Science Among the Unitarians

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In 1789, the year of the French Revolution, the great enthusiast for pneumatic chemistry Thomas Beddoes broke the dispiriting news to the Birmingham physician William Withering that the "spirit of Chemistry has almost evaporated at Oxford". Beddoes had been appointed Reader in Chemistry at Oxford in 1787, but a university not noted for its warmth towards reformers, had disappointed him. As one in sympathy with the Unitarians, his pejorative assessment of Oxford science epitomises many of the associations historians have made between religious dissent and a fostering of the sciences. It may also remind us of the more acidic remarks of the man who did most to promote the word "Unitarian": for the ancient universities Joseph Priestley reserved such words as "stagnant pools" and "sewers".

The appearance in 2005 of a collection of essays dedicated to *Science and Dissent in England* has provided incentives to re-assess a large literature on relations between the sciences and different forms of religious dissent. Despite many nuances and qualifications, the existence of suggestive correlations survived in that volume and continues to attract attention. In his contribution, Geoffrey Cantor reaffirmed the superiority of the provision for an education in science in the dissenting academies of the eighteenth century compared with that in the English universities, and provided evidence of commendable science teaching in Quaker schools, particularly during the Victorian era. A concern for moral rectitude could find expression in the approval of the natural sciences as a wholesome subject for study, one even capable of diverting young men from the seductions of sensuality.

Respect for the Quakers was transparent in Priestley and the virtues of studying nature were extolled by other Unitarians, particularly those instrumental in founding new institutions for their cultivation. Behind the Warrington Academy was the vision of John Seddon. Behind the Manchester Literary and Philosophical Society lay the energy of Thomas Percival, who also helped in moving the Warrington Academy to Manchester in 1785. Behind the Newcastle Literary and Philosophical Society lay the industry of William Turner. With his eye on nineteenth-century provincial scientific culture, Paul Wood, as editor of *Science and Dissent in England* could refer to a "consensus" that "Dissenters, and especially Unitarians and Quakers, were members of the local elites who controlled the institutions of science in the provinces". In an earlier survey, Jean Raymond and John Pickstone described as "omnipresent" the "continuing linkages of science and Unitarianism". It was Unitarian polymaths such as George Walker and Joseph Priestley who had made science a "central part of Unitarian culture" and "without the Unitarians, most of the provincial scientific societies would have been substantially weaker and several would not have existed".

My purpose in this essay is not to challenge such a consensus but to reflect on the specific role played by Unitarians in the nurture and conduct of the sciences in late eighteenth-century England. Given their high profile in recent discussion, it is reasonable to ask whether (and if so why) there was anything distinctive in what Unitarians brought

to the study of nature. Before grasping that nettle, however, it would be sensible to remind ourselves about some of the problems that stand in the way of too simple an analysis. A preliminary problem has been noted by John Money when he asks where Unitarianism stood in relation to the other constituencies of dissent: "Was it, as usually portrayed, the distinctive fruition, with Warrington Academy to the fore, of that elusive thing, the 'English Enlightenment', in which reason and religion linked arms at the general vanguard of Progress…? Or was it in fact rather more limited and defensive: a response to mounting pressure from other Dissenting elements which remained theologically orthodox and politically as well as culturally conservative?" If the latter, he continues, a continuing dialogue between Unitarianism and liberal Anglicanism may have unsettling implications for cut and dried categories.

Interpreting Correlations

Among the problems that spring to mind when seeking to correlate science with religious dissent are several that were indicated in my own contribution to *Science and Dissent in England*. Historians seeking religious motivations for scientific enquiry have to contend with the sceptical riposte that, with so many professional opportunities denied to Dissenters, the cultivation of the sciences was perhaps one of the few inviting doors left open. A second problem is that the universalist aspirations of scientific knowledge-claims has meant that they have commonly been invoked to transcend and heal religious divisions rather than to flow peculiarly from one or a few dissenting traditions. An additional, related difficulty is that supposedly distinctive features of a particular dissenting movement that might be thought to have created a special relationship with the sciences can turn out to have been shared by other religious belief systems. John Morgan has given substance to this objection with reference to supposedly distinctive, but actually more widespread, characteristics of seventeenth-century puritanism and of seventeenth-century latitudinarianism.

A converse problem also exists. The quest for a distinctive set of beliefs or practices within a specific religious group that might be propitious for the sciences can fail because of too great a diversity of position within the group. Within evangelical non-conformity in early nineteenth-century Britain, one finds many variants of natural theology, each implying a different priority and focus for scientific activity. The clockwork universe of William Paley, so often regarded as paradigmatic, was very different from the progressive creation model of Hugh Miller who saw in the degeneration of species *within* each geological epoch both a reflection and a proof of a fallen world. When carefully selected scientists are presented as typifying the outlook of a given religious group, yet another problem surfaces in that the religious beliefs of scientists have not uncommonly deviated from current orthodoxies, sometimes precisely because of their engagement with or promotion of scientific innovation. This is the difficulty already canvassed with respect to Priestley. Even as a Unitarian was he typical of those on whom he conferred the name?

When Robert Merton advanced his correlation between Puritanism and the expansions of science in seventeenth-century England, he had to concede the existence of a problem that he was unable to resolve: "To what extent did the old Puritans turn their attention to science…because this interest was generated by their ethos, and to what extent was it rather the other way, with those having entered upon a career in

science…subsequently finding the values of Puritanism congenial?" This chicken and egg problem drew from Merton the rather lame comment that both processes were at work but to an unknown extent. The problem is again nicely illustrated by Priestley, for whom the purification of religion would become paramount in a ministerial career for which he had studied at the Daventry Dissenting Academy. As we shall see, he was exposed to scientific literature at Daventry; but it is not clear that this had the effect of directing him towards the scientific studies he would make his own.

How forbidding is this array of problems? Are there no ways to overcome them? The attraction of presenting scientific knowledge as apolitical and therefore prejudicial to party interests has been very great, but it does not preclude the possibility that particular forms of science can also be attractive if they happen to support one's religious preferences at the expense of those to which one is opposed. There is little doubt that in the 1770s Priestley perceived his monistic account of the workings of the mind to have the advantage of jeopardising all the corrupt and dualistic theologies that protected the pre-existence of Christ. The objection that ostensibly distinctive features of a particular dissenting movement deemed favourable to science can turn out to have been shared by other social groups does not preclude the possibility that some distinctiveness might remain. Thus Geoffrey Cantor has uncovered a distinctive form of natural theology among Quakers, reflecting their doctrine of an 'inner light' and permitting an exceptional openness towards, and even enthusiasm for, a natural history (and a science of botany) that interpreted the world as a creation. Nor does the objection undermine the possibility that religious precepts among the shared values might, albeit more generally, be conducive to, or at least compatible with, scientific study. In my earlier account of the historiographical problems, I could not escape the conclusion that respect for the sciences and their promise of amelioration was, at least for a time, central to Unitarian identity. And this could not have been said of Anglican or Methodist identity.

The question of diversification within a group, and whether scientific representatives can be chosen who typify its religious orientation and priorities, is not so easily addressed. Yet the problem does not prevent a biographical study of the scientists selected and an investigation into the connections they may claim or deny for the relevance of their beliefs to their science. In Geoffrey Cantor's studies of Michael Faraday as a Sandemanian scientist and in his recent *Quakers, Jews and Science* are striking examples of the value of pursuing such particularities. Biographical studies should also be capable of deciding Merton's chicken/egg question in individual cases, even if the result is to reveal a complex entanglement, with a partial symbiosis of scientific and religious interests eventually emerging. I believe that, despite the complications, Priestley's trajectory is amenable to such analysis, the monistic and deterministic metaphysics to which he was drawn in maturity proving supportive of both his scientific and religious convictions. With these considerations in mind, let us look more closely at the grounds on which a correlation between Unitarianism and science has been affirmed.

<u>The Basis of Correlation,</u>

Before looking more closely at the kinds of science visible among Unitarians, it is useful to see the links that have been perceived between the prophets of rational dissent and the analysis of nature. One that can easily be missed is the motivation to succeed in science

as a way of establishing an authority in one domain that might add credibility to one's pronouncements in another. As Robert Schofield has pointed out, Priestley took maximum advantage of his reputation as an experimental philosopher to give extra authority to his dissenting theology. And it is not difficult to see how such added prestige would be particularly welcome to those advocating heterodox positions. At the Disruption of the Scottish Church in 1843, the evangelical geologist Hugh Miller made much of the fact that within the new Free Church were scientific luminaries such as John Fleming and David Brewster who had no equal among those left behind.

Fundamental to Unitarian belief was the right to liberty of conscience in religious matters. This belief sat comfortably with respect for the sciences, which could be hailed as paradigms of free enquiry. In the year of the French Revolution Priestley's friend Richard Price formulated three basic principles of revolution: the right to liberty of conscience in religious matters; the right to resist power when abused; and the right to choose one's own governors. In the London Revolution Society, Price was a conduit for correspondence with France, to be described within the Society as "the friend of the Universe". Crucial to the confidence of the Unitarians, especially in 1789, was the conviction not only that their theological position could withstand rational criticism but also that it marked the end result of applying reason to theological claims. Hence the assertion of Raymond and Pickstone that "their Priestleyan model of man, as a knowing and worshipping being, had been central for their science and for their rational theology". The application of reason, which Priestley blithely believed would lead to all humankind eventually agreeing with him, did not entail a rejection of biblical literalism, as one can see from his critique of Swedenborg; but the peculiar confidence of Unitarians in their form of rationalism was to mark them out for special opprobrium. A linkage with science was, however, noted by their critics. In an attack on the Socinians published in 1826, the young Baden Powell would note their assumption that the human mind "enlightened by science in physical things, must be guided by analogy and congruity, and depend upon its own resources in the search after religious truth". It was necessary for Powell to offer a less revolutionary account of scientific rationality, in which dedicated scientific enquiry resulted in caution not over confidence.

Another way of expressing the linkage we have just considered would be to say that among the Unitarians "social progress is in part modelled on scientific progress" and that both scientific knowledge and social improvement were deemed to flourish best where there is free exchange of ideas. State-imposed uniformity, whether religious, intellectual, or economic, was deigned obstructive. In Priestley's vision, scientific progress was not merely a model but was also a vehicle for social and religious reform. In a much cited passage he predicted that "this rapid progress of knowledge … will, I doubt not, be the means under God of extirpating all error and prejudice, and of putting an end to all undue and usurped authority in the business of religion as well as of science". The progress was not *merely* progress. Its increasing rapidity confirmed it was a progress towards an end: "As all things (and particularly whatever depends upon science) have of late years been in a quicker progress towards perfection than ever; we may safely conclude the same with respect to any political state now in being". For an apostle of rational dissent to remove the disadvantages suffered by dissenters was an ever-burning priority. Not only that but science and a purified, rational Christianity would fight on the same side in their battles with superstition. Not surprisingly

persuasive parallels have been drawn between Unitarian millenarianism and secular utopias. A common view among the Unitarians was expressed by William Turner: God is "the merciful Parent of the Universe, who never meant anything but the happiness of his creatures". Jesus Christ was prophet and teacher rather than redeemer. Repentance was required of the rational Christian in order to secure heavenly bliss; but as Derek Orange observed, "it was an optimistic view, consistent enough with the fashionable secular utopias of the time". In Turner's Newcastle congregation Orange found the distinction between sacred and secular "obscure". The religious quest "passed naturally into intellectual inquiry".

The prominent motif of improvement, so clearly visible in Priestley, was nevertheless grounded in a doctrine of Providence that had profound moral connotations. "As a millenarian Christian and an Enlightenment reformer", writes John McEvoy, "Priestley viewed society, nature, and history as a nexus of improvement, designed by God to generate good out of evil". An example from within the religious sphere would be Priestley's specification of criteria for achieving a continually improving translation of the Scriptures. It would be difficult to claim that a preoccupation with 'improvement' was uniquely a prerogative of dissenters, but recent studies seem to confirm that in those coffee houses and societies where an ideology of scientific and technological progress took hold, dissenters were disproportionately represented and Unitarians especially so. In his study of the Coffee House Philosophical Society, which met from 1780 to 1787, Trevor Levere has noted the incorporation of members from the Lunar Society of Birmingham, which helped to set the tone: "The significance of the election of industrialists and radicals is confirmed by the prominence with which the practical applications of science, including industrial processes, featured in the discussions held within the new Society". Other commentators have spoken of a "culture of invention". In Josiah Wedgwood, member of both societies and emblem of the 'potteries', there is an epitome of the correlations we have identified so far. In July 1789, when the Bastille fell, he rejoiced in "the glorious revolution which has taken place in France". To Erasmus Darwin he wrote that "the politicians tell me that as a manufacturer I shall be ruined if France has her liberty, but I am willing to take my chance in that respect, nor do I yet see that the happiness of one nation includes in it the misery of its next neighbour". Darwin, more a pantheist than a Unitarian, agreed. Among the Unitarians, as Orange so tastefully put it, Britain's industrial revolution was taking place not behind God's back but at his express command.

Correlations between Unitarianism and science have, of course, been strengthened by the fact that Newton's magisterial achievement had been associated with a robust monotheism and a rejection of the Trinity that eventually brought him to conclusions verging on Socinianism. In what Stephen Snobelen describes as a "dual reformation", in which Newton endeavoured to purify both natural philosophy and religion, there are striking respects in which Newton's commitment to the unity of nature resonated with a belief in the one true God who was not only omnipresent within, but also exercised dominion over, nature. The drive to unification was manifest on so many levels: in his insistence on an ultimate unity of matter, in unifying terrestrial and celestial physics, in his commitment to the universality of his law of gravitation and in emphasising simplicity as a regulative principle for the exegesis of both nature and Scripture. Belief in the unity of the Godhead is, of course, affirmed in Trinitarian Christianity too, but in

Newton it had traction and real consequences as part of his drive to remove corruption and idolatry.

There were links between Newton and Priestley, not only in their zeal for religious reform but in Priestley's inauguration into science. Newton's *Opticks* was one of the texts he studied at Daventry, reminding us of the correlations that have been asserted via the educational advantages of the Dissenting Academies. To read Priestley's *Journal* is to enter what can seem a strange place as he repeatedly tells of cut- up cats and what to modern sensibilities might seem an incongruous merriment:

> [Mon 14 Oct] Were very merry. Newton's *Optics*; Middleton's *Discourses*. Altered and transcribed a great part of my sermon upon *The perfection of Christian morals*. [Tue 15 Oct] Afternoon, dissected a cat. Everything succeeded very well. Pelted one another with the parts. I threw a [piece of] carcass into Jackson's face, and he emptied a chamber pot upon me.

So much for the correlation between Puritanism and science! And yet, to be serious, in the space of eight months, Priestley added to voracious reading in theology and philosophy major texts in mathematics and the sciences, including works on anatomy, calculus, algebra, geometry, optics, natural philosophy, and under the category of 'arts and sciences' what was then called 'useful knowledge'. Of one who was eventually to be disparaged as "half a Mahometan", it is interesting to note that his studies at Daventry included a complete reading of the Qu'ran.

Encouragement to study the lectures of Benjamin Martin on Newtonian philosophy may have contributed to an intellectual formation in which he would later reflect on different styles both of science teaching and natural theology. As Simon Schaffer has observed, Priestley appears to have reacted against the practice of those itinerant science lecturers who would captivate their audiences by exposing and manipulating natural powers, electricity for example, as if they themselves were custodians and mediators of God's immediate power. Priestley would prefer a less flamboyant form of intellectual display in which theological capital was made from the rationality of creation, understood as an integrated system. This was a genre of natural theology in which there could be significant connections between a theological and a scientific impulse. If nature was really a rationally designed system, there had to be mechanisms of restoration, to obviate for example the cumulative fouling of the air as a consequence of breathing. His pioneering work on the restorative effects of vegetation can be interpreted as having been sustained by his rational theology. To his friend Theophilus Lindsey who was to be minister of the first Unitarian Chapel, in Essex Street London, Priestley proudly announced in August 1771 that "I have discovered what I have long been in quest of, *viz*, that process in nature by which air, rendered noxious by breathing, is restored to its former salubrious condition".

Apologias for the utility of science in the eighteenth century took many forms but it was clearly possible for Unitarian thinkers to identify with its practical applications, its emancipatory (even revolutionary) possibilities, its morally wholesome features, its correctives to superstition and its offering a rational route to knowledge of the Creator's power. Priestley's work on respiration, however, takes us into the domain of specific scientific enquiry. So let us look more closely at the kinds of science undertaken by Unitarian reformers.

Science among the Unitarians

In this section I simply wish to review some of the branches of science in which Unitarians were active. Again it is difficult not to focus on Priestley whose contributions included a theory of matter and force that ran counter to prevailing wisdom, an exploration of different 'airs' (we would say gases) having distinctive properties, a metaphysics for neurophysiology that helped to establish David Hartley's physical basis for the association of ideas, and a monistic account of mental operations that allowed him to abandon the immortal soul. This was not to abandon belief in a future life because for Priestley a correct theology stressed the resurrection of the body, a doctrine that provided the only ultimate incentive for reformation of character and the only ultimate basis for social control.

Priestley was attracted to a concept of matter in which it was deconstructed into attractive and repulsive forces. He credited his contemporary John Michell with the recognition that it was not possible to give a coherent account of the internal cohesiveness of blocks of matter without postulating an "immaterial, spiritual and penetrable mortar". As Priestley developed the idea, matter and spirit ceased to be ontologically distinct and were fused into something new. Whether one called this matter or spirit did not matter to Priestley as long as it was made clear that it did not correspond to traditional conceptions of either. The case Priestley made for his understanding of substance has been neatly summarised by Schofield:

> Attraction and repulsion, rather than solidity or impenetrability, are what make matter what it is. The power of repulsion resists but does not prevent penetrability. The phenomena of optics, electricity and magnetism, etc., demonstrate that there are spheres of attraction and repulsion within one another. The limits between spheres of attraction and repulsion are not places where there are no forces, but where forces balance each other as equal weights do in a balance.

In his mature work, the *Disquisitions relating to Matter and Spirit* (1777), the connections between Priestley's dynamic theory of matter and his Unitarian polemic are so explicit that it would be difficult to disentangle them. His monistic treatment of matter and spirit underpinned his unitary account of the human person and allowed him to complete his critique of pre- and post-existent souls, which had so corrupted a primitive Christianity.

A science that lent support to Priestley's material immaterialism was chemistry, since one could demonstrate, as in the case of acids and alkalies, that the properties of a compound need not be found in its parts. In Priestley's well-known work on gases, there was also support. By materially capturing different 'airs' and focussing on their different properties, he was able to expel a vocabulary of 'spirits' that had traditionally pervaded the science. To some degree Priestley also illustrates that 'culture of invention', to which reference has been made – at least in his vision of how his different gases might be used. His 'fixed air' in solution was not without commercial promise. As he boasted to one correspondent: "I can make better [mineral water] than you import, and what cost you five shillings will not cost me a penny". It was also volunteered as a possible remedy for scurvy. His 'nitrous air' (our nitric oxide) held promise as a preservative. He reported to

Alessandro Volta in June 1777 that "yesterday we ate a pigeon which I had kept in nitrous air near six weeks". It was "perfectly sweet and good", though "the water in which it had stood was very putrid". French balloonists would acknowledge their debt to Priestley, who in conversation with fellow members of the Lunar Society, would doubtless have approved a more mundane use for the air-borne vehicle: to carry manure uphill. Even the gas with which he is most associated, his 'dephlogisticated air' (Lavoiser's 'oxygen') was envisaged as an affordable luxury.

Reference to dephlogistication reminds us of the theoretical framework within which Priestley worked and one he would not surrender to Lavoisier. To see a direct entailment from his religious mission to the phlogiston theory would surely be simplistic. There are, nevertheless, respects in which his commitment to phlogiston might also reflect a strong commitment to the unity of nature. At the simplest level phlogiston, as a principle of metallicity and combustibility, could be used to explain why certain substances had properties in common. The concept was also unifying in the sense of being a common explanatory resource for a wide range of phenomena. One of many examples discussed by Schofield concerns the ingestion of food: "Animals ate materials containing phlogiston, transforming it, possibly by the vibrations Hartley supposed to occur in the brain, into the form of electric matter that was then directed by the nerves into the muscles, where it caused muscular motion". Though the thesis has been contested by McEvoy, Schofield has proposed another respect in which Priestley's metaphysics predisposed him against Lavoisier's oxygenic principle. Lavoisier's system required a multiplication of elements and embraced what Schofield calls a "material pluralism in science". This included a multiplication of imponderable fluids, such as caloric, as well as a multiplication of elementary substances. Priestley, less enamoured of Lavoisier's operational definition of elements, was more engrossed by the ultimate nature of matter on which, as we have seen, he held a distinctive view. While McEvoy has protested that this makes Priestley too much a Newtonian, Priestley's willingness to transpose matter into forces ultimately owed something to Newton's *Optics* with its affirmation of action at a distance.

One of the Unitarian protagonists of the Manchester Literary and Philosophical Society, Thomas Henry, was particularly concerned with the uses of science, recommending to manufacturers the value of chemistry and an understanding of mechanical powers. Within the Lunar Society, Priestley had aided Wedgwood through the analysis of clays. But if chemistry was a science of particular interest to Unitarians, this was due in large measure to its medical uses. This was true for another Manchester Unitarian, William Henry, who on his return from Edinburgh practised as a doctor and managed the family magnesia business. This is the Henry whose 'law' of partial pressures (that in a mixture of gases each would dissolve in water to an extent determined by its pressure alone) was to inform the atomic modelling of John Dalton. The interest in pneumatic chemistry has to be set in a context where prevailing theories of disease focussed on the damaging effects of unclean, contaminated air, a theory given prominence by John Pringle, the President of the Royal Society who, when presenting Priestley with the Copley medal, sang his praises as one who had shown that "not a single vegetable grows in vain". From a study by Christopher Lawrence, we know that doctors drew on Priestley, the most colourful perhaps being Thomas Beddoes with whom I began, who set up a short-lived 'Pneumatic Institute' in Bristol where the curative

properties of gases were vigorously advertised, and where the young Humphry Davy enjoyed his induction. Beddoes dangled before his clients the prospect of cures for syphilis, scurvy and consumption. As both Trevor Levere and Larry Stewart have emphasised, pneumatic medicine was widely associated with radical reform, Edmund Burke pursuing chemical metaphors in his depiction of the enemy: "Churches, play-houses, coffee-house, all alike are destined to be mingled, and equalised, and blended into one common rubbish; and well-sifted, and lixiviated, to crystallize into true, democratick, explosive insurrectionary nitre". Beddoes enjoyed the support of James Watt who came to his aid when more elaborate apparatus was needed to control precisely formulated atmospheres. And even if they rarely recovered, his patients sometimes expressed a sense of relief, as did the young son of a Dr. Crump who "used frequently to ask … for some of Dr. Beddoes breath".

For a more lasting contribution to an emerging new science, it is instructive to return to Priestley because it is not an exaggeration to say that the theological and metaphysical principles that underpinned his monistic understanding of the human person created the space for a science of the brain that would soon be occupied by investigators less steeped in the corruptions of Christianity. In a recent doctoral dissertation, Huw Price has complemented the work of Fernando Vidal, in showing how Unitarian critiques of the pre-existence of Christ, when coupled with assaults on the immortal soul, made it possible to associate the act of thinking with bodily processes and the functioning of the brain in particular. Whereas dualistic ontologies tended to place limits on such development, Priestley's monistic and mortalistic accounts of the relation between body and mind made it possible for Priestley to infer, in his *Free Discussion of the Doctrines of Materialism and Philosophical Necessity*, that "the business of thinking is wholly carried on in, and by the brain itself, because all the effects from which we infer the faculty of thinking can be traced to the brain, and no farther". His rhetoric culminated with the opinion that "there is just the same reason to conclude that the brain thinks, as that it is white, and soft".

The brain thinks. How modern Priestley seems to a world in which it is no longer people but their brains who become the subject of sentences. Nor were these references to brain location isolated. Priestley predicted that "whenever we shall be able to deduce the powers of a magnet from the other properties of iron, we may perhaps be able to deduce the powers of sensation and thought from the other properties of the brain". This is not of course to say that all Unitarians were monists. Priestley had had to part company with David Hartley in this respect in his 1775 edition of Hartley's *Observations on Man*. But it does mean that a forceful Unitarian agenda could engender a proto-neuroscience. And because, in Priestley's view, it was mere superstition to believe in any direct influence of the divine on the human mind, and indeed on any part of the machinery of nature, it has been possible to say that Unitarians laid the foundations for what later became known as scientific naturalism.

The problem with Priestley

In this closing section I wish to return to a problem that has been latent throughout this discussion. How typical was Priestley and can he be used to characterise Unitarian conceptions of science and scientific conceptions? The problem is acute because one of his closest friends, Richard Price, took a stand on metaphysics, theology and the nature of

matter that differed profoundly from Priestley's, giving rise to a debate that Priestley himself made public. In the other domains we have considered, chemistry and an incipient science of the brain, one could be progressive without accepting Priestley's prescriptions. Rational dissent, as a multiform religious movement embraced Arians (who might still believe in the pre-existence of Christ), Socinians, deists and cryptodeists, making clearly defined correlations difficult. If Unitarianism meant the freedom of the individual to strip religion of the irrational, then it had the propensity to dissolve itself as believers determined for themselves what they could not believe.

With reference to matter theory, Price claimed the authority of Newton for an emphasis that contrasts sharply with that of Priestley. For Price matter was unequivocally passive, constantly subservient to a divine will and presence. His recourse was to the Newton who had told Richard Bentley that powers such as gravitation were not innate to matter. For Priestley attraction and repulsion were properties, the only properties, of matter. As John Stephens has shown, Price's understanding of matter reflected a more conservative understanding of Providence and a dualistic ontology. Referring to the elasticity of Newton's aether, Price described it as a property that "supposing to exist, must be derived, not from any powers of self-motion in the matter of this aether, but from the constant agency upon it of an intelligent and omnipresent spirit". Price also enlisted Colin Maclaurin's account of Newton for his purposes. Maclaurin had written that "the laws`of nature are constant and regular, and for aught we know, all of them may be resolved into one general and extensive power, but this power itself derives its properties and efficacy not from mechanism, but in great measure from the immediate influences of the first mover". This was only one of several major theological differences between Price and Priestley and it clearly affected their respective concepts of matter. Price was particularly scathing about Priestley's line on solidity to which he objected: "Two equal solid bodies moving towards one another in contrary directions, and with equal velocities, will meet and impinge and stop one another; but if *unsolid* they would not act at all on one another, but pass through one another, just as if there had been nothing in the way". Price was repelled by Priestley's dependence on repulsion.

Conversely, the dynamic account of matter that Priestley developed was shared by scientists having theological positions as different from his own as from each other. The similarity between the physics of Priestley and that of Boscovich has often been noted but the Croation Jesuit was outraged when he found it manipulated by Priestley into an assault on the soul. Looking ahead, an ontology of attractive and repulsive forces would be championed by Michael Faraday, who as a Sandemanian, belonged to a conservative Protestant biblical sect. Clearly correlations must not be transposed into relations of entailment.

Turning to chemistry, it is not to demean Priestley's achievements to note that the ontology in which the next major conceptual breakthrough in chemistry was made was not Priestley's own but was more akin to the Newtonianism of Price. I am thinking of John Dalton's atomic theory, which had its origins in Newton's models of *particles* and their associated attractive and repulsive forces. The idea that in a mixture of gases the particles of each gas repelled only those of their kind was conjectured by Dalton to be an explanation of Henry's law of partial pressures and eventually led to the idea that the atoms of each element had their characteristic weights. Dalton's depiction of atoms with symbols that spoke of solidity and materiality cut across Priestley's presuppositions.

One of perhaps few admirers of Priestley who fully understood his position was the young Samuel Taylor Coleridge. Priestley's holistic understanding of chemical compounds was attractive to Coleridge who at the time of the French Revolution shared the zeal and optimism of Lindsey, Priestley and Price. But a holistic approach to chemical composition could also sit comfortably with a more reactionary culture, as it did with Humphry Davy's appeal to gentility at the Royal Institution. One of Davy's objections to the chemistry of Lavoisier was its reliance on material principles, oxygen itself having been misconstrued as a principle of acidity. Davy is sometimes credited with having replaced an oxygen with a hydrogen theory of acidity, but it is more accurate to see his critique as an anti-reductionist protest. The laughing gas that Davy so famously administered was itself proof that compounds were more than the sum of their parts because the different combinations of nitrogen with oxygen produced gases of strikingly different properties. To inhale one was to be inebriated; to inhale another was to choke to death. The point is that a philosophy of chemistry which in Priestley was allied with radical reform could so easily, in the aftermath of and reaction to revolution (which did so much to damage the Unitarian cause), be domesticated and aligned with vitalistic principles. As Davy recalled in his *Consolations in Travel*, "the doctrine of the *materialists* was always, even in my youth, a cold, heavy, dull and insupportable doctrine to me, and necessarily tending to atheism".

Priestley may be assigned the credit for asserting that it is the brain that thinks, but a neuroscience does not have to presuppose such a seemingly reductionist account of the human person. Priestley's inspiration stemmed in part from David Hartley whose primitive but pioneering account of mental functions had not precluded a spirit component in humankind nor a conviction that the association of ideas was a divinely designed mechanism. But it is again in the reaction of Richard Price that one sees how Unitarians could be poles apart on absolutely fundamental issues. Priestley himself summarised one difference between them: "he supposes that the powers of perception and thought reside in an immaterial substance, but that the exercise of these powers is made to depend on the organization of the body; whereas I suppose these powers to reside in the organized body itself, and therefore *must* be suspended [upon bodily death] till the time when the organization shall be restored". On other theological points there were marked differences, Price affirming that the individual mind participates in the Divine Mind. Such intimacy was denied by Priestley who excluded intercourse between divine and human minds. Contrasts have also been drawn between their respective millennialism and between the determinism of Priestley and he libertarianism of Price. Of one thing we can be sure: Priestley's importation of chemical language into theology as well as politics was typical of no-one but himself. On the vital subject of Resurrection, he and Price begged to differ. For Priestley there was no problem with the merging of science and religion: "Death, with its concomitant putrefaction and dispersion of parts, is only a *decomposition*; whatever is decomposed, may be *recomposed* by the being who first composed it; and I doubt not but that, in the proper sense of the word, the same body that dies shall rise again". As Fernando Vidal has noted, an earlier chemist, Robert Boyle, had already rejected that equation. Price had his own objection: "it is … implied that the men who are to be raised from death, will be the same with the men who have existed in this world, only as a river is called the same, because the water, though different, has followed other water in the same channel…Did I believe this to be all the

identity of man hereafter, I could not consider myself as having any concern in a future state".

Priestley has so often been used to typify the connections between Unitarianism and science, but in Price's judgement` he would be unlikely to be recognised in heaven.