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THE FOUNDATION OF THE ROYAL SOCIETY AND THE MEDICAL PROFESSION IN ENGLAND

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The foundation of the Royal Society in the year 1660 is perhaps the most important scientific event in the history of our country. We are celebrating the three-hundredth anniversary of the oldest scientific institution in the world, and the most distinguished. More than this, we are commemorating the institutional establishment of the experimental method in scientific inquiry, the beginnings of what we now call scientific medicine, along with the beginnings of systematic progress in every other branch of natural philosophy, as it then was called.

We all know too much about the rate of progress in medicine and in everything else to suppose that all this happened overnight. Medicine, and especially the actual curing of sick people, is peculiarly difficult to bring under the experimental method, and until very recent times, indeed, advances in mathematics, physics, or even chemistry were exceedingly slow to affect the practice of doctors and the prospects of their patients. Indeed, the social historian has recently become a little sceptical about the importance of scientific medicine for a century and more after the foundation of the Royal Society. It was not until the chemical advances of the late eighteenth century, not perhaps even before the arrival of anaesthetics and antiseptics, that the welfare of the people as a whole was much affected. Nevertheless, the foundation of the Royal Society was to a surprising extent the work of the English medical profession. They helped to found

it, and they supported it, these hard-working, far-sighted Stuart doctors, because they believed that it would save lives and relieve pain. It is not for us to be critical of them because it took so long.

They could not have founded it by themselves, of course, and we shall have to look rather carefully for

the exact part which they played. We are right to choose the year 1660 for the anniversary, but the Society did not receive its charter or its Royal name until July, 1662. Moreover, it had a prehistory going back some fifteen years before 1660, both in London and in Oxford, a succession of philosophic meetings and of short-lived organized groups of scientific men. There is even a possibility that the idea of establishing a permanent institution was brought over from France, and foreign-born people were certainly influential in the early Royal Society. Dr. John Wallis, the great mathematician, an original Fellow, left behind him a record of these

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earlier meetings. It is from him that we can learn how prominent medical men had been in bringing the Society into being.

Medical Men Among the Pioneers

In London in "about the year 1645" he tells us there were weekly meetings of persons "inquisitive into Natural Philosophy, and other parts of Humane Learning, and particularly of what hath been called the *New Philosophy* or *Experimental Philosophy*." He gives us

the names of eight people who took part in these first recorded meetings of the inchoate Royal Society. Now four of them were medical doctors, all of them Fellows of the Royal College of Physicians, and one of them, Francis Glisson, was later President of that very important professional institution and an outstanding figure in seventeenth-century medicine. Wallis himself had studied medicine under Glisson and was said to be the first of his pupils to maintain publicly the circulation of the blood—for it has to be remembered that the great Harvey was still alive in 1645 and that his epochal discovery was not yet twenty years old. No wonder the young Robert Boyle could write in 1646 of this “new philosophical college, that values no knowledge, but as it hath a tendency to use,” and was occupied with agriculture and engineering, as well as what we call science. Practical medical doctors have always been, and the practical bent of the early Royal Society must owe much to them. Knowledge, in Bacon’s phrase, was for use in the relief of man’s estate.

Wallis goes on to tell us the business of this group—“Physick, Anatomy”—and it is significant that these should begin the list, “Geometry, Astronomy, Navigation, Statics, Magneticks, Chymicks, Mechanicks, and natural Experiments.” The actual subjects of conversation were again headed by physiological ones, “the circulation of the blood, the valves in the veins, the *venae lacteae*, the lymphatick vessels.” These were followed by the Copernican hypothesis and other astronomical topics, telescopes, experiments with atmospheric pressure and falling bodies, together “with other things appertaining to what hath been called the *New Philosophy*, which from the times of Galileo at Florence, and Sir Francis Bacon in England, hath been much cultivated in Italy, France, Germany, and other parts abroad as well as in England.” Bacon, we must remember, was an ever-present reality to these men, and he had after all died less than twenty years before. Bishop Sprat, the earliest historian of the Royal Society, whose book appeared barely five years after it was founded, felt that “there should have been no other Preface to the *History of the Royal Society* but some of Bacon’s writings.”

Four of the eight pioneers, as already said, were London physicians, and two of them, as might have been added, one of the doctors and a mathematician, held posts in a London teaching foundation, Gresham College in the City. Peculiarly English as the Royal Society was to be, it is quite clear from Wallis’s sentences that its founders were well aware that science was an international matter, and that Galileo’s Italy, with its academies to help scientific as well as literary work, was in the 1640’s much in advance of England. Indeed, Wallis gives credit to a foreigner, Theodore Haak, a German then resident in London, for suggesting these meetings, and one of the four doctors, George Ent, was a naturalized Dutchman. It would seem that the life of this club went on with fair regularity until the return of Charles II in 1660, though it was interrupted from time to time, owing, it is said, to the disturbed political condition of the country under Cromwell and the Commonwealth. The circle of members evidently grew, but the “Invisible College” in London was not the only club for this or for related purposes which had come into existence. Wallis shifts the scene to Oxford, after 1648–9—to Oxford where “some of our company” had taken residence.

Wallis himself went to take up a professorship: Jonathan Goddard, M.D., to become Warden of Merton College; and John Wilkins, who has often been looked upon as the personal founder of the final Royal Society, to become Warden of Wadham College. The philosophical society which came into existence at Wadham in the 1650’s was evidently larger than the original London group, and it was much more distinguished. Besides the professors and heads of colleges, Robert Boyle was a member, and provided laboratory space and laboratory staff; so was William Petty, and so also two men still in their twenties. One was John Locke, and the other was another youth of miraculous ability and versatility, Christopher Wren.

A Striking Characteristic

These are great names in the history of our country, and they introduce us to the most striking characteristic of the founders of the Royal Society, that so many of them should have been men of genius. Christopher Wren in these early years was interested above all in anatomy and physiology, and his first notoriety came about because of accomplishments with blood transfusion. He never practised as a doctor, but Petty took the M.D. degree and probably did have patients. It seems fair to say that half of the Oxford circle were medical men. Six of the ten men mentioned by Wallis certainly were, and four of them practised at some time in their lives. Amongst them was Thomas Willis, whose “circle of Willis” is known to every dissector of the brain.

Blood transfusion was a favourite “experiment” with the early scientific academies, abroad as well as at home, and it may be taken as typical of the attitude of these physicians towards experimentation, and of their expectations from it. Traditional medicine looked upon the blood as of extreme importance in all disease, and on the letting of blood as the obvious first step towards cure. It was getting rid of the bad blood, the seat of the disease, an attitude which still survives in folk medicine and in the phrases we use. It must have seemed obvious, then, to the men of the seventeenth century that if it became possible to empty a sick man’s veins of every drop of “peccant” blood, and give him a fresh supply, perhaps from animals, then he could not fail to be healthy. It was soon found, of course, that matters were a little more complicated than this, but the Royal Society had reported to it the case of a destitute wretch who had sheep’s blood substituted for some of his own, and said he felt the better for it.

“The Royal Society,” says Sprat, actually began in London at the Restoration of the Monarchy, after Cromwell and the Puritans, “in the wonderful, pacifick Year 1660. So that if any Conjectures of good fortune, from extraordinary *Nativities* hold true” (and here we must notice that the good Bishop, and most early Fellows were the same, still half believed in astrology) “we may presage all Happiness to the Undertaking. And I shall here join my solemn Wishes, that as it began in that Time, when our Country was freed from Confusion and Slavery; so it may, in its Progress, redeem the Minds of Men from Obscurity, Uncertainty and Bondage.”

In 1657 Wren had gone to London as a professor at Gresham College, and there was an access to the London group of gentlemen of a scientific bent, even of noblemen. Once more three out of the nine new names,

mentioned this time by Sprat rather than Wallis, were physicians: one of them was Dr. Croon, whose Croonian lectures have ensured to anatomy and physiology an important place in the Royal Society for two hundred years and more. It was on November 28, 1660, that fourteen men, after hearing Mr. Wren's lecture at Gresham College, agreed to "continue their weekly meeting on Wednesday at 3 of the clock . . . everyone to pay down ten shillings, and besides engage to pay one shilling weekly, whether present or absent." These meetings have continued until to-day, and since 1663 they have been meetings of Fellows of the Royal Society, whose records start with the statement quoted. Nearly a fifth of the 115 original Fellows held the degree of M.D., and it has been reckoned by the Royal Society's most recent and authoritative historian that 55% of the scientists amongst them were physicians or surgeons: in 1698 the proportion was still about the same.

Traditional Categories

Sir Henry Lyons, late treasurer of the Royal Society, in distinguishing "Scientific Fellows" from "Non-Scientific" Fellows was following an established tradition in the study of the Royal Society in earlier times. The scientific Fellows are contrasted with the amateurs, the *virtuosi*, the country gentlemen and peers, interested in curiosities and rarities, diverted by "experiments," but not themselves engaged in adding to knowledge, not themselves professional scientists. Lyons reckoned that the non-scientists were more than twice the number of scientists in 1663, and thrice the number in 1671. Again following established convention, he attributed to this very high proportion, and especially to the prominence of amateurs on the Society's Council and amongst its Presidents, its rapid decline from its early, Newtonian eminence.

Although it is obvious that amateurs did hinder the early Royal Society, especially the politicians who became Presidents, the contemporary social historian finds himself a little critical of these traditional categories. They are not very helpful for such a purpose as describing the role of medical men, and we may notice that some very important people do not fit. John Evelyn, the diarist, a founding Fellow, was decidedly a gentleman and a virtuoso too, but he was a botanist and he was a theorist of scientific organization: he wrote in 1659 a sketch of a residential scientific college, which might have turned into something like the Institute for Advanced Study at Princeton. The Hon. Robert Boyle could never be called a mere amateur, but he was no full-time professional scientist: he was the son and brother of a peer, one of the richest in the country. In fact, there was in the 1660's only one professional full-time scientist in England, and that was Robert Hooke, the curator of the Royal Society for setting up experiments. Hooke happened to be a genius too, an architect as well as an astronomer, a physicist, a chemist, and a pioneer microbiologist of the first importance in the history of medicine. He was also the badly paid servant of the first voluntary society, a voluntary society for an intellectual purpose constructed on the model which is now universal, the first which ever existed.

A Fascinating Feature

Here we reach the feature of the Royal Society which makes it so fascinating to the student of social institutions, and when we recognize this fact about it we can

begin to see how the medical men fit it. We can say that the Royal Society was brought into being and maintained by a peculiarly English alliance, an alliance between the gentry on the one hand, and certain of the higher clergy and of the university professors, together with a group of medical doctors, on the other hand. The scientists themselves, the great men like Newton, Boyle, Wren, Hooke, Halley of Halley's Comet—what an incredible generation it was—Petty and Graunt the founders of vital statistics, Ray the naturalist, Locke the philosopher, belonged indifferently to any one of these elements, and were not professionally distinct as a group.

Their work was made possible for them by the whole society, in which all were equals: opportunities for discussion, for foreign correspondence and scientific intelligence, for publication were all provided, though very little of what we should call laboratory space was ever made available, and almost nothing for subsidizing research. The largest distinct group, the most constant in attendance and certainly the most reliable source of subscriptions, which had to provide the revenue, were the medical men. They fitted best into the entirely novel atmosphere of a voluntary society for scientific purposes, although it was the "gentlemen, free and unconfined," as Sprat calls them, who brought with them the voluntary principle, making the Royal Society as independent as the House of Commons, which consisted of gentry. It may be inaccurate to classify the doctors as "scientists" as has always been done, and so create them into a majority of active Fellows, but it is legitimate to look upon them as the most reliable element in the new organization.

This is not the opportunity to go further into the analysis of a subject which, it must now be obvious, can become unexpectedly complicated. It may be asked why it was that a society of this sort appeared in England and nowhere else, for the practising physician was a familiar figure all over Europe, and the new experimental philosophy was also international. It must be baldly asserted in reply that the gentry were unique to England, the type of gentry who could make up the House of Commons and co-operate with clergymen, dons, and doctors in a voluntary society.

In fact, it should be added that our account is not complete, and one of our categories in a sense includes all the others. For in England pretty well everybody who helped to found this Society, or who became active in it, would be counted as a gentleman, and nearly all of them probably came of landowning families, even though, as in the case of Newton, Locke, or Pepys, the estate itself was often small. It is a mistake, and a common one, to think of the early scientists as mainly of business stock. There were exceptions, and one was Graunt, who was a London tradesman and had to be specially recommended to the Society by the King. Doctors in Stuart England were gentlemen, certainly the sort of doctor who would sit round the table and watch experiments under the presidency of Lord Brouncker and in a company which, by 1664, might include Prince Rupert, the King's uncle, or Lord Ashley, Chancellor of the Exchequer.

An Influential Model

Science in England, then, began its institutional life in a voluntary society of a sort which would have been inconceivable elsewhere: in these early years, moreover, it was more successful than it has ever been anywhere. These two facts are undoubtedly connected, though

obviously not as simple cause and effect. It would be wrong, however, to suppose that it was intentionally done. There had been a considerable amount of thinking on the subject of scientific institutions in the earlier seventeenth century, but none of it envisaged an entirely voluntary society. The most influential model was undoubtedly Bacon's House of Salomon, described in his *New Atlantis*, which was published in 1627. The institution here described is on an enormous scale, with vast ranges of laboratories, a whole hierarchy of scientists, even *Merchants of Light* as he calls them, who were to be for ever travelling about the world in search of scientific intelligence. The *House of Salomon* was to be a department of state. The earlier Italian academies were on a tiny scale, with only a handful of members, but they were under princely patronage and their members and publications were paid for by the potentate. The ambitious plans of the Czech thinker Comenius, and of Hartlib and others, who were all active and influential in England at the time when the group which Wallis describes first appeared, were all likewise public, governmental matters.

Undoubtedly the founders of the Royal Society expected that something like this would be done for them, that Charles II would provide not simply a lovely name and a handsome charter, but a building, endowments to pay professionals, a teaching establishment, not to mention funds for research and for staff. The royal charters themselves (there were three of them in rapid succession) even seem to contemplate this. In 1666 the French King founded, for a small group of men who had previously been organized as a club in somewhat the same way as the English groups we have described, the *Académie des Sciences*, which did pay salaries, subsidize research, ensure publication.

A Financial Problem

This was just what the struggling Royal Society needed, since from the very first its major problem, the perennial problem of the voluntary society, was to collect its subscriptions, pay its servants, keep itself going. By the year 1676 the Fellows owed their Royal Society £2,000 in back subscriptions, at a shilling a week a head. We may think it was as well that they never got anything out of Charles II except the derelict building which stood on the site of Chelsea Hospital, for we are told that French science suffered from the fact that it was official science, what the Crown, which paid the bills, thought science should be. Better that the wretched Hooke should be paid in copies of books published by the Royal Society, better that the generous Halley should be forced to foot the bill for Newton's *Principia*, although the Society had officially undertaken to print it.

We can now see how important the prosperous, methodical medical man must have been to the infant Royal Society. It is significant that when the desperate Treasurer had to start recommending Fellows to be expelled, only one of the original medical Fellows had to go; the worst offenders were the country gentry. The doctors, if they provided none of the first-level genius, served faithfully on the Council and, like the munificent Boyle, must have provided in their homes those research facilities which the Society could never afford. We must guard against the impression that a Stuart doctor's house could be turned with great ease into a primitive laboratory because of its dispensary. It was the apothecaries who dispensed medicines, just as it was the barber

surgeons who did the operating, and our subject would be a far different one if these were to be included as part of the medical profession. For it was from such humbler, "mechanical" people that the *operators* came, the laboratory assistants for men like Boyle and for the Society itself, and science could never have begun unless these men had been available, along with the clock-makers to fashion the instruments.

Leeuwenhoek and Malpighi were among the foreign members of the early Royal Society, and it published their articles in its transactions, even some of their books. It must not be imagined then that the doctors who gave so freely of their time and money received nothing back. It is remarkable, however, that so little opposition to the Royal Society's activities came from the medical profession. Even the coveted right to bodies of criminals for dissection, also possessed by the Royal College of Physicians, was conferred upon it.

Conclusion

It is true, and it is to be expected, that the ablest and most effective attacks on the new foundation did come from a doctor, a sustained polemic in defence of Aristotelian physics and chemistry, Hippocratic and Galenic medicine against the experimental method and scientific medicine from "Henry Stubbe, physician at Warwick," in the 1670's. He was attacking Bishop Sprat and a famous scientific clergyman, Joseph Glanville, an enthusiast for the experimental method, to whom the "traditional notional way" was incapable of providing a cure for a cut finger. And besides it "diverted Learned men from the study of God's GREAT BOOK, UNIVERSAL NATURE."

The tough and wily Stubbe worsted the facile Glanville and declared in a letter to Boyle in June, 1670, that the body of the nation were against the Royal Society, the two universities (especially Cambridge), the physicians of London, for whom he claimed to be writing, indeed the whole medical profession, "except it be such as Dr. Sydenham." It so happens that the great Sydenham was never a Fellow of the Royal Society, although he and John Locke were friends and collaborators. Perhaps Sydenham was not alone in feeling that the experimental method, as knowledge then was, had not yet so much help to give the practising physician. But it is historically vitally important that Stubbe was wrong about his contemporaries, and that Sydenham was untypical of them. In the everyday support which it gave to the Royal Society, before and after its foundation, the English medical profession did more for the cause of science than it can ever hope to do again.

Perhaps it is unfair to talk as if none of the doctors belonged to that inner circle of genius which gave to the Royal Society its colossal historical reputation and importance. Dr. Raven believes that the whole scientific movement was begun and nurtured by the doctors. And one early Fellow of the Royal Society who was also a doctor, a practising physician, was decidedly a genius, John Locke the philosopher.

Locke, and he was not untypical, did not become a Fellow until he left the philosophical club at Oxford to go to London in 1668. In London he practised medicine, and wrought upon the body of his patron, that same Lord Ashley who was Chancellor of the Exchequer, a surgical miracle, which under those conditions might so easily have a surgical *quietus*. Here,

day after day, and year after year, in company with Sydenham, he made his observations, botanical, climatic, political, social, and statistical, as well as medical. And as a doctor, in this situation, he conceived of the great *Essay* concerning human understanding. When *Principia* was published, Locke was baffled by the mathematics. He had nothing to do with the Newtonian/mathematical development of the Royal Society. But as an early Fellow, Locke the doctor began the whole empirical movement of modern philosophy.

THE DEBT OF SCIENCE TO MEDICINE

BY

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The foundation of the Royal Society 300 years ago represents not only a critical event in British history by the provision of an instrument whose influence brought this country in one generation from a position of insignificance to the forefront of the whole scientific movement, but a signal demonstration of the coming of age of modern man. Most historians will agree that our present epoch was inaugurated not at the Renaissance or by the Reformation, but in the seventeenth century, when the New Philosophy, expounded by Francis Bacon and evangelized by Comenius, integrated and explored the whole field of natural knowledge. Mr. Laslett's article in this issue expounds the particular value of its medical members to the origination and maintenance of the Royal Society. Here we will consider in more general terms the contribution of Medicine to the movement of thought and life of which the Society became the symbol and instrument in 1662.

The debt of our Western world to Greek medicine and in particular to the Hippocratic Colleges and the doctors' oath of service, and to the two pillars of medical learning—the anatomy and physiology of Galen and the botany and pharmacy of Dioscorides—has hardly yet been adequately acknowledged: the whole framework of our University education owes its origin principally to them. The Arabian doctors, trained on the works of Aristotle and bringing back to Spain and Europe the glory of Greek science, stimulated the scholastic movement of the thirteenth century. The invention of printing gave the world a flood of Greek and Latin classics, and provided scholars with the knowledge from which the whole field of nature could be surveyed. It took a century and a half to digest this knowledge, to compare it with the traditional lore of geographers and astronomers, of the herbals and bestiaries, of alchemists and magicians; but during that period it was in the medical profession even more than by the clergy and reformers that the new biology, cosmology, and philosophy were developed. We have only to remember the influence of Salerno upon Padua and the other great universities of Northern Italy, upon Montpellier and Basel, upon Louvain and Oxford, Leyden and Cambridge; the scholars like Ermolao Barbaro, Jean Ruel, and our own Edward Wotton, in 1541 President of the College of Physicians; and their successor Conrad Gesner of Zürich and his vast correspondence with doctors all over Europe from Lisbon to Dantzig, and from Naples to London, and with the two English physicians and scientists William

Turner and John Caius, to see how direct and continuous was the service of the world of medicine to the expansion and the unifying of the studies of the organic world, of biology and physiology, and perhaps most effectively of botany. It is true to say that the study of plants, their taxonomy, their "uses and values," their employment as drugs, and their care and cultivation, had reached a true scientific status a generation before the influence of Copernicus had been felt even in the centres of learning. And practically all the contributors to this epoch-making achievement were medical men.

Gesner and the British Naturalists

Of them all Conrad Gesner is beyond question the outstanding leader. The orphaned son of a follower of Zwingli, he was bred up in the tradition of Erasmus and by the most enlightened leaders of the Reformation in Switzerland. Beginning with the classics, but early developing a passionate interest in nature, he studied the whole literature of science, composed the huge volumes on animals, reptiles, birds, and fishes, prepared for a similar treatise on insects, and had collected some thousand pictures and masses of notes of plants. Over eighty books were published by him before his early death, and his voluminous letters to dozens of doctors and naturalists gave unity and leadership to the scientific study of the flora and fauna, the cosmology and physiology of our world. Both our British naturalists were his personal friends: from Turner he received the first list of British fishes, and from Caius not only the book on dogs, but a long series of pictures drawn by Caius himself from the animals that he saw in the London docks and markets and in the Lion Gate of the Tower, which was at that time our only zoological gardens. Among these pictures was an excellent drawing of a female elk which Caius described by the name of horse-deer, because, as he explained, though the Norwegian sailors who had imported the animal called it an elk, Julius Caesar had stated that the true elk had no joints in its legs, "therefore this cannot be an elk." Gesner's reply, while grateful and gracious, states plainly "though Caesar says this about the elk just as Herodotus says it of the elephant, both statements are false: there is no animal without jointed legs."

This is a good illustration of the principal problem of these early investigations: how were they to deal with the vast mass of lore and fable which for a thousand years had done duty as natural history? Not only unicorns and gryphons, the yale and the phoenix, but lions and cranes, the fox and the crow, were the heroes of a library of legends and anecdotes, and familiar through centuries of sermons and moralizings. We can see from a comparison (say) of Shakespeare with Milton how the old world of Caliban and Ariel, of fairies and witches, gave place to the realm of law and observation, of Areopagitica and the classics: but for the men of the sixteenth and early seventeenth centuries the change demanded a discipline not only of literary criticism, but of observation and experiment quite strange to the tradition of culture and religion. When we add that even the classical authorities—even Aristotle and Theophrastus—were describing only the beasts and plants of the Eastern Mediterranean, we can realize something of the difficulties which Turner, when he wrote the first list of birds or tried to identify the flora of the Northumberland coast or the East Anglian fens, had to overcome. Only an intense scrutiny of the classical