ALCHEMY AND THE WORLD OF SCIENCE: AN INTELLECTUAL BIOGRAPHY OF FRANK SHERWOOD TAYLOR

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INTRODUCTION

Some papers of Dr F. Sherwood Taylor (1897-1956), the founding editor of *Ambix*, have recently been deposited in the Museum of the History of Science, Oxford, of which he was Curator during the 1940s. They provide a valuable record of a chemist and historian who contributed to various fields of study. The insights and information acquired in the course of sorting these papers, and of supplementing them with background material from those who knew him and from published sources, have allowed a biographical account of Sherwood Taylor to be compiled, which seems a fitting way of commemorating both the formation of the archive and (as it happens) the fiftieth anniversary of the foundation of *Ambix*.[1]

THE YOUNG CHEMIST

Frank Sherwood Taylor was born at Bickley, near Bromley, Kent, on November 26, 1897. His father (a "non-militant Huxleyan agnostic") was a solicitor of comfortable means, and so Frank was destined for an appropriately formal upbringing.[2] From Sherborne School he won a classics scholarship to Lincoln College, Oxford. But the Great War took him first to Flanders as a private in the Honourable Artillery Company; and in October 1917 at Passchendaele, voluntarily taking the place of an older man in a front-line action, he was seriously wounded, and lay on the battlefield for many hours. During the next nine months he underwent some fourteen operations.[3] By the time he came up to Oxford at the beginning of 1919 he had decided, and was allowed, to study not classics but chemistry.

The roots of this change lie in a childhood enthusiasm for practical science, inspired at the age of eight when he took from the family bookshelves a multi-volume work called *Science for All*. It was not a children's book but a collection of introductory essays on "every-day Science".[4]

> I found it a great deal more interesting than anything I had ever read, and from that date I was possessed by a wish to "do experiments" on my own. My early efforts were not attended with much success. I can remember trying to make an alloy from washing soda and lead, by melting them in a tin lid heated by a bicycle lamp. Naturally I failed, for soda does not dissolve in lead. ... I see now that I should have had much more fun if I had had a book which told me how to do things very cheaply, and how to do as many interesting experiments as possible with simple things I could get at a chemist's shop or at an ironmonger's.[5]

He later wrote such a book, *The Young Chemist* (1934); but the whole of his career as teacher, textbook writer, and expounder of "science for all" can be said to have originated here.

He pursued his interest at school, and read authors such as Huxley and Haeckel from his father's library. Yet it was the War which precipitated the decision to study chemistry at university. The horrors of Passchendaele and of long hospitalisation afterwards probably impressed upon him the need to develop the benign applications of science. He was particularly fascinated by the surgery that was being performed upon him.[6] More poignant, though, was the influence of his eldest brother Raymond, who had been gassed in the War. Unable to speak, he wrote: "This is what modern science has done for me".[7] It is important to remember that Sherwood Taylor was not to be a simple apologist for science. He condemned the way in which it had been perverted by the materialist world, and advocated instead a science with humane and religious values and universal horizons, through which men sought to be *wise* rather than merely powerful. As he put it in a lecture, "we must not conclude that science is any more the cause of our evils, than the gridiron was the cause of the martyrdom of St Lawrence".[8] It seems that he may have taken up science for this very reason – because he was not prepared to accept the implications of his brother's dying indictment.

OXFORD

Having turned to chemistry he could hardly have found better instruction, for the science tutor at Lincoln College was N. V. Sidgwick, one of the leading chemists of the age. Sidgwick was a good practical chemist, an inspiring lecturer, and a theoretician and synthesist at the forefront of the subject. His book on valency was to have a profound impact.[9] His influence on his pupils is evident in all of Sherwood Taylor's later work, not only as scientist but as historian and philosopher too. Sidgwick himself had a classical background and a philosophical turn of mind; and (like all the pupils of A. G. Vernon Harcourt) he passed on an interest in the *history* of chemistry, and used it in his teaching.

Chemistry has generally been Oxford's best science, and Sherwood Taylor's generation had some excellent members and teachers, as well as ample facilities.[10] College tutorials were supplemented by lectures and practical work in various laboratories – from the formality of the new Dyson Perrins Laboratory to the homely atmosphere of the college laboratories. W. H. Perkin jnr presided over organic chemistry at the Dyson Perrins; Frederick Soddy (about to receive a Nobel Prize for his pioneering work on isotopes) was in charge of inorganic chemistry in the Old Chemistry Department; H. B. Hartley ran the Balliol-Trinity Laboratories, which were the centre for physical chemistry; and University and college lecturers included Sidgwick, D. L. Chapman, F. D. Chattaway, E. G. J. Hartley, B. Lambert, J. E. Marsh, T. R. Merton, H. T. Tizard, and A. F. Walden. It would be difficult to envisage a school of chemistry of higher calibre. Among Sherwood Taylor's contemporaries in 1919-21 were S. Barratt, E. J. Bowen, G. R. Clarke, C. N. Hinshelwood, W. Hume-Rothery, G. D. Parkes, J. H. Wolfenden, and (with him at Lincoln) F. M. Brewer, all of whom went on to distinguished careers.[11]

These very years in Oxford also saw two unusual ventures relevant to Sherwood Taylor's subsequent life. It was in 1919 that R. T. Gunther arranged in the Bodleian Library an exhibition of historic scientific instruments which he had unearthed from Oxford colleges and departments in a pioneering survey of the material remains of science. The exhibition was the first triumph in his campaign to establish a permanent museum of such things in the Old Ashmolean Building, itself a monument to Oxford's scientific past.[12] This development was part of a readjustment of values, the scientists having begun to respect their history and its remnants, while the non-scientists were being asked to acknowledge the part played by science in shaping the modern world. It also reflected the traditional Oxford ideal that science should be taught as part of a "liberal education". It was not Gunther himself but the medical professor Sir William Osler who placed the exhibition in the context of a wider philosophy, calling for a reconciliation between science and the arts towards a world of peace and humanity.[13]

Osler was also behind the other venture, whereby a niche in the Bodleian Library was assigned to Charles Singer (whom Sherwood Taylor came to regard as "the father of the history of science in this country"),[14] along with his wife Dorothea Waley Singer and a succession of distinguished collaborators, as a kind of history of science research unit. It was a move towards a permanent department, and progressed as far as Singer's appointment to a lecturership in 1920, which was Britain's first university post in the history of science. But this gentle attempt to foist change on the old University did not succeed, and soon afterwards Singer left Oxford to help develop the first such department in the University of London.[15] Gunther's approach, with greater persistence, had greater success in its way, his museum of scientific apparatus being founded in 1924. Sherwood Taylor was to become heir to both of these movements which began in Oxford when he was a student.

TEACHING AND RESEARCH

In 1921 he obtained his degree with distinction (shortened-course degrees for war service candidates were not given classes), and it qualified him for a succession of posts as a chemistry master. The first was at the County Boys' School, Maidenhead. His knowledge of chemistry was still "decidedly patchy", but his teaching was sufficiently stimulating for two of his earliest pupils to win scholarships to Oxford, one of them R. P. Bell. He is remembered as a teacher who not only made chemistry seem exciting, but also endeared himself to the boys by his mischievous humour and by spending many lessons nominally devoted to chemistry in reading and discussing poetry![16]

His historical interests were also apparent; and it was while teaching that he set about research into the ideas and work of the Hellenistic alchemists, using his classical education in combination with his chemical knowledge. He is said to have been drawn to the subject by his love of mystical poetry, especially that of William Blake.[17] Here we find two more characteristics of his life's work: historical research consisting of precise textual criticism, in the classicist tradition; and an acknowledgement and appreciation of the spiritual, mystical, and poetic element in the record of human experience. In 1923 he enrolled as a part-time student of University College, London, to pursue this work under

the supervision of Charles Singer. A preliminary thesis on the transmutation of metals as described in early texts was presented for the Oxford postgraduate degree of B.Sc. in 1925, and the full thesis, "A Conspectus of Greek Alchemy", earned his London Ph.D. in 1931.[18] Its main substance appeared in the *Journal of Hellenic Studies*; and his article on "The Origins of Greek Alchemy" in the first issue of *Ambix* (1937) was derived from the same source.[19] It was, moreover, to be the foundation for his most famous historical book, and for the topic which remained his chief speciality.

Sherwood Taylor's first books, however, arose from his teaching of chemistry. Inspired in part by Sidgwick, and with help from another Oxford chemist, D. Ll. Hammick, he compiled a small textbook of *Elementary Practical Physical Chemistry* for secondary schools and university first-years, published in 1928. The next year *A New School Chemistry* was issued by Dent, in a series edited by E. J. Holmyard.[20] Other textbooks followed. The most substantial and enduring were his *Inorganic and Theoretical Chemistry* and *Organic Chemistry*, which were to be the authorities upon which countless students relied for three decades. The tenth edition of the former was still in use well into the 1960s.[21] *The Young Chemist* was also reprinted in the 1960s.[22] All these books were written while he was chemistry master at Gresham's School, Holt (Norfolk) and then at Repton School, near Derby – where he was ably supported by the laboratory assistant, H. Pocock, who even marketed "chemical cabinets" to use in conjunction with *The Young Chemist*.[23]

In 1933 his teaching career progressed from school to university, with his appointment as Assistant Lecturer in Inorganic Chemistry at East London College (soon to be renamed Queen Mary College), University of London, a post he held for five years. During this time he engaged in some practical research in the college laboratories, preparing double salts from halides of metals and organic bases, and examining their properties. Some results were published in the *Journal of the Chemical Society*, though a longer paper written with several collaborators was apparently rejected.[24] Such research was a natural part of being a university lecturer. But it is uncertain whether he envisaged continuing in this career – for he was also busy developing other possibilities.

SCIENCE, HISTORY, AND FREEDOM

It was in these same years at Queen Mary College that he turned his attention to wider aspects of the history of science, and to writing his first expositions of general science for the average reader. *The World of Science* (1936) was his masterpiece in this genre, and for a long time it was to be his best-selling book.[25] It was an encyclopaedic work of synthesis, and established him, in the tradition of *Science for All*, as a mediator between science and the common man. Like some of his other books seeking to convey difficult technical knowledge to a wide readership, one of its underlying virtues was the trouble taken to solicit information and advice from experts. He combined this with a patient and businesslike readiness to accommodate the requirements of his publishers. For the reader, his more obvious quality was simply "the gift of making science intelligible" – of being able to explain very complex things in lucid and direct language.[26]

The history of science, which had been seen by its pioneers as offering a bridge between science and art, and between science and the general public, was an ideal medium for the exercise of the same talents. The historical introduction to *Inorganic and Theoretical Chemistry* had benefited from the advice of Singer, one of the masters of this field; and later, in *A Short History of Science*, Sherwood Taylor acknowledged the help of J. R. Partington, his professor at Queen Mary College.[27] The influence of such men clearly encouraged his historical ventures *outside* the world of alchemy.

He staked a first and bold claim in this field in 1938 when he offered his public *Galileo and the Freedom of Thought*.[28] It brought together one of his great scientific heroes and one of his great philosophical concerns – freedom of intellectual thought and expression. He considered that he knew Galileo better than any other historical character, and often lectured on him. In the 1950s he planned a revised edition of the book, though it did not appear, perhaps because of de Santillana's study of the same subject.[29] Instead, he gave Galileo the star role in *An Illustrated History of Science*, telling his young readers how Galileo had "made it his task to confute the science of the Greek philosophers and to found a new science on observed fact and nothing else".[30] He had come into conflict with authority because of it; and this aspect of the Galilean legend moved Sherwood Taylor because it was an archetype of the free scientific intellect in conflict with the inertia, stupidity, and intolerance of the established institutions of society. Sherwood Taylor's own age was full of examples, and so *Galileo and the Freedom of Thought* had a contemporary message too.

His view of the persecution of Galileo did not need to be modified when he became a Roman Catholic – Galileo's conflict had not been with the Catholic Faith but with an authoritarian Church. Sherwood Taylor's attraction to Catholicism actually began in his studies of Galileo; but his devotion to the Church was never so sheepish as to quell his primary allegiance to truth and freedom, as he saw them. For instance, he felt strongly that the Vatican should declare itself against nuclear warfare.[31] "Freedom" was an especially emotive notion in those days. A number of his acquaintances were scholars who had been hounded out of their own countries, such as the Austrian polymath Robert Eisler; and he went out of his way to be helpful to such people.[32] At the end of the Second World War he was one of the founders of the Society for Freedom in Science, the brainchild of another philosophical scientist, J. R. Baker. The Society reflected the character of such men by being no dupe to simplistic political polarisations – it conflicted not only with the obvious totalitarian targets but also with bodies like UNESCO, whose statement on "race" it attacked in 1953.[33]

The reverse of the coin is tolerance of other views and traditions. In his religious explorations Sherwood Taylor became sympathetic with many exotic beliefs; and once a Catholic he continued to recommend the Chinese mystical philosophy of Tao (following a precedent in Jesuit teaching, though equally because of its associations with Chinese alchemy).[34] As a historian, too, he urged the study of men's lives and ideas *on their own terms*, and was a painstaking exponent of remote and often very difficult modes of thought – the outstanding instance, of course, being alchemy.

AMBIX

In 1936, amid an upsurge of interest in the subject, Sherwood Taylor was one of a group of specialists who founded a Society for the Study of Alchemy and Early Chemistry, which at first he administered from his home in central London. More importantly, he took on the job of Honorary Editor of its journal, *Ambix*.[35] The first issue appeared in May 1937. There was no editorial statement, but Julius Ruska's methodological discussion set the tome.

> We continually need new texts, we need summaries of contents, translations and commentaries ... But in order to achieve a real history of alchemy we also need the application of the keenest critical methods. ... The inevitable consequence of critical philological work is the destruction of illusions, but there remains no other way of clearing the undergrowth of legends and of approaching historical truth.[36]

These very things became enduring characteristics of the journal, and were provided not least by the editor himself, in articles ranging from ancient Greece to late seventeenth-century England.

Ambix demonstrated straight away both the scope there was for original work on the subject, and the daunting range of erudition required, not least on the part of its editor. E. J. Holmyard later paid tribute to Sherwood Taylor's "scholarship, judgment, and unremitting labour" in this "exacting and intricate task". Problems inevitably arose, and in spite of his tolerance of the views of others he sometimes had to exercise "the firmness requisite in an editor".[37] *Ambix*'s appearance during its first two decades was, however, erratic, like much else in those austere and disrupted times. It was suspended for no less than eight years from 1938, and after its return gaps of a few years became normal.

J. R. Partington was probably the guiding force in the formation of the Society, and became its first Chairman. His articles in the early issues of the journal were models of their kind. But many other historians, both masters of the field and younger men who were to be equally distinguished, contributed to *Ambix* under Sherwood Taylor's editorship: Tenney L. Davis, Denis I. Duveen, R. J. Forbes, Gerard Heym, C. H. Josten, Edmund O. von Lippmann, Douglas McKie, Richard B. Pilcher, John Read, Julius Ruska, Mrs Singer, H. E. Stapleton, Lynn Thorndike – it was an impressive, international gathering.

MUSEUM OF THE HISTORY OF SCIENCE

In 1938 Sherwood Taylor left his post at Queen Mary College and took, as it were, a sabbatical from full-time employment. He had, in fact, certain independent means of income, derived partly from a legacy, and including a small chain of village general stores. By now, too, his books were bringing an annual accumulation of royalties. Writing was to remain an important part of his income, and he approached it very professionally, in collaboration with his agent David Higham and his main publisher William Heinemann Ltd, to both of whom he was a considerable asset.[38] 1939 alone saw a three-volume textbook of *General Science for Schools*, *A Short History of Science*, and

the cleverly titled *Science Front 1939*; and the flow continued in the years that followed. *The Century of Science* and *Science Past and Present* were especially successful.[39]

To underpin this writing career, he was looking out for "some appointment which will allow me to devote myself to the study of seventeenth-century scientific thought"[40] – or, to be truthful, any other subject that might catch his imagination. In 1939 he came into contact with R. T. Gunther, who, at the age of 70, was seeking a successor as Curator of the museum he had founded in Oxford. After an informal interview he was told to be ready to start the following spring. Gunther intended to spend a few months initiating him, but in the event died leaving the Museum in confusion, many things having been packed away for the War. Sherwood Taylor found lodgings in Oxford and was appointed temporary Curator from August 1940 (and full Curator, on a greatly increased salary, in 1945).[41]

The Old Ashmolean Building, in which the Museum of the History of Science was housed, had been opened in 1683, and for 175 years it was the centre of science teaching in the University of Oxford. Elias Ashmole had been an alchemist and a collector of alchemical manuscripts; and the laboratory associated with his foundation had a significant place in the transition from alchemy to "modern" chemistry.[42] These facts must have strongly attracted Sherwood Taylor, and the influence of Ashmole's heritage and ambience of the Old Ashmolean soon took hold of him.

He *did* pursue his study of seventeenth-century thought, and lectured on the subject.[43] More significantly, starting with Ashmole's own works and the Ashmole manuscripts in the neighbouring Bodleian Library, he extended his knowledge of alchemy down to the seventeenth century. He found many texts and poems to analyse, and became particularly fond of the English alchemists, homely characters like George Ripley and Thomas Charnock.[44] Not surprisingly, it was in the early 1940s that he first drafted a general history of alchemy, though much rewriting and further research preceded its publication as *The Alchemists* at the end of the decade.[45] The Museum's collections also drew him into writing articles on the history of scientific instruments, notably those in *Annals of Science* on the thermometer, the chemical still, and the hygroscope.[46]

Instruments of measurement, observation, and experiment were the Museum's speciality. Gunther had hoped for a successor who was interested in the microscope; and in terms of the development of the collections Sherwood Taylor's greatest achievement was the purchase in 1944 of the R. S. Clay collection, which was rich in optical material and above all microscopes. His attention had been drawn to it by the old enthusiast G. H. Gabb, who bequeathed a portion of his own eccentrically miscellaneous collection when he died in 1948.[47] Gunther's books and instruments, meanwhile, were inseparable from the Museum, and were secured as a loan from his heirs. Sherwood Taylor himself added some alchemical books to the Museum library, and his presence attracted similar gifts from friends such as Duveen, Heym, Sidgwick, and especially Stapleton, who gave his library of books and manuscripts on Indian and Arabic alchemy.[48]

The Museum was closed when he took over, but in 1941 a reduced display was opened in the basement. After the War this was closed because of necessary repairs to the building. By 1947 it was possible to mount a temporary exhibition of "scientific apparatus pertaining to medicine and surgery" – broadly interpreted so as to include the Clay microscopes.[49] In 1949 the renovation of the Old Ashmolean was finally completed and the Museum, for the first time, fully occupied the building which Gunther had fought so hard to secure for it. A guide book was published (the most recent!), and a re-opening ceremony held in October.[50]

For all the vicissitudes, there had been no doubt of the Musum's survival. Its subject-matter, however, had no link with the University's curriculum, though Gunther had wished to see official "History of Science" courses taught from his Museum. Sherwood Taylor shared this aspiration. Lecture courses to Royal Air Force cadets, starting in 1942, he proudly described as "the first systematic instruction in the history of science to be given by the University".[51] His schemes after the War began with a "Memorandum on the Teaching of the History of Science in Universities", submitted to the authorities in 1946, including proposals for a Diploma and for *five* lecturerships![52] To prove the need he launched a programme of lectures on "the History and Method of Science" (a phrase imported from London) in the academic year 1947-8, when over 70 lectures were given by himself, S. F. Mason, and guests A. C. Crombie and P. Moran.[53] Mason, a pupil of D. Ll. Hammick, had been appointed to help develop the Museum's teaching role. When he left in 1953 a post of Lecturer in the History of Science was established (and filled with much distinction for over 30 years by Crombie), and for a while a Diploma was taught.[54]

SCIENCE MUSEUM

It had not been difficult for Sherwood Taylor's interests to embrace the precision technology represented in the Museum of the History of Science. He was already keen on the history of crafts and tools, in which he saw the beginnings of scientific discovery;[55] and he had a sound appreciation of the interdependence of science and technology, large and small. The appeal of his popular and educational books lay partly in their fearless descriptions of the most recondite modern techniques – television transmission and reception in *Science Front 1939*, for instance, and in the 1950s nuclear power generation in *Power To-day and To-morrow* and *A History of Industrial Chemistry*.[56] The idea for the latter book was in his mind in 1950, when he was also planning (abortively) a "History of Scientific Instruments", "which is a subject that I really do know something about", as well as writing a booklet on inventions for the British Council.[57]

There were various reasons, then, why the Science Museum in London, the national museum of science and technology, held interest and potential for Sherwood Taylor. With a possible visiting professorship in the USA having fallen through, and death-watch beetle threatening the same fate to the roof of the Old Ashmolean, he applied for the Directorship of the Science Museum, and was appointed in October 1950. The status and the pay of this prestigious post made it all the more attractive. But (as he confided to Catholic friends) he also felt it would be a good thing for a Catholic to hold the office. "The Vatican *will* be pleased!" was one good-humoured message of congratulations.[58]

On the other hand, his appointment was greeted with surprise and even hostility by some senior staff of the Museum. His well-publicised views on science and religion were partly at issue. Put crudely, a man who defended the existence of miracles and the virgin birth, while criticising the narrow materialism of modern science, seemed an odd choice to head a scientific department of the Ministry of Education. Attitudes which were unexceptional in the academic atmosphere of Oxford would feel very out of place in the new environment. More to the point, they were easy targets for whose who in fact resented his appointment on other grounds, for it seems to have been a deliberate break with tradition: he was the first complete outsider to hold the office, and the first to come to it as a *historian*, or for that matter as a popular educator.[59]

The Museum was in the process of change during these years (1950-56), a combination of post-war reconstruction, spin-off from the Festival of Britain, and a slightly re-defined role (as implied in Sherwood Taylor's appointment). Several new galleries and displays were opened, such as the dramatic coal-mining gallery. Special events and temporary exhibitions were staged, including a centenary celebration of the chemist Sir William Ramsay, and the "British Clockmaker's Heritage" exhibition, both in 1952. Sherwood Taylor's interest in improving the historical holdings led him to assign a substantial sum to be spent on choice pieces from the Percy Webster horological collection.[60] A notable acquisition for which he was responsible was the painting "Coalbrookdale by Night" by P. J. de Loutherbourg, unknown at the time and now perhaps the most famous of all industrial paintings.[61] The Science Musum Library also attracted his attention, and he made his most individual mark by organising an exhibition of "A Hundred Alchemical Books", the first in a series of bibliographical exhibitions.[62]

The post of Director of the Science Museum was a civil service managerial job under strict control from Whitehall. The core of his work was a dull and stressful routine of administrative overseeing and rubber-stamping, sitting on and arguing with committees, letter dictating, and swapping memoranda with the Keepers and with his counterpart at "the Ministry". The restrictions associated with the latter were especially awkward. He had, for instance, to restrain publishers, editors, and lecture organisers from their natural wish to bill him as "Director of the Science Museum" unless what he was saying had official approval. He often spoke and wrote as a private individual and as a Catholic; yet even so uncontroversial a book as *An Illustrated History of Science* made no mention of his position, the dust-jacket alone being intrepid enough to call him "The Director of a world-famous scientific institution"![63]

LECTURES AND BROADCASTS

One can see something of the tiresomeness which only aggravated Sherwood Taylor's dislike of administrative business and conflict, and increased the contrast with Oxford.[64] Yet there were some advantages in his London job. More than ever he was treated as a person of importance: captains of industry were honoured by his requests to inspect their works, or to be supplied with photographs or information; and it gave an edge to the reputation and influence he had already earned in the educational world. One of his

policies as Director was to try and make the Science Museum a really effective educational resource.[65]

Freelance lecturing was an important part of his work as an educator, and large numbers of typed and handwritten lectures survive among his papers.[66] His indefatigable schedule of one-off talks all around the country amounted, like his writing, to a career in itself. Scientific and chemical societies in universities, and Catholic societies and institutions, were his most frequent audiences. He was also invited to school speech days, to openings of museum exhibitions, and to debates (which he did not like very much). He continued to give academic courses (for the Science Museum's neighbour Imperial College, and at Oxford), and he increased and participated in the Museum's own lecture service. He was also called upon to address scholarly and professional bodies: the Association of Women Science Teachers, the British Association for the Advancement of Science, the Institute of Physics, the Museums Association, the Royal Philosophical Society of Glasgow, to mention a few.[67]

He maintained his links with the Chemical Society, and in 1947 helped to organise their centenary exhibition (at the Science Museum) and wrote the booklet *A Century of British Chemistry*.[68] He was Chairman of the steering committee which, in the same year, founded the British Society for the History of Science, and served as its President in 1951-2 and 1952-3. His Presidential Address in 1953 was a key statement from a pioneer of the discipline, and could be read with profit even today.[69] Assessing the secondary literature available to the historian of science and (from his own experience) "the difficulties of providing such books", he managed to say a great deal about the scope and method of the subject, and the way in which it needed to develop, especially within the universities.

While he was thus at the top of his calling as a historian of science, he was accorded one of the highest honours available to a scientific educationalist, being invited to deliver the 1952 Royal Institution Christmas Lectures for juveniles (December 1952 and January 1953). He was asked to lecture on historic experiments, which could be re-enacted for the audience in the vivid manner for which the Christmas Lectures are renowned; and he wove around them, under the heading "How Science Has Grown", a sweeping history of experiment and observation.[70] Having arranged for Heinemann to publish the lectures, the problem of what the book should offer in place of the experiments was solved by commissioning illustrations from the painter A. R. Thomson, RA. Their good-humoured and casual simplicity disguises a careful attention to detail and much serious research to ensure their authenticity. Sherwood Taylor was very proud of the result, which appeared as *An Illustrated History of Science* in 1955.[71]

One of the Christmas Lectures was given a second performance for the BBC's outside broadcast cameras, a television tradition then only four years old.[72] This was not Sherwood Taylor's only encounter with broadcasting. In 1954 he took part in the pioneer television parlour game "Animal, Vegetable, Mineral?" at the invitation of the producer David Attenborough, who wrote afterwards hoping that it had not been "too frightening" an experience.[73] Wireless broadcasting was more familiar to him. During the 1940s and

50s he read a number of short talks, both on the history of science and on the philosophical aspects of science and its relation to religion. It extended the routes by which he could reach his audience, at home and in school. Different techniques were possible too. He prepared several educational dramatisations: one on nineteenth-century public health improvements, another on the ideas of the alchemists through the ages. A further permutation was the radio conversation, the most memorable in 1947 with J. R. Baker on the question of miracles, which Sherwood Taylor defended and Baker, a Unitarian, denied.[74]

LAST WORKS

During 1953 Sherwood Taylor suffered a period of illness. In 1955 he was ill again for much of the middle and later part of the year. His friends felt that the stressful nature of his professional life in the 1950s "took its toll of his health".[75] He died on January 5, 1956, at his home in Crowthorne, Berkshire. *An Illustrated History of Science* was in the midst of popular success.[76] A chapter he had written with Charles Singer on "Pre-Scientific Industrial Chemistry", for Singer's *A History of Technology*, had been corrected in proof and appeared later in the year.[77] It was a preview of a book which brought many of his interests together. Alchemy lay behind much applied chemistry; and it seems appropriate that having written *The Alchemists* while at the Old Ashmolean he should produce *A History of Industrial Chemistry* at the Science Museum. It was completed during his last illness, and published in 1957.[78]

Also among his papers was a file containing material for the next issue of *Ambix*, including his own article on "An Alchemical Work of Sir Isaac Newton". Confirming the original suggestion by R. J. Forbes, its conclusion that Newton "was in the fullest sense an alchemist" was – and indeed remains – no trivial bequest to the history of science.[79] With the addition of an obituary by Holmyard, this issue of *Ambix* was published in October 1956, completing the fifth volume. Its new editor was Desmond Geoghegan, who also took up the subject of Newton's alchemy.[80]

MAN AND MATTER

Frank Sherwood Taylor was a man of distinguished appearance, with pale complexion, black hair, and in later life a neatly-cut beard. He walked with a limp, which was the effect of his war-wound. Mildly spoken and an attentive listener, his pupils and younger colleagues found him approachable and helpful; while his own mentor Singer thought him "a very likeable fellow", though (in the 1930s anyway) "inclined to be lackadaisical & whimsical". He enjoyed the amenities of a modern life-style: his homes always had a telephone, and he was a motorist for many years. He commuted to the Science Museum in a car with a diesel engine. His hobby was bee-keeping, and he was also "a very knowledgeable gardener".[81]

He had a playful, often understated sense of humour, which most people found endearing.[82] It could, however, be missed by strangers. A student who came to the Museum of the History of Science enquiring if there was a collection of books he might

use (perhaps phrasing it badly) was taken aback by the response "I don't collect books, I write 'em!"[83] On one occasion he could not resist the temptation to dictate a wry letter to a radio producer who had asked him for a talk on alchemy "angled at the Third Programme audience":

> a Third Programme audience ... is a thing I have never seen. I suppose they are people with long untidy hair, spectacles and an addiction to all the latest intellectual fashions, of which I believe Jung's alchemical studies to be one.[84]

In fact, his attitude to C. G. Jung's psychological interpretation of alchemy was an example of his openness to the valuable aspects of opinions with which, on the whole, he disagreed. He acknowledged that Jung's perceptions were true, but knew that they were not the "complete picture". His critique stopped far short of the extreme condemnation commended to him by Gerard Heym in private letters. It is to his credit that the pages of *Ambix* were kept open to all *bona fide* scholarship, and in 1946 were distinguished by a contribution from Jung himself.[85]

No one who knew Sherwood Taylor was surprised when he turned to the Roman Catholic Church, for he had always been deeply interested in and receptive to religious experience and the intellectually demanding writings of spiritual philosophers – be they alchemists, mystical poets, or Christian saints. Since his Galileo studies he had begun to observe his Catholic friends and to study some of the great Catholic authors. He had been reading the *Confessions* of St Augustine when, standing beside a London by-pass one day, he heard an inner voice say "Why are you wasting your life?" It was, he later learned, the feast-day of St Augustine. Less than three months later, in November 1941, he was received into the church.[86]

His predilection for textual and philosophical exegesis very much characterised his intellectual life as a Catholic. He prepared translations of works by the mediaeval contemplatives Jan van Ruysbroeck and Hugo of St Victor.[87] Inevitably he was drawn to the thirteenth-century scientist and theologian Albertus Magnus, only recently (in 1931) canonised and made patron saint of scientists.[88] Above all he revered St Albert's pupil St Thomas Aquinas, whose erudite theology was part of a fully worked-out natural philosophy. He studied Aquinas's writings "like a very small mouse at a very large cheese", attending courses at Blackfriars in Oxford, and elucidating his attitude to science in a paper read to the Aquinas Society in 1944.[89] It inspired a full scrutiny of thirteenth-century scientific thought, which was presented as lectures, though never published.[90] As it happens, the study of Aquinas and the mediaeval Dominicans from the point of view of the history of alchemy had been urged by Partington in the first issue of *Ambix*.[91]

Sherwood Taylor's association with Blackfriars, one of the great centres of Dominican learning, was very important to his religious life in Oxford. He was also active in other Catholic bodies, especially the Newman Association (a society of university graduates), being Vice-President, and Chairman of their Publications Committee.[92] He wrote the tract *The Attitude of the Church to Science* for the Catholic Truth Society.[93] In 1949 he undertook to collaborate with Sister Cecilia Oddie, OP in the writing of a general science

textbook under the auspices of the Association of Convent Schools.[94] In short, he became a leading lay voice in Catholic education and science.

In 1936 he had been content to say approvingly that science, while not denying the existence of God,

> concerns itself with things it can understand and test and experiment with. For the rest it minds its own business and leaves everyone to decide on his own religious views.[95]

Having become a Catholic, his mind inevitably fastened on to "the possibilities of their synthesis"[96] – a synthesis of science and religion which would achieve true "wisdom", the universal outlook of the true "natural philosopher". This was the theme of his book *The Fourfold Vision*, its title taken from Blake. It includes a defence of the possibility of virgin birth, and a discussion of the spontaneous perception of deity in nature, illustrated by poetic quotations. To these he added an account of his own visionary experience in the gardens of St John's College, Oxford, on an autumn morning in 1943 – an experience which confirmed to him "that the scientific description of nature is as jejune as the chemical analysis of the painting of an old master".[97]

He went on to develop his religious thought in a profoundly philosophical and learned paper "On the Excellence of Things", and then in a popular book, *Two Ways of Life: Christian and Materialist*.[98] In these and in numerous other writings and lectures, some of which were collected in the volume *Man and Matter* (1951),[99] he expanded upon how modern science and the science-dominated world should be reconciled with Christianity and mysticism to achieve a unified philosophy, learned in part from the past.

> As a natural philosopher I do not want to use things, but rather to enter into them with understanding; and so I seek to relate myself to them by knowing and loving them ... It is very clear to the natural philosopher, that the true object of his contemplation must be the One that is the All, the whole of Nature as existent both in space and in time ... a manifold of light and stars and dust, seas and deserts, elephants, frogs and fleas, slugs and lilies – all interdependent, and therefore *inseparable without a falsification.*[100]

A Chemistry of Spirit

In 1930 Sherwood Taylor adopted as his emblem a figure he took from the earliest manuscript of alchemical symbols – the serpent swallowing its own tail, coiled around a Greek motto and signifying "the unity of all things".[101] The Greek, in fact, is well translated by his later phrase, "the One that is the All". Even though the priorities of his earlier life were, of necessity, rejected as "materialist", his mature views as a Catholic had grown out of a lifelong interest in mysticism and alchemy, his studies of which played no small part in urging him along the road to Rome. So a distinct unity characterised his thinking both as a historian of alchemy and as a religious philosopher. His alchemists had much in common with his ideal "natural philosopher" (and thus his ideal self): the "excellence of things" was *their* ultimate faith too, and philosophically they too attempted "the unification of all nature in a single scheme".[102]

Albeit only "an interim report", his book *The Alchemists* has endured because of its honesty and restraint, and because of its author's empathy with the subject.[103] It

displayed the approach he commended to historians of science: to release the historical character from the context of retrospective value-judgments and "understand and enter into his point of view".[104] This too was an extension of his mystical approach to the things of nature: "to enter into them with understanding". So great was his sympathy with alchemy – both as a spiritual quest, a refining in the human mind, and as a physical quest, a refining of the material of creation – that he could be said to have pursued a version of it in his own life. After all, alchemy was not only "essentially religious" but it relied heavily upon the study of texts![105]

Of course, Sherwood Taylor insisted (*contra* Jung) upon the *practical* nature of alchemy – that the true alchemists were chemical technicians who devoted long hours to laboratory work, seeking "to perfect everything in its own nature".[106] But they were not "materialists" because the horizons of their vision extended beyond the laboratory, where the manipulation of matter was part of a personal journey towards the universal mystery – as their twentieth-century successors have occasionally felt. Sherwood Taylor lived through an age when discoveries in chemical physics inspired Rutherford and Soddy to announce a "new alchemy". Nuclear reaction verged upon proving the transmutation of base metals into gold possible, and this was one of the things which rekindled interest in the history of the subject.[107] Sherwood Taylor kept an open mind anyway about what the alchemists may have achieved, believing as he did in "preternatural" events, and conscious that no modern chemist had seriously tested alchemical claims, such as repeating the vast number of distillations of the one specimen which certain texts recommended.

He spoke of setting up a furnace in his garden and trying some of the procedures himself, and he did once attempt the distillation of eggs.[108] But the point was that alchemy had been a consuming life's work, with the personality of the alchemist as one of its raw materials. The doctrine of a common quality or component in all things, which the Greeks called *pneuma*, was Sherwood Taylor's answer to the logic of alchemical belief and practice. As "a chemistry of spirit", working upon this *pneuma* both in matter and in man, alchemy made sense to him[109] – increasingly so as he too came to witness, in a way that can no more be communicated than could the ultimate secret of the alchemists, the unity and the perfectibility of creation.

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[85] FST, *The Alchemists* (note 45), pp.159-160, 227; MSS, boxfile "History of Alchemy &c", including unpublished typescript critique of "Jung's Account of Alchemy", and letter from H[eym], 1943; C. G. Jung, "The Bologna Enigma", *Ambix*, vol.2 (1946), pp.182-191.
[86] "Catholic Profiles: 96", *Dictionary of National Biography* and obituaries in *Catholic Herald*, *The Newman*, and *Proceedings of the Chemical Society* (note 1); FST, *Man and Matter* (note 2), the first chapter of which, pp.9-30, consists of an autobiographical account of his upbringing, religious explorations, and conversion (pp.28-9). And see FST, "The Confessions of Saint Augustine", *Westminster Cathedral Chronicle*, vol.39 (1945), pp.68-70.
[87] Jan van Ruysbroeck, *The Seven Steps of the Ladder of Spiritual Love*, translated by FST (Westminster, [1944]); Hugo de Sancto Victore, *The Soul's Betrothal-Gift*, translated by FST (Westminster, 1945). Several unfinished translations of similar works are among the MSS.
[88] FST, *St. Albert: Patron of Scientists* (Oxford, 1950); FST, "St. Albert the Great", *The Month*, new series vol.13 (1955), pp.220-232.
[89] "Catholic Profiles: 96" (note 1); FST, *The Attitude of Saint Thomas to Natural Science* (Oxford, 1944). The MSS contain many notes from the courses he attended; his ancient folio copy of Thomas's *Summa Theologiae* is still treasured by Mrs ST.
[90] MSS, boxfile "Lectures on XIII Cent Science", and other papers, including outline for book "Physical World of XIII Century Christendom".
[91] J. R. Partington, "Albertus Magnus on Alchemy", *Ambix*, vol.1 (1937), pp.3-20, esp. p.20.
[92] Obituary in *The Newman* (note 1); MSS, files "Newman Assoc. Correspondence", 1944, and "Newman Association Publications C[ee]", 1948-50.
[93] FST, *The Attitude of the Church to Science* (London, 1946).
[94] FST & C. Oddie, *General Science for Girls* and *A Short General Science* (London, 1952 and 1955); MSS, boxfile "General Science for Catholic Schools", 1947-50. Intended as a 3-volume work, the publishers changed the title of the second volume and the third appears never to have been issued, though a typescript of it (by Sister Cecilia) is among the MSS.
[95] FST, *The World of Science* (note 25), p.21.
[96] FST, *The Fourfold Vision* (note 17), p.11.
[97] *Ibid.*, quoting from p.98. Cf. FST, *Man and Matter* (note 2), p.17.
[98] FST, "On the Excellence of Things" (note 34); FST, *Two Ways of Life: Christian and Materialist* (London, 1947).
[99] See note 2. It consists of 12 lecture-essays (including "On the Excellence of Things", pp.102-125), preceded by an autobiographical introduction pp.9-30 (see note 86).
[100] FST, "On the Excellence of Things" (note 34), pp.117-119. Cf. Brown (ed.), *op.cit.* (note 4), vol.5, p.376.
[101] He used it on the front cover of many of his books, starting with *Inorganic and Theoretical Chemistry* (note 21), having first illustrated it in *Journal of Hellenic Studies* (note 19), p.117. See: pp.112, 116-7 of the latter; FST, "The Origins of Greek Alchemy" (note 19), pp.44-5; FST, *The Alchemists* (note 45), pp.52, 57-8. For a later study of the symbol see H. J. Sheppard, "The Ouroboros and the Unity of Matter in Alchemy: A Study in Origins", *Ambix*, vol.10 (1962), pp.83-96.
[102] FST, *The Alchemists* (note 45), p.235.
[103] *Ibid.*, p.ix. It was nicely reviewed by Holmyard in *Nature*, vol.170 (1952), pp.725-6; and see Caldin's assessment in *Proceedings of the Chemical Society* (note 1).
[104] FST, "Reflections on the Writing" (note 69), p.243.
[105] FST, *The Alchemists* (note 45), pp.235 (religious), 2-3, 190-191, 234 (texts).
[106] *Ibid.*, p.3, and see p.233.
[107] FST, *A Century of British Chemistry* (note 10), p.5; FST, *The Alchemists* (note 45), pp.233-4; FST, *A History of Industrial Chemistry* (note 56), pp.360-361; MSS, file of correspondence between FST, S. F. Mason, and H. E. Stapleton, 1948. And see: Dorothy M. Fisk, *Modern Alchemy* (London, 1936); Lord Rutherford, *The Newer Alchemy* (Cambridge, 1937); Frederick Soddy, *The Story of Atomic Energy* (London, 1949).
[108] Personal communications.

[109] FST, *The Alchemists* (note 45), p.230, and generally pp.7-17; FST, "The Idea of the Quintessence", in Underwood (ed.), *op.cit.* (note 15), vol.1, pp.247-265.

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