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Puritans and the Royal Society

THE official programme of the recent tercentenary celebrations of the founding of the Royal Society included a single religious service. This was held at 10.30 a.m. at St Paul's Cathedral when the Dean, the Very Rev. W. R. Matthews, D.D., D.LITT., preached a sermon related to the building's architect, Sir Christopher Wren. Otherwise there seems to be little reference to the religious background of the Society's pioneers and a noticeable omission of appreciation of the considerable Puritan participation in its institution.

The events connected with the Royal Society's foundation range over the period 1645 to 1663, but there were also earlier influences. One of these was Sir Francis Bacon, Lord Verulam, 1561-1626. Douglas McKie, Professor of the History and Philosophy of Science, University College, London, in *The Times* Special Number, 19 July 1960, states that Bacon's suggested academy called Solomon's House described in *New Atlantis* (1627) was too often assumed to be influential in the founding of the Royal Society, much in the same way as Bacon's method of induction, expounded in his *Novum Organum* of 1620, has been erroneously regarded as a factor in the rise of modern science. But this may be disputed, for Bacon enjoyed considerable prestige as a learned man and his works were widely read. Moreover, an examination of titles of books written during the first half of the seventeenth century indicates that the title of his earlier work, *The Advancement of Learning* (1605), was quoted and copied many times.

J. W. Adamson in *Pioneers of Modern Education*, pp. 16-17, rightly corrects any extravagant views of Bacon's importance as a scientist, pointing out he did little original investigation, that he adhered to the Ptolemaic Theory and remained ignorant of some contemporary science, including the invention of logarithms. He does, however, recognise that 'His tireless industry in her cause, his exceptional powers of imagination and expression, made him the poet, the prophet and the journalist of the New Philosophy'.

His influence through this 'Advancement of Learning' is seen in such books as the one William Petty wrote, *The Advice of W. P. to Mr. Samuel Hartlib for the Advancement of some Particular Parts of Learning*, 1648. Hezekiah Woodward also opens the preface to his book *Of a*

Child's Portion, 1649, with 'Our Great Advancer of Learning noteth . . .'. A title of John Dury's was *An Agency for the Advancement of Universal Learning*, 1649. That year *An Humble Motion to the Parliament of England concerning the Advancement of Learning* was presented by John Hall. The ready pen of Samuel Hartlib produced *The Advancement of Husbandry Learning*, 1651, and three years later edited educational pamphlets 'for the consideration of those who seek the Advancement of Learning in these Nations'. Also in 1653 John Webster presented his criticisms in *The Examination of Academies*, 'to the judgements of those who love the Advancement of Learning'. All the foregoing were Puritans, while the Royalist, Abraham Cowley, in 1661, wrote *Propositions for the Advancement of Experimental Philosophy*.

It is also interesting to note that Bacon was the second son of Sir Nicholas Bacon, Lord Keeper of the Great Seal of England and of his learned Puritan wife Ann. Such a mother may well have influenced her son to study the works of God, especially as the Puritans' great teacher, John Calvin, wrote *The Institutes of the Christian Religion*, 1559, in four books, the first of which is entitled *Of the Knowledge of God as Creator*. In this he states 'There is no portion of the world, however minute, that does not exhibit at least some sparks of beauty . . . the elegant structure of the world serving us as a kind of mirror, in which we may behold God, though otherwise invisible'; and 'Let us not decline to take a pious delight in the clear and manifest works of God'. From this treatise later Puritans were to find inspiration for scientific work. Bacon meantime coined the phrase 'To the glory of God and the relief of man's estate', which was to become the slogan of the pioneers in science.

The establishment of Solomon's House, suggested by Bacon, would be a research institute of some thirty-six fellows, with apprentices and assistants, engaged in various projects, in pure and applied science, a conception remarkable for the imagination and insight displayed by the author. It was this model, quoted later by learned men, that undoubtedly helped to produce a climate of opinion favourable to the establishment of the Royal Society.

William Petty in his 'Advancement' mentioned above refers appreciatively to Bacon's works, and advocates, among other things, the establishment of a College of Tradesmen and an Academic Hospital with a laboratory, botanic garden, library and qualified staff to conduct scientific investigations. Twelve years later Petty was to be one of the founders of the institution which was to foster such activity. This

instance even alone would suggest that Bacon had considerable influence in the creation of the Society.

Another factor favourable to the formation of the Society was the establishment in 1597 under the will of Sir Thomas Gresham of a college in his London house. It consisted of seven professors who lectured respectively on Divinity, Law, Rhetoric, Music, Physic, Astronomy and Geometry. This was no research institute and tended to follow traditional lines, but its professors enjoyed considerable freedom. Among them were a number of Puritan scientists, some of whom became Fellows of the Royal Society, the chief being the founder members, William Petty and Jonathan Goddard.

It was in Gresham House that early meetings of these men interested in science took place. The first was in 1645 when the Civil War was still being waged. Discussions were confined to scientific topics, politics and religion being banned for obvious reasons. Here it would seem that the participants were either Puritans or those less ardent for the king and therefore tolerated in Parliamentary London. More enthusiastic Royalists would surely have been in the field elsewhere.

John Wallis described these meetings of 'The Invisible College'. They had apparently been suggested by Theodore Haak, who was probably of Dutch origin, born near Worms of Calvinist parents. He became a deacon and was employed in London by the Westminster Assembly (Puritan) to translate into English some Dutch annotations of the Bible which were published in 1657. According to the *Calendar of State Papers* he had been awarded £50 in 1650 by Parliament for 'good service in corresponding beyond the seas'. Haak thus was of definite Puritan sympathies, and in 1663 he became one of the original Fellows of the Society.

The religious views of Wallis himself may have been derived from his father who was a minister and from his education in that seed bed of Puritanism, Emmanuel College, Cambridge. He became a chaplain and, in 1642, by deciphering a Royalist message in two hours, made himself a great reputation. While he gave evidence against the persecutor of Puritans, Archbishop Laud, who was executed in 1645, he signed the remonstrance against the execution of Charles I. Wallis became a prominent mathematician and Cromwell appointed him Savilian Professor of Geometry at Oxford, 1649. He was another of the Fellows elected in 1663.

John Wilkins, a prominent member, had a Puritan background, and was made Warden of Wadham College, Oxford, by Cromwell

in 1648. He wrote on both science and theology, and became Bishop of Chester, 1668, attempting the comprehension of dissenters and opposing their persecution. He was a founder Fellow and the first Secretary of the Society with Oldenburg.

George Ent was one of the London group. His father, a merchant, came to England as a refugee from Roman Catholic persecution in the Low Countries. He had graduated in medicine at Padua in 1636. He wrote in support of Harvey's view of circulation and eventually became president of the Royal College of Physicians and was knighted by Charles II. His Fellowship of the Royal Society also dates from 1663.

Another graduate in medicine attending these meetings and supporting Parliament was Christopher Merrett. He also became a Fellow in 1663.

The Gresham Professor of Medicine, Jonathan Goddard, was a confidant of Cromwell. He too had graduated at Padua. His wide interests ranged from telescopes to chemistry, and fruit trees to medicine, as revealed in the fourteen papers he contributed to the Society. In 1651 he became Warden of Merton College, Oxford, but was ejected at the Restoration.

The senior member of the Invisible College was the forty-eight-year-old Francis Glisson, already Regius Professor of Physic at Cambridge, retaining his chair through the Commonwealth and until his death in 1677. He wrote extensively on medicine and also became a Fellow of the Society in 1663.

The other Gresham Professor at these early meetings was Samuel Foster, who held the chair of Astronomy. He was no theorist but a practical mathematician, a practising observer and a maker of astronomical instruments. Another product of Emmanuel College, Cambridge, he died in 1652, before the end of the Commonwealth, and thus was the sole member of the group who did not join the new Society.

All the above were university men and supporters of Parliament. Charles Scarbrough was the only pronounced Royalist in the group. A physician and friend of Harvey, he was knighted by Charles II and became a Fellow of the Society in 1663.

The other member mentioned by Wallis was the youngest, eighteen-year-old Robert Boyle, a product of Eton, of independent means, and to make his mark as the greatest of these early scientists. Son of the Earl of Cork, he received no formal university education, but travelled extensively, and was learned in theology, interested in the diffusion of the Scriptures and the defence of Christianity against atheism, endowing

lectures for this purpose. He produced numerous papers for the Society on physics, chemistry and other subjects, but declined its presidency and a bishopric.

Cambridge with its University was already under Puritan influence and Parliamentary control. But only after the defeat of Charles at Naseby in 1645 did Oxford submit. Then non-Puritans in the colleges were replaced by people loyal to Parliament. So the Gresham College meetings, while continuing, lost some members to Oxford; Wilkins in 1648 leaving to become Warden of Wadham College. The next year Wallis became Oxford's Savilian Professor of Geometry. Then in 1651 Goddard was appointed Warden of Merton College. William Petty, a clothier's son, experienced traveller, sailor, interested in things mechanical, graduated M.D. at Oxford in 1649 and became F.R.C.P. in 1655. He was the first leader of the new group, the meetings continuing in his lodging until his appointment by Cromwell in 1652 as Physician General of Ireland. Then they were held in Wilkins' rooms at Wadham. Boyle joined them in 1654 and became host in 1659 when Wilkins left for the Mastership of Trinity College, Cambridge, which he had to resign at the Restoration the next year.

Thomas Sprat, educated at Wadham and graduating M.A. in 1657, became interested in science through Wilkins, and dedicated to him his laudatory poem about Cromwell. At the Restoration he became a high Anglican and was appointed Bishop of Rochester in 1684. He wrote his *History of the Royal Society* in 1667 emphasising its Royalist origins—probably to curry favour, trimmer as he was, for he supported James II, but subsequently helped in the coronation of William and Mary after the Bloodless Revolution of 1688!

Others in the Oxford company were the three Royalists, Seth Ward, mathematician and later Bishop of Salisbury; Thomas Willis, to become Professor of medicine; and Ralph Bathurst, a doctor of medicine and eventually a dean. Lawrence Rooke had left Cambridge for home after graduating M.A. in 1647, but came with two pupils to Wadham to benefit from John Wilkins' science and while at Oxford assisted Boyle with his experiments. A man of wide learning, he, like many of his day, had a profound knowledge of Theology. He was Gresham Professor of Astronomy 1652-57 and then held the chair of Geometry until his death in 1662. Christopher Wren, later to rebuild London, was another member, who was also sufficiently acceptable to the Commonwealth to be able to succeed Rooke as Professor of Astronomy at Gresham College in 1657. His chair was taken over in

1660 by Walter Pope, who had been with him in the Oxford meetings and had acted as one of Parliament's official Visitors to the University, but elected as Fellow of the Society in 1663.

It was from these groups, consisting largely of men with Puritan sympathies or tolerable to Cromwell's men, that the Royal Society had its origin. After the Restoration in 1660 the universities were cleared of Parliament's nominees and a number attending the Oxford meetings left. In London on 28 November 1660, following Wren's usual lecture as Professor at Gresham College, twelve men met and decided to form a scientific society like the foreign academies. They were Lord Brouncker (the first President), Messrs Boyle and Bruce (became Earl of Kin-cardine), Sir Robert Moray, Sir Paul Neile, Drs Wilkins, Goddard and Petty, with Messrs Ball, Rooke, Wren and Hill.

These are described by Professor McKie as ten Royalists, with Wilkins a moderate and Goddard as the solitary Puritan. But this is hardly the case, for Wilkins and Petty, like Goddard, had been promoted by Parliament. Wren was not out of its favour and Rooke, a religious man, had been active at Oxford during the Commonwealth. Abraham Hill (secretary in 1673) was a young London merchant whose father had acted for Parliament. Bruce was a zealous Presbyterian who tried later to help the Covenanters, and Boyle's piety and interest in the Scriptures was more in keeping with Puritanism than the religion of the Court. Even Moray, who was a friend of Charles and largely instrumental in obtaining a charter for the Society, was a moderate whom Clarendon criticised as employed by his fellow Scots to establish Presbyterianism in England in 1645. This leaves Brouncker and Neile as Royalists and the physician Peter Ball whose views are unknown.

The twelve 'founders' drew up a list of forty-one names, of whom Professor McKie states 'thirty-one were Royalists, two had supported Parliament, one did not join and there are seven whose political affiliations it has not been possible to ascertain.' It can be pointed out here that of all these alleged Royalists there were a number who were of Puritan sympathy in religion even if they were not in arms against the king. In that confused age there were many like the famous Sir Edmund Verney, Puritan and disapprover of bishops, who still felt he must support his king. These nominees too were people selected as likely to be approved by Charles II and would not be such Puritans as were discreet enough to be absent from Restoration London.

There are a number of figures connected with the Society to be considered here and some of them are included in others. The 'Twelve'

above and the 40 mentioned became Fellows and are found in the total of 146 admitted as Fellows under the 1663 charter. This number was made up of the 21 members of the Council and two groups admitted on 20 May and 22 June, together numbering 98 and making 119 to which 30 were added on or after 1 July, in 1663.

It is, however, important to note that Dorothy Stimson in *Bulletin of Institute of the History of Medicine*, 3 (1935), states that 42 of the 68 in the first group of actual members (i.e. 62 per cent.) of the Society were clearly Puritan, although Puritans were then a minority in England. Robert K. Merton in 'Puritanism, Pietism and Science' (*Sociological Review*, vol. xxviii, No. 1, 1936) confirms this.

In *English Preachers and Preaching*, C. F. Richardson suggests the Royal Society began among a small group of learned men in which Puritan divines predominated.

So Richard S. Westfall concludes in *Science and Religion in Seventeenth Century England* (1957), p. 7: 'Irene Parker, Dorothy Stimson, R. F. Jones, G. Rosen and R. K. Merton have argued with some cogency the connection between Puritanism and Modern Science.'

Similarly, A. F. Smethurst in *Modern Science and Christian Beliefs* (1955), devotes his second chapter to the subject of 'The Seventeenth Century Pioneers of Modern Science and their Christian Faith', showing how many were zealous Christians as well as keen scientists.

A considerable amount of emphasis has been placed by Professor McKie and others on the Royal and Royalist nature of the Society, and no doubt the glamour attached to the terms is attractive to some. Also the term Puritan in today's careless society is not welcome. The more objective studies made in America and elsewhere, and detailed biographical investigation, however, confirm the major contribution made to the foundation of the Society and its scientific work by Puritans.

It is interesting to note that after the resolution of 28 November 1660, and Moray's success in interesting the king, nearly two years passed before the Society received its first charter. This was on 15 July 1662. A second charter with arms and the Society's mace was given by Charles II on 22 April 1663 after which date the first year's 146 Fellows were elected.

The first joint secretaries appointed that year were Dr John Wilkins, whose Puritan leanings have been mentioned above, and Henry Oldenburg, a German Protestant, who came to England about 1640. The latter was at first a Royalist, but a friend of Milton, and took as

his second wife the only child of the Puritan, John Dury, who was a member of the Westminster Assembly of Divines during the Commonwealth. Oldenburg went to Oxford with two pupils, of whom one was Boyle's nephew, and himself entered the University in 1656. There he met Boyle, Petty, Wilkins, Wallis and others and became interested in science. In the Preface of the Society's *Philosophical Transactions*, 2 (1666), 443, he expressed his attitude, writing of the 'wonderful contrivances of the Supreme Author'. Thus the venture was launched with men of definite Puritan leanings as its officers.

Now Westfall (op. cit. p. 32) writes: 'It is true that during the first flush of enthusiasm following its formation, the Society enjoyed a brief spurt of social prestige; and since they adopted an admission policy that accepted anyone who applied, they found themselves with a long roll of members, including many with no active interest in natural philosophy. A majority of early members attended fewer than five meetings and refused to pay the dues, with the result that the Society almost died shortly after its birth. A small minority of men devoted to science, led by Oldenburg and Haak, kept the Society alive.'

The trouble was that many of the very early members were not scientists, but people interested in its title and Royal patronage. The number of Fellows elected fell to five in 1669 and, excepting one year, did not reach ten until 1677, and after 1684 fell off again. It was at its lowest in 1690 with one elected and not until 1711 did the annual elections exceed ten.

The Society's income was derived from the shilling a week subscription from its Fellows. At the end of 1663 the membership had dropped to 131 and the amount owing was £158. By 1673 the deficit had increased to £1,957. As Sir William Penny, F.R.S., the present treasurer, points out in *The Times* (op. cit., p. 7), the king was asked in 1662 for a grant of lands in Ireland. Charles wrote personally to the Duke of Ormond, the Lord Lieutenant, strongly recommending such an endowment, but was quite unsuccessful. In 1669 he gave Chelsea College and its lands to the Society, but recovered possession in 1681 for £1,300 to build there a hospital for soldiers.

The Royal patronage was genuine, Charles being interested in experiments, and such practical problems as navigation, but he was neither consistent nor generous. The king sent lodestones and glass spheres to the Society, asked about the nature of sensitive plants, and requested that a degree of the earth's surface should be measured, but

found no funds for it. Even the Royal Observatory erected at Greenwich in 1675 was loaned instruments by the Society.

Michael Hoskin, lecturer in the History of Science at Cambridge, describes this early weakness in the Royal support of the Society (*Listener*, 21 July 1961), pointing out that Oldenburg in writing to Boyle expressed the view that 'this Society would prove a mighty and important body, if they had but any competent stock to carry on their designs'. In contrast the secretary had letters from France stating 'the King refuses nothing to the Academy. If it does nothing, it will not be for lack of aid.' Oldenburg was also told of Louis XIV insisting that no expense was to be spared in the establishment of the Observatory, which was part of the Académie des Sciences.

The king supported his mistresses and enjoyed his jokes, laughing at Boyle's weighing of air; and Restoration authors followed in ridiculing the Society in such pieces as Thomas Shadwell's play *The Virtuoso*, Samuel Butler's *Elephant and the Moon* and Jonathan Swift's *Voyage to Laputa*.

It was left to a few enthusiasts to keep the Society going. Some were the amateurs like Samuel Pepys who attended regularly but contributed no papers. Reference to P. H. Maty's monumental *General Index to the Philosophical Transactions of the Royal Society*, 1781, gives a measure of Puritan participation in making reports. The complete list of authors, 1665-1700, contains 460 names. Of these 75 gave five or more papers and 28 per cent of them were Puritans. Ten or more were given by 35, of whom the Puritan proportion rose to 37 per cent. The Dutch biologist Leeuwenhoek heads the list with 124, followed by Edmund Halley's 81 and Martin Lister's 70. Then came the Puritans, John Wallis and Robert Boyle, with 68 and 58 respectively. Surprisingly Sir George Ent and the Royalist John Evelyn produced only 3 and 2.

The distinguished Puritan Botanist, Nehemiah Grew, who wrote *The Anatomy of Plants* was elected a Fellow in 1671, and acted as secretary for the years 1677-79. He prepared a catalogue of the Society's museum, published as *Musaeum Regalis Societatis*, a folio volume, in 1681.

An Essex blacksmith's son, sent to Cambridge by Squire Wyvill, and graduating M.A. in 1651, John Ray, was another great Puritan naturalist. Elected Fellow in 1667, he contributed ten papers to the Society's *Transactions*. He was a friend of Francis Willughby who was an original Fellow of 1663 and son of a Warwickshire knight. Between

them they produced a series of books systematically describing Plants, Fish, Birds, Snakes, Animals and Insects. Of these Willughby's *Fishes* was published by the Society in 1681, thus nearly ruining itself financially.

There were, however, many scientists of Puritan origin remaining outside the Society for various reasons. An example of these is Thomas Sydenham, Parliamentarian Captain, and famous physician, friend at Oxford of Boyle and Petty, but contributing no papers to the Society. Another is Andrew Yarranton, engineer and agriculturalist. A number of others interested in the natural world and disseminating scientific knowledge, but not Fellows, were tutors of Dissenting Academies. Such a one was Charles Morton, a Fellow of Wadham College, Oxford, under Wilkins. On the other hand the physician, Samuel Dale, was one who contributed numerous papers but never became a Fellow.

The greatest of the seventeenth-century fellows, however, was Isaac Newton, elected in 1672, becoming President in 1703 and knighted in 1705. Brought up in Parliamentarian Lincolnshire, and at Grantham Grammar School, he entered Puritan Cambridge in 1660. Showing a deep interest in the Scriptures and leaning rather to Calvinism than otherwise, as well as exhibiting an austere and ascetic character, he belonged to the Puritan tradition. Achieving fame after the publication of his *Philosophiae Naturalis Principia Mathematica* in 1687, until his death in 1727, he long led the Royal Society into a more prosperous period. Thus he continued the succession of deeply religious men of the Puritan type which the Society has never lacked.