephen Clucas, "In search of 'The True Logick': methodological eclecticism among the 'Baconian reformers'," *Samuel Hartlib & Universal Reformation*, eds. Mark Greengrass, Michael Leslie, and Timothy Raylor (Cambridge: Cambridge U.P., 1994) 51-74.

[23]. HP 29/4/21A [Ephemerides, 1635] *[check!]*.

[24]. HP 30/4/58A [Ephemerides, 1640].

[25]. HP 30/4/42B [ibid].

[26]. HP 47/17/1A – printed in Charles Webster, *The Great Instauration: Science, Medicine and Reform, 1626-1660* (London: Duckworth, 1975), pp. 523-4.

[27]. HP 37/44B [cited John T. Young, *Faith, Medical Alchemy and Natural Philosophy. Johann Moriaen, Reformed Intelligencer, and the Hartlib Circle*, The History of Medicine in Context, eds. Andrew Cunningham and Ole Peter Grell (Aldershot: Ashgate, 1998), p. 37.

[28]. HP 9/16/5A-B [Moriaen to Worsley, 19 May 1651].

[29]. HP 15/5/3A-4B [Robert Child to Hartlib, 11 March 1651].

[30]. HP 62/27/1A-B [William Rand to Hartlib, 1 Sep. 1651].

[31]. HP – *confirm reference*.

[32]. HP 60/14/3B.

[33]. Pell's *An Idea of Mathematicks* would be published, in fact, by Hartlib in 1650, although it had already circulated widely in Latin before the date that Hall wrote.

[34]. HP 60/14/4B. Pell, it should be added, like Milton, gained a reputation amongs the *viruosi* for guarding his privacy. His friend and landlord, the mathematician John Collins (whose own zeal for communicating and diffusing scientific information earned him the title 'The English Mersenne', said of him: 'He hath been a man accounted incommunicable' – see *Dictionary of National Biography*, art: Pell, John.

[35]. HP 33/2/27A [no date, later 1650s].

[36]. HP 26/14/9B.

[37]. HP *check* [Ephemerides, 1639].

[38]. HOP 18/1/2B [Henry More to Hartlib, 12 March 1649].

[39]. The point is made forcibly in Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle and the Experimental Life* (Princeton: Princeton U.P., 1985), p.??