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CECIL HENRY DESCH, 1874-1958

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At the beginning of this century the study of metals and their alloys was given a new interest and direction by the work of Floris Osmond in France and Roberts-Austen in this country. Prior to that time the chief concern of metallurgists lay in the extraction of metals from their ores, which had been won from the earth by the miner, and so mining and metallurgy worked very closely together. The physical properties of the metals themselves and the manner in which improvements in these properties might be achieved was knowledge in the possession of practical people and the basis of that knowledge was almost wholly empirical.

The work of Osmond and Roberts-Austen inaugurated and inspired a real scientific approach to the study of metallic properties and truly founded scientific metallurgy as we know it today.

Few metallurgists who were trained in their subject during the past halfcentury have not had cause to be grateful for the admirable survey of the science of metals as it was developing during that time contained in the *Textbook of metallography* written by Cecil Henry Desch and first published in 1910. That this book went through four printings and was then rewritten and issued as a fourth edition in 1937 shows how the demand has continued over the years and how greatly its value has been appreciated by succeeding groups of students.

Cecil Henry Desch was born on 7 September 1874 in London - the son of Henry Thomas Desch and his wife, Harriet Ingerson. When only a few months old Henry Thomas Desch had the misfortune to lose his own father, a seafaring captain who had died of cholera, and he was brought up at Boughton in Northants where he attended a local school near Northampton. The teaching was surprisingly good and the master seemed to have taken a special interest in him. At any rate when he found that his pupil was interested in measurement, he proceeded to give him special coaching in land surveying which enabled him on leaving school to become an articled apprentice with a firm of surveyors. On completing his articles he joined W. Cubitt & Co., Grays Inn Road, with whom he remained for 52 years, attaining the position of Chief Surveyor, and for the last few years was a Director of the company. During his connexion with this firm he was responsible for many important constructional contracts including the Cunard Building in Liverpool, important offices in Cornhill and Lombard Street, and a large number of private country mansions. During the First World War he also had charge of a factory associated with Cubitts for the manufacture of shell fuses, and the strain of this extra work undoubtedly affected his health. Earlier in his career H.T. Desch had been sent over to France to study cements and mortars in connexion with his work as surveyor and builder, and during his stay in that country his interest in the French country dialects was aroused. That interest became a great hobby and he never missed an opportunity of travelling to France to add to his knowledge of the subject. On many of these occasions he took his young son, Cecil, with him, and these visits laid the foundation for that excellent knowledge of the French language and that facility in speaking it which brought a great deal of pleasure in later life. His many contacts in that country made the name of C.H. Desch a well-known and much-respected one in French scientific circles. (He had the honour of being elected a corresponding member of the French Academy of Sciences in 1947.)

While intensely interested in the subject of dialects, his father never had the facility nor perhaps sometimes the

courage to pronounce some of the unusual sounds and one of the reasons why he liked Cecil to accompany him on such travels was the help he got on difficult occasions through having someone with him who would face up to the problem without hesitation.

Cecil's mother, who was born Harriet Ingerson, came from Pilton, N. Devon, and was the youngest of eleven children, all of whom lived to a good age. Later, as governess-companion to Mrs Howard Vyse, whose husband was the Vicar of Boughton, she accompanied Mrs Vyse on many continental journeys to the South of France where a part of each year was always spent. It was at Boughton that she met H.T. Desch, and on their marriage they came to live in Tottenham, Middlesex, at that time almost rural on the fringe of the countryside surrounding London. Mrs H.T. Desch died in 1933 at the age of 90 and to the last her memory of all the events in her long life was clear and unclouded. The family consisted of two sons and one daughter, the brother of Cecil, Ernest Conway, carrying on the calling of their father as a surveyor.

It was from his mother that Desch received his early education which she carried on until he attained the age of nine when he was first sent to a school. With the aid of William Ellis's phonetic system she taught him to read and from her he acquired a knowledge of botany which remained an interest throughout his life. A walk with him through the countryside was made more interesting by his identification and comments on the wild flowers that were passed on the way and the numerous varieties of alpine flowers always gave him special pleasure. His home training was broadened by visiting teachers in French and music, and his ideas on religion were guided by the knowledge to be gained from such books as Edward Clodd's *Childhood of religion* and Moncure Conway's *Sacred anthology* - an anthology drawn from all the religions of the world.

His father's attitude to religious matters was in this way clearly shown. Although in his earlier years Henry was a member of the orthodox church, he was a seeker after truth and he later came to hold the view that 'nothing should be believed that could not be clearly proved'. He was a frequent attender at lectures on ethical and sociological subjects at Conway Hall to which his young son, Cecil, frequently accompanied him. With a deep admiration for his father, it was natural that Cecil should grow up with a mind that viewed religious convictions with an open detachment.

When nine years old he went to St John's School, Tottenham, where the teaching does not seem to have been particularly good. Map drawing was an important subject in the curriculum and much time was devoted to it. That and the exercise of committing to memory long lists of Latin and Greek roots seemed to be the only subjects that left any impression of the time spent at that school. Desch did admit, however, that his knowledge of Latin and Greek roots came in useful later on. In sketching buildings and landscape scenes he possessed a quite unusual skill and he made many beautifully executed drawings of botanical specimens, archaeological objects and historic buildings for his own records. So perhaps the exercises on map drawing were not altogether without their value.

Three years later he was transferred to Birkbeck School, Kingsland, a school founded by William Ellis to give secular teaching only. There was a strong bias towards science subjects which included chemistry, physics and physiology. There was also a subject referred to as 'social science' made up of a blend of economics based on the ideas of John Stewart Mill, combined with sound teaching on the principles of citizenship. The headmaster, James Runtz, had been a pupil of Huxley and he was an admirable teacher. He held the post of headmaster to that school for 52 years.

This school laid little stress on examinations and did not enter the boys for scholarships. Nor did it offer any opportunities for games, although there was a good gymnasium and some military drill was given. But there was a chemistry laboratory and the teacher of chemistry, William Runtz, a nephew of the headmaster, had been trained at the Royal College of Science at South Kensington. He was an enthusiast and he aroused the interest of the pupils in his subject with the result that many of them decided on chemistry as their future career. In addition to the chemical laboratory, there was a good collection of minerals and natural products used in industry whilst, to assist in the teaching of physiology, there were such things as a skeleton which had been obtained from Germany with detachable heart, lungs, brain and eyes, and large coloured physiological diagrams which had been prepared at the instigation of the headmaster. Although no religious instruction was

given, secular moral instruction was given and the moral standard of the school was high. Desch never regretted his parents' choice of this school and there is no question that his own interest in science was awakened by the instruction which he received there and by the enthusiasm for the subject in those who taught him.

The neighbourhood of Kingsland gradually changed. The houses were broken up into tenements and more and more the pupils came from outside the district. On the death of James Runtz the school came to an end and the buildings and equipment were handed over to the London Education Authority to be used by them as a training centre for teachers.

On the break-up of the school some of the pupils attended evening lectures on chemistry at Toynbee Hall and through this contact they gained some knowledge and insight into the social work being carried on at that centre. During his last year at school Desch was head boy, which was an early indication of that recognition by his fellows of his individuality and his ability.

Having decided to study chemistry, he entered at the early age of 15 the City and Guilds Technical College at Finsbury. This undoubtedly was the main formative influence on his scientific career for he enjoyed every day of the time that he spent there. At that period Finsbury Technical College was at the height of its fame. Under the guidance and direction of Sylvanus Thompson, as Principal and as lecturer in physics and electrical engineering, with John Perry who taught mathematics and mechanical engineering, and Raphael Meldola as the Professor of Chemistry, the College was fortunate in possessing a group of brilliant teachers. But they were more than teachers, they were strong personalities in their own right. Thompson, a brilliant lecturer with a most attractive and pleasant manner and a wide range of knowledge in other subjects than his own; Perry who possessed a highly original mind and a flair for presenting subjects in an unconventional manner, and Meldola thoroughly conventional but thoroughly sound in his grasp and knowledge of chemical science. These men gave inspiration to more than one generation of students who gave them their respect and admiration in return.

Desch obtained first place in the College examinations after spending two years as a student in organic chemistry and remaining for a further year in Meldola's laboratory as a research student. His work during that year resulted in the publication of a paper under their joint names on 'Some homonuclear tri-derivatives of naphthalene' - his first scientific paper published at the early age of 18.

The demonstrators at that time in the Chemistry Department were also particularly good teachers. They were John Castell-Evans, a slightly eccentric Welshman, and Frederick William Streatfeild, to whom many prominent English chemists owe their introduction to organic chemistry. Amongst those were G.T. Morgan and M.O. Forster who had preceded Desch in the course at Finsbury the previous year and who both became professors at the Imperial College of Science and Technology when that College was inaugurated.

Desch had now confirmed his decision to follow chemistry as a career and he discussed with some of his fellow students who had arrived at a similar decision the best way of obtaining further experience and training. M.O. Forster strongly advocated a stay at one or other of the German Universities which were pre-eminent throughout the world as centres of chemistry research and teaching, but to Desch the problem of financing a stay of any duration in Germany proved to be too difficult and he had regretfully to abandon the idea for the time being. The desire to do so however remained strongly in his mind and it was again Forster who recommended, with some knowledge of the financial problem, that Wurzburg should be considered as it was one of the less expensive centres with an active chemistry department.

In the meantime some remunerative work had to be obtained and, following a reply to an advertisement, a position as an assistant chemist was obtained with F. Kendall & Son in Stratford-on-Avon. This firm manufactured chemical materials for the brewing industry and during his association with this works Desch was engaged on the routine testing and control of the processes for the manufacture of such materials used in brewing as caramel for colouring, bisulphate for sterilization and non-fermenting sugars like levulosan, which were at that time the mainstay of the business. Some research work was also carried out and during his period as an assistant chemist this research led to the granting of patents for the production of caramels which were soluble in spirits and to the publication in the

Chemical News by Desch of one or two minor papers and notes. The bacteriological examination of yeasts and ferments was also carried on at the Stratford laboratory and photo-micrographs of samples were taken and recorded as a matter of routine control. In any work in which he was engaged, Desch had as a natural habit the desire to study and to make himself familiar with the published information on every aspect of the subject. During this period he acquired as a consequence of the work in Kendall's laboratory a good knowledge of bacteriology and, rather surprisingly, a practical understanding of those defects in the product which arise during the brewing of beer and a knowledge of the various ferments which cause them.

What proved of greater significance later on was the interest which developed into photo-micrographs and microscopes and the practical techniques for successful high-magnification photographs, for it was from this beginning that he turned to metallography with the wish to apply these same techniques to the study of metal surfaces. Desch always said that his interest in metallography started during his Stratford days.

Among the commissions received by the laboratory, in which Desch took a leading part, was one to prepare small quantities of all the rare earths and particularly scandium, which had been requested by a man who ultimately turned out to be a company promoter. Many months were spent on fractionating salts from Norwegian minerals and monazite sands from Ceylon and there are records to show that the rare earth content was estimated from the absorption spectra of solutions with the aid of a Browning spectroscope - a very early example of the use of a spectroscope for the purpose of quantitative analysis. In the end the work was abortive for it ultimately became known that the object of all this research was an endeavour to find a way of evading the Welsbach patents for gas mantles. In this the company promoter was not successful and an action for infringement was raised at which Desch had to give evidence as an expert witness. He recalled the occasion always with an amused chuckle for he said that his only contribution to the trial was to convince the learned Judge that elements like scandium did really exist and were not merely figments of the imagination.

Many requests came to Kendalls for standard solutions and for reagents for testing as at that time the brewers were very dependent on German chemical manufacturers for their supplies. This led the company to start a department for the manufacture of fine chemicals and in the development of this section Desch took an active part. The new development was widely advertised. Kendalls announced they could undertake the making and supply of chemicals not otherwise obtainable with the result that this somewhat rash assertion led to a large number of orders for chemicals which it was quite unprofitable for a small department to produce. Orders for many unusual organic compounds were taken and their preparation gave rise to work which, while intensely interesting to a chemist, was financially unremunerative to the company. The experience which Desch gained in such work proved most useful when he was requested during the Second World War to assist the Government, at the instance of the Royal Society, by organizing a team of workers for the preparation of chemicals no longer obtainable.

About this time however Desch began to feel that his future advancement might be hampered by the lack of a university degree. The spare time of his evenings was therefore given over to continuing his studies and he worked for an external degree from London University, passing successively the matriculation and the Intermediate B.Sc. examinations. In addition to mathematics, physics and chemistry, he had to satisfy the examiners in botany and zoology as well. Without a teacher he taught himself the dissection of plants and animals, and he worked assiduously through all the standard types. As if this was not in itself enough, for his principal subject in the final examination he chose geology. Extensive study was made of the exposures in the neighbourhood of the local Lias deposits and the collection and examination of fossils were added to his activities. This new interest was probably an advantage to his health for it took him on long walking tours and gave him an opportunity for exercise which he would not otherwise have taken.

At that period of his life he drove himself hard and it was fortunate that his constitution survived without any apparent damage. Still set on going to Wurzburg, he saved money with unrelenting determination and even on the matter of food the minimum sufficed. He took time for some relaxation, however, through his interest in Shakespeare's plays and in the Shakespeare Memorial Theatre of which he was a most enthusiastic

supporter. The Memorial Library was another favourite haunt and he had an extensive and understanding knowledge of the dramas about which he contributed papers on several occasions to the Shakespeare Club. Stratford-on-Avon was an active and interesting period in his life and Desch retained many happy memories of his stay in the town.

In the final examination for the London B.Sc., he not only passed successfully, but he won a scholarship of £40 tenable for two years.

Meantime the Department of Fine Chemicals at Kendalls was not overcoming its initial want of financial success and it was decided to close it down. The staff had to be reduced and, to save an older man from having his employment terminated, Desch volunteered to leave of his own accord. With what he had saved and with the help of his scholarship, he thought he had sufficient money to take him to Wurzburg and there he proceeded in 1900, having spent eight years in the service of Kendalls.

There are few records of the time spent at Wurzburg University. The Professor of Chemistry was Arthur Hantzch under whom he worked for the Ph.D. degree. It was necessary to take two other subjects in addition, so physics was studied under Willy Wien and botany under Emil Kraus. His research work was concerned with organic compounds of ferric iron and it earned him his degree in 1902 *summa cum laude*.

Returning to England and somewhat uncertain what his next move should be, he was advised to consult Sir William Ramsay who was then the Professor of Chemistry at University College, London. Their interview was brief and to the point. After talking to Desch for a short time on his work in Germany and his ideas on the future research he wished to carry out, Ramsay said 'All right, Desch, you can start in the lab. tomorrow.'

The subject which interested him most and which he had touched on in Wurzburg was that of tautomerism and he resumed its further study at University College. Another occupant of the laboratory was E. C. C. Baly with whom he discussed the project. Baly suggested that it might be attacked with the help of ultra-violet absorption spectra and the research was commenced in that way, first with a large grating instrument but quickly changing to a quartz prism instrument supplied by Hilger. It was found that the interesting part of the spectrum was confined to a narrow region and after much detailed work a relation between the absorption by a layer of known concentration, or rather the logarithm of the thickness of the layer, was worked out only to find when it had been completed that the basic theory had already been published by Rayleigh. A number of joint papers with Baly were however published and later further publications on the same subject took place in conjunction with T.M. Lowry who also worked in Ramsay's laboratory at University College.

This continuance of the work started at Wurzburg led to the award of the D.Sc. from London University for a thesis on 'Keto-enol tautomerism' in 1902.

An opportunity to apply his knowledge of metallography occurred when Sir William Flinders Petrie, who was on the staff of University College, asked him to examine the composition and structure of metal implements which had been found during the excavations at Ur. This was done with his usual thoroughness and an interest in archaeology inevitably followed. That his knowledge of the subject was far from superficial was recognized when later he was asked to become a member of the British Association Committee on that subject. A subject of much interest to that Committee was the origin of the Sumerians and it had been suggested that an analysis of the copper and bronze objects found on the sites which had been excavated might throw light on the problem. If it were found that they contained impurities which were characteristic of those metals in other parts of the habitable area known at that time, some light might be thrown on the sources from which the metals were derived and consequently on the migrations of the Sumerians themselves.

Desch undertook the analysis of many objects for this purpose, first by the ordinary chemical methods and latterly as an added refinement by spectroscopic methods. He became secretary of the Sumerian Committee and several reports were issued as the work progressed. The curators of various museums became interested and submitted examples of other copper and bronze objects and the scope of this Committee widened and the work increased. That this activity was appreciated can be indicated by the many centres which took advantage of

this new approach to obtain more information about the archaeological objects in their charge. In addition to the British Museum, work was done for the Louvre, the Oriental Institute of Chicago, the Iranian Institute of New York and many other bodies. To help in the analyses, an assistant was appointed and the cost was most generously financed by Sir Robert Mond. Unfortunately on his death this help ceased and the work of the Committee came to an end. After being in abeyance for some time, it is of interest to record that the Copper Development Association assumed the responsibility of restarting the work and now carry it on.

To this phase of his work Desch ascribed the origin of his keen interest in the history of science, but it was also fostered by the teachings of Positivist Philosophy and by his friendship through this connexion with other members of the group like F.S. Marvin. This author, who had published *The living past* and other books interpreting historical development, ran summer schools in Rome and other places at which Desch was a frequent lecturer.

The award of the D.Sc. marked the end of his training period and the need to seek some remunerative employment now arose. At King's College, London, the Professor of Metallurgy, A.K. Huntington, had just bought a metallographic microscope and wanted an assistant who had some acquaintance with the instrument. Desch received his appointment and for the next few years his growing attachment to this subject ran parallel to the interest in organic chemistry in which all his training had been centred. He acted during this period as assistant sub-editor to John Greenaway for the Chemical Society. Large numbers of journals had to be issued to abstractors, the abstracts they sent in were corrected, set up in proof and the proofs corrected. He always regarded this experience as giving him an excellent training in the use of scientific literature. The habit of making an abstract for his own use of any article or paper that he read and wished to retain for future reference remained with him all his life.

For the Chemical Society he wrote for many years the annual progress reports on organic chemistry, at first alone but latterly with collaborators. Abstracting, in fact, was a means of augmenting the rather meagre salaries paid in those days to scientific assistants and Desch did much of this work. When the Institute of Metals was founded, he did much abstracting for it as well as for the Iron and Steel Institute. Articles for the technical press were another source of income and his many-sidedness was shown by several articles contributed to the *Concrete and Constructional Engineering Journal*. The work of his father, which involved reinforced concrete construction, no doubt gave this subject an added family interest.

Desch did not find it very easy to work with Professor Huntington who was quick-tempered and exacting. Although the detailed investigation work had been carried out by assistants, he was averse to publishing joint papers of the results in which their names would have appeared with his. He was an ardent balloonist and the cellars of the laboratory at King's College were packed with varieties of balloon fabrics, all undergoing testing and examination. Indeed, for some time after taking up the post, Desch was engaged in investigating all manner of resins to find better ways of making balloon fabrics less permeable.

Working in the chemical laboratory at this time was another assistant, Miss Elison Macadam, who was engaged in the accurate analyses of metal samples which were then examined metallographically by Cecil Desch. The daughter of William Ivison Macadam, Professor of Chemistry at the College of Surgeons, Edinburgh, she had found she was debarred from taking up a chemical career at Edinburgh University because women students were not admitted. So she entered King's College, London, and trained for the Institute of Chemistry examinations under Thompson and Herbert Jackson who had recommended her to Professor Huntington when her examinations were successfully passed. Her meeting with Cecil Desch was a happy circumstance for both, for during 1908 they became engaged.

The work at King's College offered little prospect for further advancement. The salary was only £150 per annum and, even with the help of outside work, this was not sufficient to face the responsibility of a new home. So Desch resigned and started looking around for a better paid position. This was probably the most trying period of his life. New jobs were not so easy to get, nor did he find disappointments easy to bear. That most keenly felt was the appointment of another candidate to the secretaryship of the newly-founded Institute of

Metals, but shortly afterwards he applied for and received the Graham Young lectureship in metallurgical chemistry at Glasgow University, thus starting on the career in which he found both satisfaction and success - that of university teacher.

In January 1909 Cecil Desch and Elison Macadam were married and those who were later privileged to visit them will always recall with pleasure the happy atmosphere of a home created by a devoted partnership. Professor Huntington remarked regretfully that Cecil Desch had robbed him of his best assistant.

The post in Glasgow was nominally under Professor John Ferguson, the Professor of Chemistry and the learned historian of everything pertaining to that subject. A fortunate degree of freedom however was allowed the lecturer. The classes were small, there was a good metallographic outfit and several on the staff of the Engineering Department came for instruction in its use. There was time also for research, and work on corrosion was started. Time was available too for collecting the mass of information that went into the writing of the famous *Textbook of metallography* which came out in 1910 and immediately won recognition.

After the first year, however, the classes were reorganized, the engineering students being separated from the main chemistry class which included those taking pure science and medicine, who received their lectures from Professor Ferguson. Desch took the engineering students who came from many parts of the world. With many Indians (including Sikhs complete with turbans) were Chinese, Philippines, Egyptians, Norwegians and Italians, so above everything a lecturer had to be clear and unambiguous. Desch took great pains with his lectures and devoted much thought to the manner of their delivery, thus laying the basis for a lecturing style that became altogether admirable during the progress of his career. He had the ability to explain in clear and lucid terms the scientific principles underlying any new advance in metallurgical thought and he could always bring to bear in a discussion an extensive knowledge of the available literature.

At that time a close neighbour at the University was Sir George Beilby whose interest in metals and particularly in the surface changes which occurred when metallic surfaces were polished had led to the publication in the *Transactions of the Royal Society* of papers which had greatly advanced our knowledge not only of the polishing process but also of some of the more profound aspects of the metallic state. This common interest fostered between the two men warm feelings of respect and friendship.

In the May Lecture to the Institute of Metals in 1911, Beilby referred to a theory of Quincke that all solidification was preceded by separation into two states, one of which formed foam-cells within which the other part solidified. A committee was set up by the Institute to formulate this idea into a research project and to state the questions to which answers were desired, and Beilby offered to finance the enquiry. Desch was appointed official investigator to the committee and at the same time the scope of the enquiry was widened to cover the general question of solidification from the liquid state.

The First Report by Desch to the Beilby Research Committee was a masterly summary of the then existing knowledge. A very large number of sources had been consulted and all essential information set out in a clear and lucid manner. In addition to Quincke's hypothesis, attention was directed to other ways in which a cellular structure in solids might arise, and the effect of surface tension and other physical properties came under review. In the Second Report, experimental results on some aspects of grain formation arid shape were given. From an experimental study of metallic masses, which in alloys like brass could be separated into their constituent grains, Desch showed that there was indeed a close analogy between the distribution of faces in foam grains whose form had been determined by surface tension and metallic grains where surface tension effects were secondary, but both were in reality derived from a more general principle which had previously been studied by Lord Kelvin, namely, the homogeneous division of space into cells without forming voids. Desch then went on to study convection cells, but came to the conclusion that they were of little importance in the solidification of metal masses.

These reports to the Beilby Prize Committee attracted a great deal of attention and were widely praised for the balanced judgment with which a large amount of information bearing on the solidification of metals had been marshalled and critically surveyed. They did much to establish the reputation of Desch as a scientific metallurgist of the first order.

He enjoyed his association with Glasgow University and when he was invited to occupy the Chair of Metallurgy at the Royal Technical College, which became vacant in 1918, he very willingly accepted. At the same time he strongly recommended that the two courses should be merged and that the Department of Metallurgical Chemistry with its equipment should be transferred to form a unified metallurgical centre. This was agreed, but there was a period of transition during which, while Professor at the Royal Technical College, he continued to give lectures to the chemistry classes at the University. This was mainly brought about by the fact that Professor Ferguson had retired during the war period of 1914-18 (he died shortly afterwards) and no immediate appointment was made to the vacancy. These classes were something of a trial. They numbered several hundred students and during Professor Ferguson's time a tradition of rowdiness had grown up which for some time continued unabated during Desch's lectures.

The work of the metallurgical department at the Royal Technical College was heavy. It included evening work to a certain extent as well as day work and there was little time left for original research. The numbers in the classes were greatly increased by the intake of students whose training had been interrupted by the war and who were now desirous of resuming their studies. The atmosphere was however a helpful and pleasant one, and Desch introduced a new and fresh outlook into a department which had been carried on along somewhat old-fashioned lines.

In 1920 the Chair of Metallurgy at Sheffield University became vacant through the retiral of Professor J.O. Arnold and Desch received an invitation to become a candidate for the vacancy, to which in due course he was appointed.

Once again he had to tackle a job of major reorganization for Arnold had no great liking for theoretical studies and had carried on the work and teaching on the basis of traditional knowledge obtained from the observational powers of skilled workers in the metallurgical art and he had quite neglected the great advances in scientific thought which were then taking place. In a city whose prosperity was centred on the metallurgical industries, this was unfortunate, and shortly after Desch arrived a conference of old students and those interested in the University was called to discuss ways and means for improving and modernizing the teaching of metallurgy in the department. This proved to be most helpful and plans were drawn up and were ultimately put into effect for a complete reorganization. Desch's colleagues were also helpful and he was greatly indebted to William Ripper, Professor of Mechanical Engineering, and to Dr Fred Ibbotson in his own department for all the assistance they gave him. Through the generosity of Sir Robert Hadfield and other Sheffield industrialists, an extension to the laboratories was made possible and much-needed equipment also provided.

With his growing interest in metallography, Desch found his transference to Sheffield a change filled with admirable opportunities. The founder of metallography, Henry Clifton Sorby, was a Sheffield man and, although he had never occupied any academic position there, he left his collections of specimens to the University. He had also left a tradition, for his micrographs were produced before the advent of any skill in microphotography and they were all drawn by hand. With one eye glued to the microscope and the other focused somewhat indefinitely on a sheet of white paper, the research worker in his reproductions of metal structures had ample opportunity during his drawing of them to impress the details firmly in his own mind as well. Desch always advocated this practice for students as the best way of teaching this subject at the beginning.

On his first arrival in Sheffield he found the tradition of the Sorby method still very much respected and Dr Ibbotson had great skill in the reproduction of metallic structures in this manner.

When one regards the enormous extent of the practice of metallography today, it is well to remember that its introduction by Sorby to the Geological Society in 1857 did not escape critical comment. In discussing the subject, one of the Vice-Presidents, Leonard Horner, remarked that 'he had been a member of the Geological Society ever since its foundation and during the whole of that time he did not remember any paper having been read which drew so largely on their credulity'.

Desch enjoyed his association with Sheffield and its University. There was the most friendly co-operation with the steel industry of the city and, although he always refused to undertake consulting work for fees, he was very willing to give help and advice to anyone who asked for it. He loved rambling over the Derbyshire

moors and on fine Sundays he would arrange for a party of colleagues and students to meet at one of the railway stations in the adjacent countryside as the starting point for a long and friendly walk. In promoting the social activities of the University, Mrs Desch took an active part. With enthusiasm and energy she founded a social club which soon became the rallying point for all their colleagues. It was very appropriate that the laboratory in the Department of Metallurgy should now be named the 'Desch' Laboratory and that a Desch Senior Research Fellowship should also have been, founded to commemorate his association with the University and with the city in which he spent what was probably the most enjoyable twelve years of his life.

Attached to the Metallurgy Department was a small model works containing an open hearth furnace which was rebuilt and was used by Desch for teaching the practical side of steelmaking. It was useful, not only in carrying out experiments on steel compositions but in selecting those students who showed an instinctive aptitude for practical work and evidence of possessing managerial abilities. When the time came to take up careers on the completion of their courses, Desch was always of the opinion that this knowledge of student aptitude was of great use and enabled recommendations to be made for placing of men in their most appropriate spheres of work. In that sense it is a pity that the costliness of maintaining a furnace of this kind in a university establishment has led to the discontinuance of its use.

On account of the evening classes, grants were received by the University from the local Education Authority and these gave rise to a certain amount of friction with the Director of Education who seemed to find it difficult to understand why the cost of such courses should be higher at the University than in the local schools. This attitude caused Desch a good deal of uneasiness, for his nature was not of the kind that could turn to forceful rejoinder. So he suffered patiently and in silence until the opportunity for escape arose. This came along timeously when the National Physical Laboratory was looking for someone to succeed Dr Rosenhain as Superintendent of their Metallurgy Department, and after enquiries as to whether he would accept the post, he was appointed in 1932.

About this time also Desch received an invitation to deliver the George Fisher Baker Lectures at Cornell University and to occupy the corresponding lectureship for a semester of four months. He chose as his subject 'The chemistry of solids' and these lectures were afterwards published in book form and received widespread notice. The facilities which he enjoyed during his American visit of access to the well-equipped laboratories of Cornell and the opportunity it gave him of contact with the professional staff were greatly enjoyed. Whilst there other invitations were received and lectures were given at Yale, Harvard, Columbia and at most of the principal Universities in that country, and in this way be became well acquainted with the outlook and thinking of American academic life. Altogether it formed a most interesting and memorable interlude in his life.

On returning to this country he assumed his appointment as Superintendent at the National Physical Laboratory and he remained there until he reached the retiral age in 1939. He found a house at Wimbledon convenient to London where so many meetings had to be attended and convenient also to Teddington for his work. There was much administration required from the Superintendent and Desch found that this hampered the continuity of his application to the research problems. Nevertheless, the standard of the Department was well maintained and some members of the staff at that time have since achieved high academic distinction. One of the research studies in which he took a special interest was the determination of the oxygen content in steels and the fact that this difficult objective was attained by the vacuum fusion process during his tenure of the office always gave him satisfaction.

The outbreak of war in 1939 coincided with the time for retiral at the age of 65, but he remained for a few months longer to supervise some special investigations concerned with war work until his successor, Dr Sykes, could take over.

On his retirement Desch was appointed as a scientific adviser to the Iron and Steel Research Council, the forerunner of the British Iron & Steel Research Association, and a room was fitted up as a small laboratory in the building occupied by the Iron and Steel Institute. This was his headquarters for a few years and from there he gave much useful guidance and help to the research activities of the Council during a period when few people had the opportunity to devote much time to its work.

In 1943 Desch was asked to join Messrs Richard Thomas & Co. Ltd and was given a seat on the Board. His principal task was the establishment of a research laboratory in the works at Ebbw Vale and a building of very solid construction, formerly used as a blowing house for the blast furnaces, was reconstructed and allocated as premises for this new department. Before this laboratory was completed, however, the company amalgamated with Baldwins Ltd to become Richard Thomas & Baldwins Ltd by which name it is now known. Desch resigned his appointment on being asked by Mr G.H. Latham, the Chairman of the Whitehead Iron & Steel Co. Ltd to become scientific adviser to that company and he occupied this position for 13 years until ill-health made it no longer possible for him to continue. The kindness and co-operation which he received from Mr Latham and from everyone in the Whitehead organization was something about which Desch always spoke with great appreciation.

During the last years of his life he was handicapped by a long spell of indifferent health and he passed away peacefully on 19 June 1958, at 84 years of age.

With his wide range of interests Desch took an active part in many scientific and technical institutions and he was honoured by many awards and appointments. He was a founder member of the Faraday Society which elected him President in 1926-28, and also of the Institute of Metals where he occupied the Presidential Chair from 1938-40. The year after his demission of office, that Institute awarded him its Platinum Medal for his distinguished services to metallurgical science. An equally high distinction came to him from the Iron and Steel Institute by the award of the Bessemer Medal in 1938 and during 1946-48 he was President of the Institute. Elected to the Royal Society in 1923, he served on the Council from 1932 to 1934.

He was the recipient of honorary degrees from the Universities of Glasgow and Leoben and he was elected a corresponding member of the FrenchAcademy of Sciences in 1947 and made an honorary member of the American Institute of Mining and Metallurgy in the same year. The Deutsche Gescllschaft fur Metallkunde elected him an honorary member in 1938 and he attended their annual conference in Munich that year, but the outbreak of war severed his connexion with that country and he never cared to renew it when the war ended. A member of the Court of the Blacksmiths Company, he took much interest in their training schemes and with his usual thoroughness he could speak with authority on the development and history of ornamental wrought-iron work, a subject in which he had long been interested. In the towns in which he resided he took an active part in the local scientific and technical societies and served on their Councils for a number of years.

The history of science also attracted Desch strongly and he was a member of the International Society for the History of Science and he served for a term as President of the Newcomen Society. Many of his lectures and addresses bear witness to this interest. He derived much enjoyment from patiently tracing back over the years the development of scientific ideas in which he was concerned from time to time.

As has earlier been said, Cecil Henry Desch acquired from the surroundings of his early years a belief in the rightness of the Positivist Philosophy of life and he never wavered from that attitude. Through the friendship of his father with Moncure Conway, who was then the pastor at South Place Chapel, Finsbury, he had many opportunities of listening to discussions on humanitarian subjects and the integrity and forthrightness of their views made deep impressions on his mind. His concern for sociology and his desire to understand its practical aims sprung from those very early years. This desire was greatly strengthened when he met Patrick Geddes in Paris in 1900 while attending a ceremony commemorating the achievements of Auguste Comte and he formed a lasting friendship with one whom he regarded as the greatest and most impressive lecturer of his time. When Geddes founded the Scottish College at Montpellier, he often invited Desch to visit him there and to lecture. An amusing incident once occurred. Desch received a letter in which Geddes wrote ‘If you don’t come to see me soon, I’ll be dead.’ Thinking that his friend was seriously ill, he hurriedly packed his bag and hastened off to Montpellier forgetting his overcoat and many other things he should have taken with him, only to find when he arrived that Geddes was in the best of health and had only used this manner of expression to convey to Desch that he had not seen him for some time.

When the Sociological Society was formed, Desch joined in 1904 and continued his connexion when it later became the Institute of Sociology, for many years

being Chairman of Council. At that time the chief exponent of Positivism was Frederick Harrison with whom Desch was on terms of great friendship. Indeed, when he married in 1909, after the civil ceremony a Positivist ceremony conducted by Harrison also took place at Cliffords Inn.

At that period Positivist views exerted considerable public influence in Britain and Desch always viewed with regret the decline that has taken place since, a decline which he ascribed to a too rigid adherence by later members to the views of Comte without allowing for the great changes which have occurred in the intellectual and social developments of our lives since his death.

But throughout his own long life, there was no wavering, no deviation from the high ethical standards which he had accepted for his own guidance as a young man. He never questioned the beliefs of others, having 'sympathy with all who, whatever their beliefs might be, strove like himself to live faithfully by the best rule as they saw it'.

In the lists of Desch's interests, sociology took a prominent place and when to that subject there are added metallurgy, organic chemistry, physical chemistry, archaeology and science history, we can appreciate the extraordinary range of an exceptional mind. If a little austere in his outlook at times, he was nonetheless an interesting talker and was always a most pleasant and enjoyable companion.

He is survived by Mrs Desch, to whom I am indebted for much information, and by two daughters.

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