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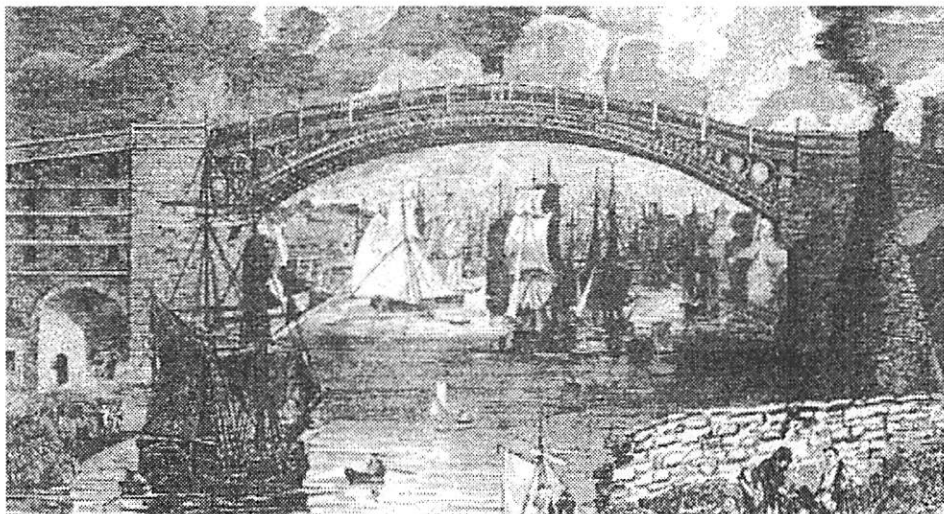
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THE SECOND IRON BRIDGE

S.T. Miller



Bridge over the Wear, near Sunderland, built 1793 - 6 mainly from Paine's design

THE rapidly growing importance of the town of Sunderland, by the end of the 18th. century, is reflected above all in the coal export figures recorded in the Order Books of the River Wear Commission. The decade 1749-1758 saw the export via the Wear of 1,500,000 chaldrons (Newcastle chaldrons), but by the decade 1789-1798 this total had risen to 2,900,000 chaldrons, i.e. doubling.

However, the further development of the town was hampered by the absence of a bridge across the river at that point. Sunderland was, in fact, divided into the 'barary coast' of Monkwearmouth on the northern side and Bishopwearmouth and Sunderland on the southern side. It is more usual in the late 18th century to talk of 'Sunderland and the Wearmouths'. The river could only be crossed by ferries (there were two ferries, the Panns ferry and the very ancient Sunderland ferry which did not end till 1957, and whose establishment may have been coeval with that of the celebrated Monastery of Monkwearmouth. It may well be that the only serious mishap ever recorded as befalling the Sunderland ferry may have added impetus to the drive towards a bridge, for in the late 18th century, on a Sunday evening, the ferry overturned in mid-stream and twenty-two people were drowned) and fords higher up the river and the medieval Chester bridge. Nor was there a decent through road to Newcastle - Sunderland was unkindly regarded as being on 'the road to no place'.

The problem was obvious enough as were the advantages to be gained by local business from a bridge. In 1790 a committee had been set up to look at the problem of the local ferry and arrived at the conclusion that a stone bridge should be set up. Yet this could be no solution since it would require supporting piers, and this would obstruct the considerable river traffic in coal which underpinned the prosperity of the town.

An answer to this was offered by Rowland Burdon. Born in 1756, he was the tenth in descent from Thomas Burdon of Stockton who had flourished in the reign of Edward IV.

His father prospered as a member of the Company of Merchant Adventurers of Newcastle and purchased the manor of Castle Eden. Rowland junior succeeded his father in 1786 and was also returned as member of Parliament for the County in 1790 in an election fought against Sir John Eden and Ralph Milbanke (the father of Lady Byron). Indeed he represented the County as a moderate Tory in three successive Parliaments between 1790 and 1806 and only retired in the latter years owing to 'circumstances over which he could exercise no control' which made him 'the victim of misplaced confidence' (in fact all his assets were lost in the crash of the bank of Messrs. Surtees and Co. which came in 1803). But Burdon was no 'mere country gentleman'. As well as being an accomplished scholar and modern linguist he had also studied architecture under Sir John Soane. He was also directly concerned in the problem of bridging the river because this would continue his Stockton-Sunderland Turnpike and an extension to Newcastle and South Shields would follow. In general there is every reason to believe that he was a leading figure in local commercial circles ('He did not cut a shining figure as an orator, but as a practical man of business he stood second to none, and as a commercial man he was known and respected by the wealthier merchants of Tyne, Wear and Tees...').

Burdon proposed that an iron bridge should be constructed in a single span, and his proposal was accepted. The foundation stone was laid on the north side on September 24, 1793 (an inscription on the foundation stone began: 'At the time when the mad impetuosity of the French nation eager for what was wrong disturbed the nations of Europe with iron war, Rowland Burdon Esq., desirous of better things, determined to join together with an iron bridge the rocky and steep banks of the Wear...') The work was also dedicated with the motto *Nil Desperandum Auspice Deo*, and it is recorded that many years after the completion of the bridge a non-latinist clergyman was asked to explain it, and knowing the Paine claim to the design, confidently translated it as, 'This desperate job was the work of a Deist!') and Thomas Wilson ('an ingenious native') was appointed to construct it. 'It was opened for the accommodation of the public' on August 9, 1796, by Prince William of Gloucester escorted by a procession of local masons (as a precaution, 1000 locally stationed soldiers marched across it first), the 'splendid shew...afforded the highest gratification to... 50000 persons. 'The 'brass' then retired to the Phoenix Lodge to regail themselves with an excellent cold collation' while 'apposite toasts were drunk, several excellent songs were sung and the day was concluded with true hilarity and genuine mirth'.

The occasion was marked by the usual flurry of broadsheets and ballads, of which one may be singled out for its topicality if nothing else:

*Ye sons of Sunderland with shouts
That rival oceans War,
Hail Burdon in his Iron Boots
Who strides from shore to shore.
Oh may he firm support each leg
Oh much, oh much, we fear
Poor Rowland may outstretch himself
In striding across the Wear.
A Patent quickly issue on
Lost some more bold than he
Should put on larger Iron Boots
And stride across the sea.*

*And let us pray for speedy peace
Least Frenchmen should come over
And following Burdon's iron plan
From Calais strike to Dover.*

The bridge consisted of six ribs of 5ft distance apart. There was a superstructure of planking to provide the base for a McAdam type road. The whole width was 32ft with a paved footpath on each side, an iron palisade and lamp posts at intervals. The bridge weighed 900 tons (the first Iron Bridge weighed only 378 tons) of which 260 tons were iron (only 46 tons of which was wrought). The span was 236ft (an immense advance on the 100ft of the first Iron Bridge) and it was a segment of a circle about 440ft in diameter. The whole thing cost £32,414. 19s. 7d., of which Burdon subscribed £30,000 (the first Iron Bridge cost a mere £6,000).

The expense of the bridge was broken down for 1792-7 in a parliamentary return at the time by Mr. Warn, MP., as follows:

	£	s	d
Expense of obtaining Act of Parliament	687	2	5
Consulting architects	695	15	10
Incidental expenses	192	8	10
Purchase of ground on north side	529	0	6
Purchase of houses	202	5	5
Cost of stones and lime	5450	11	1
Cost of timber	1966	8	8
Wrought iron	2112	0	11
Cast and wrought iron for arch	4018	3	5
Surveyors salary	1000	0	0
Assistant surveyors salary	192	18	0
Clerk and Treasurer	150	0	0
Wages to Masons and Laborers	10735	11	5
Cost of Floats, Boats and Ropes, etc.	1375	1	0
Incidental expenses	407	13	4
<u>Interest paid to subscribers</u>	<u>2699</u>	<u>18</u>	<u>9</u>
Cost of bridge	£32,414	19	7
Purchase of Panns Ferry	1600	0	0
Low expenses	622	19	4
Purchase of the Ferry	6300	0	0
<u>Low expenses</u>	<u>362</u>	<u>1</u>	<u>1</u>
Cost of bridge and ferries	£41,300	0	0

The bridge was the subject of considerable praise at the time because of the novelty of its method of construction, its elegance and its scale (indeed it would seem that it was the biggest single arch bridge of its day). In 1818, Sir J. Brunel, in a report to the bridge Commission, said, 'At the first sight of this extraordinary fabric I could not withhold the tribute of praise which the projectors and promoters of the scheme are so justly entitled to, for the boldness of the designs, for the magnitude of the enterprise, considering the time it was suggested'.

Sir Robert Stephenson described it as 'a noble and splendid structure which has no parallel in this or any other country'.

A complication must now be introduced to a hitherto straight forward story. In 1785, Thomas Paine had designed an iron bridge to span the Schwykill river near Philadelphia without piers because 'The vast quantities of Ice and melted snow at the breaking up of the frost in that part of America render it unpractical to erect a Bridge on Piers'. He intended the bridge to be of 520 tons of iron '....to be distributed into thirteen Ribs, in

commemoration of the thirteen United States, each Rib to contain forty tons...'

In June 1786 he sent Benjamin Franklin a model bridge made of cast iron bars and produced later an elaborate model that would bear the weight of three men. The State Authorities of Pennsylvania, however, were not interested, nor were the French forthcoming with any practical support, Paine having submitted his scheme to the French Academy of Science in 1787. He also sent a copy of his plan to Sir Joseph Banks at the same time for it to be shown to the Royal Society.

In 1788 Paine patented his design in London (Specification of Patents No.1667) and decided to go ahead with production himself. He had, in fact, to be satisfied with a sample rib of 88ft (moderating his ambition with 'a little common sense') by the brothers Walker of Rotherham (the very same firm which had manufactured Burdon's bridge). He tested this section for both strain (it withstood a weight of 6 tons of pig iron - twice its own weight) and for the stresses of changes of temperature. In pieces it was as portable as bars of iron, and when it was dismantled was 'stowed away in a corner of a workshop where it occupied so small a compass as to be hid away among the shavings'.

In June 1789 Paine prevailed on the Walkers to produce a bridge of 110ft span with five ribs to be erected across the Thames, then sold. By May 1790 the parts were cast and shipped, however, Paine's backer, the American Peter Whiteside, went bankrupt and the bridge was constructed as an exhibition work on Leasing Green, Paddington, with a shilling per head charge to view it. Paine recorded in a letter to Sir George Stainton 'that it is so much visited and exceedingly admired by the ladies, who, tho' they may not be so acquainted with mathematical principles are certainly Judges of Taste!'

In Britain the reaction to his inflammatory rejoinders to Burke's *Reflections*, and the attractions of France, led to Paine's flight and the bridge was left in the hands of his creditors.

The two tales now become extricated. According to M.M.Rix, who follows the normal line of development, Rowland Burdon knowing that they 'were going begging purchased the posts of Paine's bridge and in 1793 set about adapting them to their new site'. The argument in favour of Paine was continued recently by Tom Corfe, the latest historian of Sunderland ('they made use of plans...devised by the famous radical Thomas Paine...'), and a recent biographer of Paine, Audrey Williamson, who states, '...the materials of Paine's bridge and most of its principles were used to erect a bridge over the River Wear near Sunderland'. No one has ever argued that Paine came to Sunderland and constructed a bridge, but it is usually claimed that he designed the bridge, or at least his design and the pieces of his bridge were pirated by Rowland Burdon. These claims, however, were opposed, especially by Burdon's son. In the 19th century and to this day there is a strong tradition in Sunderland that Burdon was the victim, that he designed and constructed the bridge and that the credit was stolen by Paine, or stolen for him.

It does not appear that the evidence for either of these claims has ever been seriously examined. This evidence can be usefully examined in three parts. There is largely hearsay evidence of observers, and there is the evidence of the initial specification of patents.

Indeed there was considerable contemporary belief that Burdon was the designer as well as the constructor. The *Encyclopedia Britannica Supplement* of 1803 concluded its entry under 'Arch' by commenting on the Wearmouth Bridge, 'The inventor and architect is Rowland Burdon Esq., one of the representatives of that county in the present Parliament'. Thomas Bowdler, in a paper read before the Royal Society in 1797 remarked:

'Iron bridges have indeed been built in Coalbrookdale and in other places, but they were on the system of wooden arches rather than of stone. A plan for an iron bridge on a new principle was also invented by Mr. Thomas Paine, and exhibited some time ago near Paddington, but any person who examines that plan will perceive that it differs very essentially from the arch at Wearmouth...'

A Minute of the *Proceedings* of the Commissioners of the Bridge expressed thanks to Burdon, '...for his liberality to the public in constructing the bridge upon principles for which he, as inventor, has a patent, without accepting any pecuniary consideration for the patent right'.

The *Gentlemen's Magazine* in 1796 felt that, '...it is proper that the public should be informed that R. Burdon Esq., is not only the inventor of the principle on which the bridge was erected, but the patron by whose munificence it has been chiefly carried into execution'.

Finally, Surtees in his *History of Durham* says that 'the use of iron had already been introduced in the construction of the arch at Coalbrookdale, and in the bridges built by Paine, but the novelty and advantage of the plan adopted at Wearmouth on Mr. Burdon's suggestion consisted in...., etc.'

Then gradually the name of Paine replaces that of Burdon (although Audrey Williamson points out that as early as 1812 Professor Charles Hutton in his *History of Iron Bridges* praises Paine's work). At first the claim is that the material used were those of Paine's bridge, but by 1858 the *Quarterly Review* had dropped Burdon's name out altogether (indeed the *Review* not only attributes the bridge to Paine, it also attributes it to him in terms of Burdon's patent speaking of 'framed iron panels radiating towards the centre in the form of voissours'. Other commentators, including Rix, not only give Paine the credit but also go on to describe the bridge using the detailed figures attached to Burdon's patent, thus implying either that Burdon's patent was 'lifted' from Paine, or, more likely, an ignorance of Burdon's patent. A small work published by the SPCK on bridges which had also given the credit to Paine was especially irritating to Burdon's son, 'This I regard as the unkindest cut of all. That my father who was an excellent Churchman, should be thus treated by that venerable society, while Paine the infidel, is promoted to the place of honour, is at any rate to the credit of their liberality, so often called in question, though it may be somewhat at the expense of their accuracy of statement...'

This process was probably helped, as Burdon's son claimed, by the fact that after the loss of his fortune Burdon 'resigned himself thence forth quietly to that retirement which his straightened means had forced upon him. No wonder the public heard little of him afterwards', and because he was a country gentleman 'and that therefore there is great antecedent improbability that one of that class should have hit upon anything remarkable... To escape this difficulty the invention has been tried first on Wilson, then on Grimshaw, the only other parties concerned in the building of the bridge, and, these failing, it has finally been fitted upon Tom Paine. Wilson had been a school master, Paine a staymaker - my father, unfortunately was a country gentleman'.

This sort of evidence cannot be conclusive because we have no way of knowing on what information these judgements are based.

Further 'circumstantial evidence' that has been adduced against Paine is that he was not the sort of man who would quietly have submitted to the stealing and exploitation of his own design. Miss Williamson does point out, reasonably, that during the building of

the bridge Paine was in the Luxembourg Prison and in no position to be acquainted with events in Sunderland. On the other hand, Sir Robert Smyth, a banker living in France and Paine's friend, did challenge, at the time, the right of Paine to claim compensation, but although Paine returned to America in 1802 he never pressed his claim.

It could also be argued, circumstantially, that the Patents Office, even in the eighteenth century, was unlikely to allow patents for two bridge designs which were substantially the same.

Both Paine and Burdon took out patents, the former in 1788 (No.1667), the latter in 1795 (No.2066). Obviously the problem should, in theory, be resolved on examination of the specifications and, indeed, despite the availability of a number of 'red herrings' and problems of interpretation, this is decisive.

Burdon's specifications are very precise. The title itself is a good indication of the method, *Application of Metal Blocks to the Construction of Arches*. He describes the method of construction clearly:

'...my invention consists in applying iron or other metallic compositions to the purpose of constructing arches, upon the same principle as stone is now employed, by a subdivision into blocks easily portable, answering to the keystones of a common arch, which being brought to bear on each other, gives all the firmness of the solid stone arch, whilst by the great varieties in the blocks and their respective distances in their lateral position, the arch becomes infinitely lighter than that of stone, and, by the the tenacity of the metal, the parts are so intimately connected that the accurate calculation of the extrados and intrados, so necessary in stone circles of magnitude is rendered of much less consequence.'

The cast iron blocks (known in engineering terminology as 'voussoirs') were to be of 5ft depth, 4 inch thickness, with a middle arm of 2ft length, and the top and bottom arms in such proportion as to make each block a segment of a circle. These blocks would then be fixed by means of malleable iron tie rods to form ribs (in the Sunderland bridge each rib included 105 blocks). The ribs would be joined and supported laterally by hollow tubes six feet in length and four inches in diameter.

Paine's specification for *Constructing Arches, Vaulted Roofs and Ceilings* are, on the other hand, confused to some extent by analogies he uses. 'The idea and construction of this arch is taken from the figure of a spiders circular web of which it resembles in section and from a conviction that when nature empowered this insect to make a web she also instructed her in the strongest mechanical method of constructing it.. Another idea, taken from nature in the construction of this arch, is that of increasing the strength of matter by dividing and constructing it and thereby causing it to act over a larger space than it would occupy in a solid state, as seen in the quills of birds, bones of animals, reeds, cones...'

Burdon's son comments wryly that this language could embrace not only Burdon's bridge but also the catenary of the suspension bridge (spiders web) and tubular bridges (quills of birds, etc.), 'Yet we presume Mr.Stephenson will not feel much uneasiness lest in succeeding generations the bridge over the Menai or St. Lawrence be attributed to the genius of Tom Paine, whilst his own name is struck out of the roll of inventors and consigned to oblivion (Robert Stephenson did, according to Burdon's son, write a letter to Burdon's brother stating that the two patents were clearly different).

However, it is clear from further reading that Paine's concept was different, since he goes on to say:

'The curved bars of the arch are composed of pieces of any length joined together to the whole extent of the arch and take curvature by bending. Those curves, to any number, height or thickness as the extent of the arch may require, are raised concentrically one above another and separated, when the extent of the arch required it, by the imposition of blocks, tubes and pins, and the whole bottled close and fast together (the direction of the radius is best) through the whole thickness of the arch, the bolts being made fast by a head pin or screw at each end of them. This connection forms one arched rib, and the number of ribs to be used in proportion to the breadth and extent of the arch and those separate ribs are also combined and braced together by bars passing across all the ribs and made fast thereto above and below, and as often and wherever the arch, from its extent, depth and breadth, requires'.

Further information as to the design is given by Paine in a letter to Sir George Stainton:

We soon run up a Centre to turn the arch upon, and begin our erection... *The raising an arch of this construction is different to the method of raising a stone arch. In a stone arch they begin at the bottom and work upwards meeting at the crown. In this we begin at the crown by a line perpendicular thereto and worked downward each way. It differs likewise in another aspect. A stone arch is raised by sections of the Curve, each stone being so, and this by concentric curves.*

In fact Paine's project was more appreciative of the potentialities of iron than either the Coalbrookdale Iron Bridge, based as it was on principles of wood construction, or Burdon's bridge, which, it was agreed by all observers, was based on the principles of stone construction.

It should be obvious from the above that what Paine was projecting was a modern girder type bridge, based on the Bailey bridge or 'meccano' lines (otherwise it is difficult to see how it was so portable). So modern that Charles Schneider said, in his 1905 Presidential Address to the American Society of Civil Engineers, that 'Paine's experimental bridge became the prototype of the modern steel bridge'.

It may be of course that Burdon did make use of the materials from Paine's bridge. There is no evidence for this but it was not at all unusual that Burdon should go to the Walkers since he could easily have been aware of their experience, and it was equally possible that Paine's materials should be worked upon with others. However, there the connection would end - the concepts were different, the spans different, and Paine's design would require malleable iron rather than cast iron.

The obvious conclusion is, then, that Paine did not design the bridge at Sunderland, that Burdon did not use Paine's design and that not even did Paine and Burdon work on the same design at once. Any connection between Paine's experiments with Burdon's feat of engineering was purely coincidental.

The failure to recognise the contribution of Burdon to the development of Sunderland and the North-East and the expansion of the application of iron, apart from the production of a beautiful bridge, is made worse in a way by the fact that Burdon's sole excursions from his enforced retirement after 1803 were directed towards the freeing of the bridge from tolls which were maintained by those who had acquired his interest in a lottery held in October 1816 in order to reimburse themselves. On December 27. 1836, he wrote to the *Sunderland Herald* 'The object yet remains to be obtained from seeing the Monkwearmouth Bridge toll free if the Commissioners will be pleased to look steadily at the object and by raising money at a lower rate of interest or such other means as may

occur to them would endeavour to discharge the claims of those who have by lottery obtained an infamous power over the tolls, it would give me more substantial satisfaction than my memorial that could be raised by means which the public would have the right to consider a misapplication of their funds'.

He died in 1838, aged 82. Not until 1846 was the toll on foot passengers discontinued and other tolls reduced by 50 per cent. It was announced that a profit of £79,666 had been obtained from the bridge since its opening in 1796, although Burdon's original concern was not, apparently, with profit. Not until 1885 was the bridge freed from toll completely. By then it had been remodelled by Sir Robert Stephenson (although he used the same ribs) in 1859. In 1929 this structure was replaced by a modern 'near perfect replica of Newcastle bridge' and Sunderland lost one of its unique features for ever.

BOOK REVIEW

DEBATE ABORTED, BURKE, PRIESTLEY, PAINE AND THE
 REVOLUTION IN FRANCE, 1789 - 91. P.O'Brien. 283pp. Paperback.
 Bishop Auckland, The Pentland Press, 1996. £12.50



Portrait of Edmund
 Burke

IT is a long time since I have read a book on the controversy Edmund Burke launched with his *Reflections on the Revolution in France* that I have not only thoroughly enjoyed but also learned a great deal from. Dr. O'Brien discusses Burke's opinions in detail while contrasting them with the criticism made of them by Thomas Paine and Joseph Priestley. There were, of course, many other replies to Burke, most are largely forgotten even amongst academics. In fact Priestley's reply has for the most part been lost sight of. For example, in Professor Keane's recent political biography of Paine, Priestley receives minimal attention. In focusing as much on Priestley as on Paine, Dr. O'Brien restores an all important balance, for the criticism made of Burke by Priestley excellently supplements what Paine has to say. Indeed we often find in the extensive quotations reproduced in this book, that both men are saying much the same thing, though Priestley's language is all too frequently stolid when compared with Paine's method of

expressing himself.

The author's title may at first appear something of a puzzle, for it can be said that far from being aborted the debate Burke initiated continues still, however. Dr. O'Brien considers Burke's failure to enter into the debate by curbing it with his rather weak and puzzling, *An Appeal from the New to the Old Whigs*, published anonymously in 1791. This has been seen as an attempt to reply to Paine's *Rights of Man*, but if so it must be counted as a dismal failure. Burke the controversialist had clearly got cold feet.

Like Paine, Priestley was to leave England for America, where he settled. He shared Paine's political radicalism, but not his revolutionary attitude. In fact he knew Paine personally, but he was to part company when he published a bitter criticism of *The Age of Reason*. Priestley's attack is perhaps one of his poorest works and rightly forgotten. *Debate Aborted*, though, goes a long way to restore Priestley's political reputation and to remind the world that he was not just a scientist.

The author acknowledges Burke to have been a 'great man' but one who was 'scarcely rational about human rights', who resorts to sneering when he fails to have better of an argument. 'This man', concludes the author, 'must have had a large mental block'. One criticism, throughout his book Dr. O'Brien uses the title *The Rights of Man* rather than *Rights of Man*. Paine's choice of title was deliberate as he did not restrict rights, hence it is important to use the correct title.

R. W. Morrell

DAVID RIVERS' LITTLE - KNOWN MEMOIR OF THOMAS PAINE

Michael T. Davis

THOMAS PAINE'S reputation reached a pinnacle during the 1790s. His ideas divided public opinion and very few knew nothing of his writings. One was either a radical or a conservative - a supporter or a detractor of Paine. David Rivers was perhaps one exception. He sat uneasily on the fence between a friend of Paine the author and a foe of Paine the political philosopher. As a dissenting minister of a congregation at Highgate, Rivers perhaps found hostility to Paine after the publication of *The Age of Reason*, but he was prepared at least in part to concede that Paine was an eminent writer.

Rivers himself had issued several anonymous pamphlets, including a sermon on 'The Gospel a Perfect Law of Liberty' and a sermon against Popery. He was a frequent contributor to the *World* newspaper and the *Sunday Recorder*. To this day, other details of his life remain an unsolved mystery.

In 1798, Rivers published his **Literary Memoirs of Living Authors of Great Britain*. In it he found room to devote one of the largest entries to Thomas Paine. It provides an ideologically biased account of Paine's life to 1798, but its value lies not in the biographical details it recalls. In the very least, this memoir can be used to gauge contemporary opinions and is indicative of the great - and to some, fearful - importance of Thomas Paine.

Literary Memoirs is not highly consistent in its split between radical and conservative. John Bowles and Hannah More receive favourable entries, whilst the prophet-visionary, Edward Brothers, is dismissed as a "mad enthusiast" (p.71). Surprisingly, one of Paine's most ardent supporters, Thomas Clio Rickman, receives a brief memoir that records nothing of his radical zeal. Rivers' memoir of Paine shows to some extent this same inconsistency. As the following excerpt illustrates, Rivers acknowledged Paine's status as an author, but strongly denounced the ideology of his writings:

'We come now to the period of Paine's History, when his speculations were to shake the fabric of the public mind to its very foundation, and his writings to infuse a poison among a deluded commonality, the effects of which, to a philosopher in the shade, would have been scarcely credible... The abuse which has been so liberally bestowed upon Paine, as a writer, has, perhaps, for the most part, been the result of a zeal whose tendency is to weaken, more than support, its cause. Let us rather allow him, the unqualified credit of an animated, energetic writer, who displays considerable acuteness but whose manner of thinking is rude, wicked and daring, and whose language is vulgar though impressive. Let us rather rejoice, that Englishmen, with their just veneration for civil liberty and the rights of the people, were found so wise and steadfast (sic) in an hour of danger, as to despise those sorry calculators, that would persuade a country, whose constitution has raised her to be the envy of all the civilised world, to hazard that constitution upon the grossest, clumsiest, and stalest theories. Let us be thankful that the arch-theorist of the Rights of man, of those rights which transfer the reins from his passion to his reason, of those rights which dissolve ties, which confound distinctions, which destroy security, could play upon us with his new lights upon human governments, without dazzling our reason, or impairing our eye-sight. Finally let us rejoice, that when this when this wily and audacious Anarch dared, at last, to attack the sacred volume of our religion, there was found, on our

Bench of Bishops a learned and philosophical Prelate, condescending enough and active enough to oppose them nobly and completely, by his erudition, his clearness, and his strength of argument (pp.99-104)'.**

Note:

* A copy of Rivers', *Literary Memoirs of Living Authors of Great Britain*. 2 vols. (1798), has been reproduced by Garland Publishing, New York, in 1970, from a copy of the original held in Yale University Library.

** Presumably this refers to Bishop Richard Watson's, *Apology for the Bible*, published in 1796. - Ed.

* * * * *

THOMAS PAINE: HIS DECISION TO PUBLISH *THE AGE OF REASON*

G. Hindmarch

THE French Revolution has not been the subject of much impartial consideration in the United Kingdom, indeed some of the strongest influences on public understanding of this cataclysm in human affairs seems to have been purely fictional works, such as *A Tale of Two Cities*, by Charles Dickens, or the even more fanciful exploits of *The Scarlet Pimpernel*. Readers may perhaps be re-assured to learn that the greatest source of information for the present note is, *A History of Mathematics* by Carl B. Boyer, formerly Professor of Mathematics at Brooklyn College, published by Wiley and Sons, in which work Chapter 22 is devoted to 'Mathematicians of the French Revolution' and Thomas Paine is afforded very slight notice *en passant*. However, since this work sets the world's major mathematicians in the contemporary context of their lives (as well as describing their contributions to their discipline), it affords valuable insight into the progress of human thought, notwithstanding that the actual mathematics are largely incomprehensible to a general reader (like myself) who retains only the sketchiest recollection of the differential and integral calculus of his schooldays.

It is important to remember that in Paine's day learning was not selective in the way that it has largely become today and an inquiring mind then ranged over many aspects which are now generally treated as specialised subjects. Paine himself clearly demonstrates this generalised way of thinking, as we see him debating a sermon in his childish mind, purchasing globes to facilitate his studies of astronomy, sermonising the good folk of Dover and Sandwich as a Methodist preacher, advocating increased salaries for his fellow excise officers and writing some of the most important and influential political tracts of all time. And we know also that he rarely passed a few minutes without endeavouring to utilise them to improve the vast store of knowledge that he committed to his exceptional memory. To such a man the philosophies which he observed developing in Paris during his years of residence there would have proved of absorbing interest in their widest scope, not merely in the localised revolutionary practices which dominate most accounts of his French experience. It is well, therefore, that we should glance at the progressive Frenchmen of his day, whose thinking he would have followed eagerly in all its aspects as he mixed freely with them as an equal, playing an active part in the contemporary scene just as they did.

During the 14th. century, Paris had ranked with Oxford as one of the scientific centres

of the world, but subsequently seems to have played a much quieter role, and only recently have the French mathematicians of revolutionary times come to be seen as laying the foundations for the wide-spread scientific explosion of later centuries. Boyer has singled out six of Paine's contemporaries in Paris as worthy of notice from his specialised viewpoint, but he discussed them in far wider context.

The six French mathematicians, diplomatically listed in order of their births, are:

1. Joseph-Louis Lagrange (1736-1813) who is the only member of the sextet with origins other than wholly French. He was born and educated at Turin, where he became professor of mathematics in the military academy there, before securing the patronage first of Frederick the Great of Prussia and later Louis XVI of France. His wealthy parents enjoyed both French and Italian backgrounds, and he was the only one of their eleven children to survive infancy. He distinguished himself as an astronomer as well as a mathematician and published notable works in both fields.
2. Antoine-Nicolas de Condorcet (1743-1794), the only member of the sextet who has been generally associated with Paine. The two men admired each other's work and sometimes co-operated closely. Condorcet however fell victim to the contemporary vicissitudes, becoming forced into hiding, from which he emerged when he felt his protectors were thereby bringing themselves into danger; he was then arrested on sight and imprisoned, only to be found dead in his prison on the following morning, presumably from suicide; but his final resting place was to be the Pantheon. An aristocrat and philosopher, Condorcet had been an associate of Voltaire, with whom he shared a hatred of injustice; he believed implicitly in the innate goodness of human nature, a characteristic which would have facilitated his rapport with Paine, and he was an enthusiastic advocate of social reforms, such as the introduction of universal education which he saw as an antidote to vice; he unsuccessfully presented a plan for reform to the Legislative Assembly, of which he became President. His earlier writings included books on probability and the integral calculus, but he later devoted himself to social affairs, including a defence of variolation - the predecessor of vaccination as we know it. Like Paine he originally entertained high hopes of the Revolution, but became disillusioned by its excesses. True to his principles, during his period of hiding he wrote his celebrated *Sketch for a Historical Picture of the Progress of the Human Mind*, which culminated in a prediction of the bright future he imagined would follow from the Revolution (an English translation by June Barraclough was published in 1955 in New York by Noonday Press).
3. Gaspard Monge (1746-1818), son of a poor tradesman, was perhaps lucky that his exceptional ability attracted the attention of a lieutenant-colonel who secured for him opportunities to study at a military academy where he rose to become a teacher himself. Teaching appears to have been his natural vocation and his wide interests in physics and chemistry as well as mathematics had made him one of the best-known French scientists by the outbreak of the revolution; it was his unusual experience that part of his most famous book, *Geometrie Descriptive*, was banned from publication in the interest of national defence. He was also active in the political scene, and as Minister of the Navy it fell to him to sign the official record of the trial and execution of Louis XVI. His concern for adequate national defence led to his advocacy for a training school for engineers, which was to be established as the famous Ecole Polytechnique, of which Monge was a distinguished administrator as well as instructor. His great

aptitude as a teacher resulted in a stream of exceptional pupils who more than made up for the reluctance of Monge to publish very much himself, although he made discoveries which still bear his name. And it speaks well of his reputation and judgment that Napoleon took him on both Italian and Egyptian campaigns and entrusted him with the delicate decisions of which works of art were to be carried back to France as prizes of war! He was to become the outstanding scientist in his various fields that the revolutionary era produced.

4. Pierre Simon, Marquis de Laplace (1749-1827), kept a low profile in the political scene, which does not seem to have interested him although he mixed freely with colleagues who were prominent. He became the most distinguished astronomer in the post Isaac Newton period, and this caught the attention of Napoleon (an admirer of men of science) who appointed him Minister of the Interior; but in this high-ranking appointment Laplace proved so undistinguished that Napoleon, displaying his own interest in the calculus, quipped that Laplace '...carried the spirit of the infinitely small into the management of affairs'. It is of far greater importance in our present context that Laplace's astronomical theories would have become known to Thomas Paine, also a life-long student of the heavens, but one whose interpretation of heavenly movements was very different, with the possible major result for world philosophy which is suggested below.
5. Adrien Marie Legendre (1752-1834), seems to have had an exceptional influence on posterity, particularly in America, and in the field of mathematical physics. His *Elements of Geometry* was apparently the antithesis of practical maths, yet it was published in more than twenty editions during his lifetime and it was still being re-issued in America as late as 1885. The scope of his writings was very wide, but since he was primarily a 'mathematicians mathematician', his work is very difficult for a non-mathematical mind to comprehend, notwithstanding its great importance and his famed exceptional clarity in exposition.
6. Lazare Carnot (1753-1823), the youngest member of the sextet, had the most spectacular career of them all during the revolutionary years and enjoyed immense popular acclaim. He shared the military background which recurs in the personal histories of these men, and in the difficult years when the Revolution came under external threat, it was Carnot who organised the armies and laid the basis of their successes. Although intensely republican in his views, he avoided involvement with factions and actually defended royalists against false accusations (including charges that they mixed powdered glass into flour intended for republican soldiers). He antagonised Robespierre, but when a call for his arrest was made the assembled deputies rose in his defence, noisily acclaiming him as the 'Organiser of Victory' and it was Robespierre who fell not Carnot. But in spite of his brilliant career, he was to fall himself through maintaining his independence throughout later major political changes, and as he departed into exile his chair as professor of geometry was voted to Bonaparte, whose ascent to power had owed much to Carnot's genius for organisation. In exile Carnot wrote a famous work, *Reflections on the Metaphysics of the Infinitesimal Calculus*, which was philosophical rather than scientific in tone; Boyer's comment on this work displays the permanent influence of Thomas Paine, for he remarked that even in times that try men's souls, mathematics finds many devotees. Carnot's grandson, Sadi Carnot, was to become the 4th President of France in 1887.

The varied origins of the sextet, who largely came together in projects under

revolutionary aegis, possibly indicates the broad levelling effect of the revolution, before when a military career was heavily influenced by status; indeed it was a saying at the military academies, 'The competent are not noble and the noble are not competent'. All six achieved prominence in their fields by 1789, when the Revolution erupted, and it was to offer opportunities which they could not have expected to enjoy before that date. It is ironic that only Condorcet had held views that encouraged reformist activities, and that he alone was to lose his life in the turmoil, the others all surviving him by decades. But there was much more to the Revolution than politics, and Condorcet was to play a notable part in projects which were extensively debated in committee, were finalised and implemented and still stand today in testimony of practical achievements to which the sextet heavily contributed. These developments constitute a memorial to the Revolution and to the many men who genuinely strove for progress within it. But it is not a memorial in stone, it is expressed in every-day use which has continued to expand extensively, even in our own recent years.

Early in the Revolution, Tallyrand proposed a revised system of weights and measures, and a committee was set up through the Academie des Sciences to consider this reform; Condorcet and Lagrange were both founding members of this committee and during ensuing changes Laplace, Legendre and Monge also joined in its deliberations, which were so important, and called for so much expertise and judgment, that it is to be wondered how the eventual decisions and their implementation were arrived at in a comparatively short period.

First, the committee had to decide on a question which even modest scientific minds have always dreamed about - what was to be the numerical base on which the new units were to stand? It was not without considerable debate that the decimal system was decided upon, rather than the duo-decimal of twelve which even today is sometimes advocated as the more desirable, since twelve is divisible by three and ten is not. Discussion then centred on the new measurement of length, for which one suggestion was the length of a pendulum which would beat in complete single seconds, a proposal which is deceptively simple-sounding, but which presented certain practical problems (the pendulum was to evolve to a scientifically accurate measurement of time in England, not in France). The day was carried by the accuracy shown by astronomers (notably Legendre), in their measurement of the earth's latitudes, which are constant around its surface, unlike the variable degrees of longitude; the metre was then decreed to be the ten-millionth part of the distance from the equator to the North Pole, a precise distance which the present author confesses his inability to verify to any degree of accuracy whatsoever! The committee, however, had completed their metric system in all essentials by 1791.

It is not conceivable that such dramatic changes in measurement could have been thrashed out in committee without exciting keen interest from every man in France who had a professional interest, whether practical or theoretical, in the technical operation of making measurements, not only in length but in the higher degree of measurement of volumes, which reaches its most complicated form (in normal commercial practice) in the process of gauging, the mysteries of which were legendary, at least in poetic legend, for Oliver Goldsmith in his idyll of country life, *The Deserted Village*, extolled the wondrous skills of the schoolmaster in seemingly hushed tones 'and e'en the whisper ran that he could gauge'; and there was one man in Paris who had begun his professional government service as a gauger of brewers' casks in Grantham, the former exciseman Thomas Paine. And Paine, the close associate of Condorcet, would certainly have been a

most eager gatherer of every nuance of the arguments which were debated by the committee and retailed to him by Condorcet. But, alas, the many biographers of Paine have given us little information about his widespread activities and interests in his Paris days. Fortunately, from the point of view of a general reader (like myself) trying to follow Paine's thinking and its development, he left several autobiographical leads to posterity in *The Age of Reason*, his most important writing during this period. This uncharacteristic action may have been accidental, but I personally think it was deliberate on the part of a man who had seen 'many of my most intimate friends destroyed', and had come to accept the likelihood that he would soon follow them along the same fateful path.

The technique of putting thoughts to paper varies widely between authors, as does also the technique of setting musical compositions into manuscript, which latter has been more extensively studied. For example, Beethoven's development of themes is illustrated, at least to some degree, by the jottings in his notebooks, but Mozart seems to have composed mainly in his head, and inscribed finished works directly to paper. The manuscripts of Mozart, including the paper itself and its revealing water marks, have proved valuable sources of information, but there never seems to have been any comparable study of the manuscripts of his contemporary Thomas Paine, and this, I think, is a pity because it has long been my opinion that Paine's technique resembled Mozart's, in that many sections of Paine's writings were similarly composed and rounded out in his head, then committed to his remarkable memory much as other authors nowadays commit finished work to computers from which they can be retrieved at will. In my younger days I sometimes had the pleasure of listening to a professional elocutionist reciting long passages from standard works (particularly from the novels of Charles Dickens), to an attentive audience marvelling at his memory; Paine seems to have had similar extraordinary powers of verbatim recollection. I imagine that he first developed this technique in his days as a Methodist preacher so that his words could seem fresh and original to his hearers. In later life, Paine's contemporaries spoke of his lengthy accurate quotations from his already-published works, and also of the swift fluency of his writing (e.g. of articles for the *Pennsylvania Magazine*), once he had settled his mind to his task, when his pen appears to have been able to reproduce as essay previously committed to memory as a modern computer furnishes a print-out.

It is now appropriate to consider Paine's actual writing of *The Age of Reason*. He himself informs us in his prefatory profession of faith that he had been envisaging a revolution in religion since soon after he had helped produce a revolution in government in America by publishing his pamphlet, *Common Sense*, and he further informs us that it had been his intention for several years past to publish his thoughts on religion. Following the views expressed in the previous paragraph, I conjecture that quite a lot of these thoughts on religion had already been arranged in his memory-files and possibly partially committed to paper. Paine also tells us the events in Paris had convinced him that he should prepare for publication, but he does not specify at what point the decision to publish was actually taken; however, in his preface to the second part he reveals that after action was taken in the Convention against its two foreign members (Cloots and himself) he 'sat down and brought the work to a close as speedily as possible'. Clearly, at that stage Part I was well advanced and required only a few days intensive writing for completion. However, Paine also made a very curious statement which I think important; his printer had been furnished with only thirty-one pages out of the total of seventy-six which were to compose the final draft of Part I. I have worried at this division of Part I into two sections, and

now that I have read chapter twenty-two of Boyer's, *History of Mathematics*, I have come to the striking conclusion that pages one to thirty one may effectively have comprised to whole of Part 1 of *The Age of Reason* as Paine originally envisioned it. I now proceed to explain this conclusion, but in doing so I beg to invoke Paine's sentiment, as expressed in his dedication to his fellow-citizens of the United States, that I maintain my right to my own opinion just as I insist on every other man's right to his.

The Age of Reason as we now have it, consists of two parts, of which the seventy-six pages Paine had passed to his printer when he entered the Luxembourg prison in December 1793, is now known as Part 1, and it is with this, the earlier part, that I am mainly concerned in this present essay. But this Part 1 itself comprised two sections, which were specifically described by Paine himself as consisting of thirty-one pages for the first section and forty-five pages for the second (and it is as first section and second section that I refer to them in the remainder of this paper). Without seeing the original manuscript, it is not possible to be certain of the position where the division between them occurs, but since it is probable that Paine was reasonably consistent in his writing of complete manuscripts intended for publication, it is also reasonable to assume that the separate pages would have had similar word-content, and the division is therefore likely to have occurred after about thirty-one seventy sixths of the finished work, and this is approximately two-fifths through any subsequent reliable printing. By this criterion, it appears that the division was probably after the passage headed 'Of the New Testament' and before that headed, 'Defining the True Revelation'. In my view this position proves on examination to separate Part 1 of *The Age of Reason* into two sections of very different character.

The first section (apart from a few sentences, which could have been last-minute alterations) is devoted to a review of religious writing with the accent heavily on the Old Testament which is termed the Bible. It is a beautifully-written criticism, which I have personally read and admired many times, but it could have been written or committed to Paine's memory at any time during the preceding two or three decades. It may have originated in Paine's studies when he aspired to ordination in the Established Church, his subsequent disillusionment, and his renunciation of that ambition. It is, in substance, very much an amplification of the message which George Fox (founder of the Quakers and mentor of the elder Paine and his son the young Thomas) had declared as coming to him from the Almighty:

I was sent to turn people from the darkness to the light, and I was to bring people off from all the world's religions, which are vain, that they might know the pure religion, and I was to bring them off from all the world's fellowships, and prayings, and singings, I was to bring people off from Jewish ceremonies, and from heathenish fables, and from men's inventions and windy doctrines, and from all their images and crosses, and sprinklings of infants, with all their holy days (so called) and all their vain traditions, which they had instituted since the apostles' days....

The first section, with possibly a little rounding, could well have been printed as a self-contained pamphlet. But Paine gives us two reasons why he did not take this course. First, he intended *The Age of Reason* '...to be the last offering I should make my fellow-citizens of all nations...' and so was concerned to delay it as long as possible, no doubt because he wished to publish his thoughts in their most mature form. But he also knew that the religion of ordinary people had wider implications than the observance of mere dogma; thus he wrote 'that many good men have believed this strange fable, and

have lived very good lives under the belief (for credulity is not a crime), is what I have no doubt of.' Like most people of mature thought he did not wish to throw the baby out with the soiled bath-water, or, as he much more elegantly wrote, '...lest in the general wreck of superstition, of false systems of government and false theology, we lose sight of morality, of humanity, and of theology that is true.' It is a fair reply to destructive criticism of harmless religious practice to ask, "What do you propose to put in its place?" I believe Paine found his response to that question in revolutionary Paris.

In the first section he refers to biblical comment, 'What! Is Saul also amongst the prophets?'. On re-reading the second section in light of Boyer's chapter twenty-two, I found myself asking, "What! Is Paine also amongst the mathematicians?" For, there, he is at pains to associate himself with the growing knowledge of the sextet of mathematicians who have been identified in the early pages of this paper, to whose company, conversation and debates his association with Condorcet would have given him access. It is not to be assumed that Paine claimed equality with their expertise, although he cited Newton and Descartes in his arguments, he made no claim to familiarity with analytic geometry, or the calculus. Instead he detailed his own education in Thetford, revealing that although he was not himself a Latin scholar, he familiarised himself with the contents of all Latin books in the school. By implication, he explains how through association with the leading mathematicians of his day he became familiar with the development of astronomical theories which he could follow from his early studies in London after purchasing a pair of globes and attending lectures at the Royal Society. At last it became apparent why Paine, normally so reticent in personal details, chose to make these details known in the unlikely context of combating the spread of atheism in revolutionary Paris! He was preparing his ground, in case he afterwards had need to justify the astronomical knowledge on which he bases his assertion of the true revelation the Almighty has made to all men in terms that transcend all languages and all domestic situations.

He proclaims this new theology:

The Almighty Lecturer, by displaying the principles of science in the structure of the universe, he has invited man to study and to imitation. It is as if He had said to the inhabitants of this globe that we call ours, "I have made an earth for man to dwell upon, and I have rendered the starry heavens visible, to teach him science and the arts. He can now provide for his own comfort, AND LEARN FROM MY MUNIFICENCE TO ALL, BE KIND TO OTHERS."

Paine introduces his new revelation in the very first words of the second section. It is his cry of EUREKA; it is a clarion call, such as he might have proclaimed in his days as an evangelistic preacher! He proclaims it now in jubilation and with urgency.

But some, perhaps, will say: Are we to have no Word of God, no revelation? I answer, YES; there is a word of God; there is a revelation. THE WORD OF GOD IS THE CREATION WE BEHOLD and it is in this word, which no human intervention can counterfeit or alter, that God speaketh universally to man. Do we want to contemplate His power? We see it in the immensity of the creation. Do we want to contemplate His wisdom? We see it in the unchangeable order by which the incomprehensible whole is governed. Do we want to contemplate His munificence? We see it in the abundance with which He fills the earth. Do we wish to contemplate His mercy? We see it in His not withholding that abundance even from the unthankful. In fine, do we want to know what God is? Search not the book called Scripture, which any human hand might make, but the Scripture

called the creation.

Having once impressed upon his readers the message that the Almighty speaks to all men through science, Paine hastened to emphasise its unlimited capacity for adaption throughout the ever-expanding field of human knowledge and awareness.

The scientific principles.... relating to the motion of the heavenly bodies, are contained chiefly in that part of science which is called trigonometry, or the properties of a triangle, which, when applied to the study of the heavenly bodies, is called astronomy; when applied to direct the course of a ship on the ocean it is called navigation; when applied to the construction of figures drawn by rule and compass it is called geometry; when applied to the construction of plans or edifices, it is called architecture; when applied to the measurement of any portion of the surface of the earth it is called land surveying. In fine. it is the soul of science; it is an eternal truth; it contains the *mathematical demonstration* of which man speaks, and the extent of its uses is unknown.

The second section contains scant reference to biblical text, just as the first section contains scant reference to science; but both sections were addressed to Paine's whole wide audience, and in later years, when he wrote Part 2 of *The Age of Reason*, he disclosed that the spate of dissent which Part 1 aroused was based on what its dissenters termed scripture evidence and bible authority. He recorded no dissent from the scientific world to his presentation of scientific progress as the new Revelation. This must have been a source of great satisfaction to him, since (as I pointed out in 1979) his prime purpose in publishing Part 1, comprising the first and second sections set in contrast, had been to challenge the emerging scientific world to recognise his own need of a creative God, whom their specialised language he termed *The Almighty Lecturer*, rather as Freemasons refer to their conception of the Almighty as *The Architect Divine*.

There remains to be considered the question of what had finally decided Paine that the time had come to publish his thoughts on religion, as he had been minded to do for a number of years. The obvious answer, the attack in the Convention on foreigners, is not sufficient, for it is apparent that Paine had by then already dispatched his first section (possibly in updated version) to his printer, and the attack on Cloots and himself had only the lesser effect of provoking him into hurried completion of the second section. I now put forward my own answer to this question, which I base in present knowledge of the activities of the French mathematicians who were for years much in the public eye since they were playing an important practical role which had been allocated to them in consequence of their reputation as scientists. And of these activities by far the most important, in the context of this paper, are those of Laplace, the outstanding astronomer, whose theories were widely and openly discussed (with Napoleon in person, for example) and which would have riveted the continuing interest of Paine.

Laplace was a prolific writer who issued many publications over a period extending at least from 1774 to 1776; he is credited with having brought to its culmination Newton's theory of gravitation, and in his astronomical research he made extensive use of higher mathematics. In other words, he did not merely propose a theory, he set out to demonstrate mathematically that the natural laws of the universe supported its plausibility. He is strongly associated with a theory that the solar system originated in a mass of rotating gas, which as it cooled from its edges inwards formed the planets and left the rotating sun as the remaining rotating core of the original huge mass of rotating gases. Such a theory, with its on-going complicated mathematical calculations could only have

developed over a long period of time; and to Paine, whose conception of God was of a first cause, a theory that antedated the solar system he knew and had studied would have proved endlessly fascinating. But from Paine's standpoint, Laplace's philosophy, within which he developed his theories, presented an irresistible challenge.

Napoleon has been shown above to have taken an interest in Laplace, as he did in any prominent thinker, Thomas Paine included. And as Napoleon was far more than just a military genius, his discussions with thinkers was wide-ranging, as befitted a leader who was to become an outstanding head of state. Boyer recounts that when discussing with Laplace the long-developing theory that the solar system had originated in a rotating mass of gas, Napoleon observed that Laplace included no mention of God. Laplace is said to have replied, "I have no need of that hypothesis". According to the same sources this attitude of Laplace was not universally held amongst scientists, nor even amongst the members of our celebrated sextet, for Lagrange, on hearing of this interchange between Napoleon and Laplace, is said to have commented in his turn, "Ah, but it is a beautiful hypothesis". Paine, with his absorbing interest in the theory, and all related aspects, must have become aware (possibly through direct conversations with Laplace) of this deep division between eminent scientific minds, and after observing it he could not possibly have remained a passive onlooker but would have been compulsively driven to contest the spread of atheism by throwing his powers of persuasion against it.

In this urgent task that he set himself, Paine again conferred to posterity a valuable clue as to the pressure of circumstances leading to his decision to publish *The age of Reason*, he set this out in *The Author's Profession of Faith*, which reads to me as his final preface to what we now know as Part I of *The Age of reason*, but which he originally presented as a complete work contrasting false revelations with newly-appreciated truth. A lesser mind might have sought to present his message as yet another revelation to a single human being, as George Fox had done; Paine, much more humble before his God, saw his role as interpreting the workings of a first cause to all men, not all of whom had yet realised the import of the unravelling of the mysteries of "the starry heavens", even though they themselves were participating in the unravelling. Paine tells us in the clearest possible terms, "As several of my colleagues, and others of my fellow-citizens of France, have given me the example of making their voluntary and individual profession of faith, I also will make mine..." He does not identify these informants and he does not tell us how they communicated to him their personal creeds. He certainly does not say that they published them or publicly proclaimed them, rather is the tenor of his comment that he received them in a series of private examinations of beliefs during his many discussions with his contemporaries of pressing topics of the hour. Paine acknowledges these differing personal creeds, but he does not reveal or criticise them; he builds upon them.

Paine was not a remote academician writing for readers of succeeding centuries; he was a living creature of immense vitality acutely observing the essential features of contemporary times, avidly joining in discussion and influencing progress through his eloquent pen; and he seized time by the forelocks when he realised that delay could cost his fellows their right of overt individual approach to God. His first section might well have been composed long before as an overall view in a historical perspective, calling for no urgent presentation and committed to his memory for eventual publication as a last offering to his fellows; it was when his many contacts with influential personages of his day brought realisation that there was emerging an on-going battle for the possession of men's minds and souls that he found himself driven to publish his personal *Pilgrims Progress*,

recounting the advancement of knowledge and opening a new approach to God for his fellows.

And amongst his fellows he found widely varying willingness to accompany him upon this new path and a broad division between two distinct lines of thought; there is little doubt in my own mind that these two groups can be typified by the two mathematicians whose comments are recorded above; one, the atheistic brilliant young non-political administratively-incompetent astronomer, Laplace; the other, the slightly older, deistically-inclined Lagrange who shared with Paine the benefit of having lived and worked in three different countries and had enjoyed high contacts in each of them.

Thomas Paine lived through a series of stirring events of unprecedented importance, none of which were foreseen by even the best-informed of his contemporaries during his youth, but which he came to see as a natural development in the affairs of western peoples; and he himself was no idle spectator of its progress. His participation was continuous, beginning with England, where his efforts have been largely unexplored (except by myself, notably in my papers, 'The First Excise Period' and 'The Methodist Influence', published in the *TPS Bulletin* in 1978 and 1979. I hope to add to these in the not-too-distant future). Paine soon saw that the American Revolution was only a beginning which would eventually embrace a revolution in religious thought, as he made clear in his first section of *The Age of Reason*:

Soon after I had published the pamphlet "Common Sense", in America, I saw the exceeding probability that a revolution in the system of government would be followed by a revolution in the system of religion. The adulterous connection of church and state, wherever it has taken place, whether Jewish, Christian, or Turkish, has so effectually prohibited by pains and penalties every discussion upon established creeds, and upon first principles of religion, that until the system of government should be changed, those subjects could not be brought fairly and openly before the world; but that whenever this should be done, a revolution in the system of religion would follow.

The revolt of the American colonies, enormously important though it was, was not internal but was directed against a very distant external power (naturally it had some opponents, such as Oldys, who vented his fury through his hostile biography of Paine after retreating across the Atlantic). However, when revolutionary fervour spread to France, the French Revolution took the very different internal form aimed against the domestic government and its supporting factions, amongst which the church stood high. But in this second major revolution Paine took no originating part (other than the example of his American participation), not even in the total abolition of the whole national order of priesthood and of everything appertaining to compulsive systems of religion and compulsive articles of faith, although he had long anticipated that such a result would follow internal revolution in government; for the natural impetus of the French Revolution brought about this result without his aid as a natural consequence of its new thinking. Paine merely observed the fulfilment of his expectations, until circumstances forced his active concern with the right of freedom of worship of each individual Frenchman and Frenchwoman, to whom he offered a new revelation which every one of them could accept. And it is to be observed that when Paine later wrote of the opposition provoked by *The Age of Reason*, he mentioned no dissenters in France.

It is also to be observed that although Paine's *knowledge* of the patterns in the Creation was not extensive, his *understanding* was wide. Thus although he did not know that the

three satellites of Jupiter, Io, Europa and Ganymede, rotate around the planet in 1,77, 3,55 and 7,16 days, almost exactly in ratio 1-2-4, he had already covered this extraordinary circumstance by his observation that the extent of mathematical demonstration in the heavenly bodies is unknown, and while he would not have known of the numerical sequence devised by Leonardo Fibonacci about 1200, and its modern application to questions in botany, he had made an astonishing prescient forecast of *the exquisite mechanism...of...vegetablebodies* in *The Lewes Writings*.

Thomas Paine was not by nature a revolutionary; he was a reformer. His early attitude towards both government and religion was benign, and when his early history is finally presented to the public it will at last become apparent that he was originally a conformist. But Paine's conformism was not blind. He recognised injustices, and when he saw abuses practised by authority, whether civil or ecclesiastic, he exposed them, at first by public speaking, but later by the telling arguments flowing from his fluent pen. That he has become associated with the advocacy or revolution stems from the hostility of established figures to his philosophy (which they resented from a man of his modest birth) and to their great fear of his skilled powers of persuasion by a technique he disclosed in *The Lewes Writings*, and specifically re-stated in Part 2 of *The Age of Reason*. Thus, when cognisance of *The Age of Reason* spread widely from France, high church dignitaries feared sever weakening of their own authority and lies were disseminated to discredit Paine, the visionary who uniquely advocated universal revelation with associated global deism, misrepresenting him as an atheist in a disgraceful attack on his intellectual integrity in order to preserve their own privileges and power.

But it would be unfair to single out the church alone for lies spread to counter Paine's influence in revolutionary times; secular England also resorted to invention. The Charter that King John forced upon the rebel barons at Runymede, which they rejected in favour of civil war and the installation of a French usurper, was misrepresented in a myth that the self-seeking barons had protected the people of England, notwithstanding that the Runymede Charter was never English law, that it disappeared for centuries (until its terms were first published by Blackstone in Paine's hey-day), and that the real *Magna Carta*, with its complimentary *Charter of the Forest*, was issued by John's son in 1216 as his contribution to the evolution of the Charters of Liberty (these facts have also been brought to notice in *The Bulletin*, and no historian has ever been able to refute them).

The greatness of *The Age of Reason*, in my personal opinion, stems from the original publication now called Part I, which was written on a high intellectual level, outclassing the Bible, the New Testament and the Koran, from none of which Paine needed to quote in his exposure of the false bases of many accepted religious tenets. Part 2 certainly has interest, mainly from the further topical and autobiographical disclosures of Paine, but his detailed refutation of biblical text therein has little persisting value, except for those who hanker after religious dispute rather than for a basic philosophy of good living. Paine produced a detailed study of the Bible, but he did not examine the Koran, which he had also dismissed earlier in its entirety, and this perhaps was a pity, for had he done so he might have observed that the futility of argument between believers and disbelievers about dogma had been put into rational context by Mahomet centuries before, when he declared:

O ye UNBELIEVERS! I worship not that which ye worship, And ye do not worship that which I worship; I shall never worship that which ye worship Neither will ye worship that which I worship. To you be your religion; to me be mine.

I began this paper by referring to the common practice of seeing the events of the French revolution in terms of popular fiction, in which heroes save intended victims from the guillotine, a form of swift sure execution introduced for reasons of humanity in substitution for prolonged public sufferings such as those long exhibited at Tyburn. But it can be rationally argued that there is a basis of truth in such tales. And indeed there is, for not all who came under threat perished. The reasons some did not are varied, although no authentic record exists that I know of showing an intended victim surviving through voluntary substitution by a friend who took his place on the scaffold. During the highly publicised Reign of Terror, which all rational minds deplore (although rarely comparing it with the far greater scale of executions by other regimes in our own century), some who thought themselves in danger made their escape from France. Thomas Paine did not, although he enjoyed considerable opportunity for doing so. Even when he saw the prospect of execution looming inexorably before Cloots (who was guillotined) and himself, he devoted himself not to his own preservation but to more intensive pursuit of the cause for which he had remained, the preservation of spiritual freedom.

Verily truth is stranger than fiction. In fiction heroes offered themselves in substitution for those whom they had warm ties of affection. The emotional affection of Thomas Paine for other people is little known, for he valued his privacy. But Paine does not seem to have entertained any doubts that his proper course was to continue his life's work, even though he knew that thereby he was almost certainly condemning himself to the guillotine, because by offering the sacrifice of himself he was simultaneously offering to his fellows through the completion of his great work, a prospect for survival of the better elements of religious belief.

Note:

The author offers this paper as a belated supplement to his paper, 'Thomas Paine, The Methodist Influence' (*TPS Bulletin*. 1979. 6.3. 59-78). He freely concedes that some of its points are matters of opinion, but feels it has a logic which merits attention and would welcome independent critical analysis by competent scholars, as he would of his paper, 'Thomas Paine and the Myth of Magna Carta' (*TPS Bulletin*. 1982. 7.2. 29-52).

Ed.

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