

NATURE

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SCIENCE AND NATIONALITY

SCIENCE is one of the spheres of human activity which knows nothing of boundaries and frontiers, of races and creeds. It appeals neither to tradition nor sentiment, it has no folk-lore or legends. Its study is free to all, it speaks in one language, it has but one object, but it is the handmaid of all art, all industry and all human progress. "Science, like Nature, to which it belongs," said Davy, "is neither limited by time or space. It belongs to the world and is of no country and no age." Pasteur's view was that "Science has no nationality because knowledge is the patrimony of humanity, the torch which gives light to the world". It is justifiable to write of Chinese art, Byzantine art, Moorish architecture, Italian painting, Greek sculpture and Russian literature, but science cannot be divided into such chapters. The contributions of the ancient, the medieval and modern worlds and of all continents are interwoven and inseparable. Illimitable in its extent, the edifice of science may be compared with the temple of art of which Lafcadio Hearn wrote to the musician Krehbiel. In this temple, he said, "the more you advance the more seemingly infinite becomes the vastness of the place, the more interminable its vistas of arches and the more mysterious its endless succession of aisles. . . . The Vatican with its sixty thousand rooms is but a child's toy house compared with one of the countless wings of art's infinite temples." In the erection of this great structure of science, a multitude from many lands have assisted, and their work is seen to-day in the sky and on the sea, in factory and field and around our hearths and homes, touching every side of life.

But though science knows nothing of frontiers and boundaries, its investigators have homes and belong to some particular community, and it is but natural that these communities should take a special pride in their notable men, upholding their reputation and honouring their memory. Thus it comes that memorials are set up where the great were born, where they laboured and where they died, and such memorials become the shrines around which on appropriate occasions commemorations are held.

The question of what it is that moves all mankind to commemorate its great men was asked and answered by the late Prof. Wilfred Trotter in his Hunterian Oration to the Royal College of Surgeons of England on February 15, 1932. "The *conscious* and *ostensible* motives," he said, "under whose influence we approach the commemoration of great men are first, to contemplate in humble piety and emulation a largeness of mind and character that far exceeds our own, and secondly to seek inspiration from struggles heroically engaged and perhaps triumphantly won." Elsewhere it was written: "we commemorate to instruct ourselves, to inspire others to act in a way similar to that of the men we revere, perhaps most of all to impress the fact of the debt of the living to the past". In the first of his seven essays on "Representative Men", Emerson remarked, "The knowledge that in the city

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is a man who invented the railroad raises the credit of all the citizens". As with a city so with a nation, and one cannot but feel his own status raised by the knowledge that the great men of the present or the past belong to his own community, and all gain something from association with historic places connected with notable events or outstanding men. We all have our heroes, from whom we gain vigour and resolution, for as Carlyle said, they are "profitable company". If the hero is a Pasteur so much the better, for he it was who advised the students of Edinburgh "to associate the cult of great men and great things with every thought". It is given to but a few to come into intimate contact with the really great, but no student of science need lack knowledge of the lives and characters of famous men of science, for biographies and histories abound. It may be, as Prof. Trotter said, that "in all our commemorations, whether by word or plastic act, we make our own pictures and drift increasingly away from the actual man"; but pictures we must have, and our debt is great when a biographer succeeds in delineating vividly the man of whom he writes. "In the written records of the lives of men and women," said Lord Oxford, "we have all a common territory, inexhaustible in its range, permanent in its interest, from which pedantry itself cannot shut us out."

Inspiring and valuable as the biographies of men of science may be, still more important are the histories of science which, when written in an impartial spirit by men of knowledge and experience, provide those broad and unbiased views which are the birthright of every student. Men of science have come from all classes and all lands, a Siberian town giving birth to a Mendeléeff, a Serbian village to a Tesla and an Indian home to a Ramanujan. When von Zittel was asked to write his history of geology, it was suggested that he should record chiefly the progress of that science in Germany, but he was unwilling to accept any such limits. "All civilized nations," he wrote, "have shared in the development of the natural sciences, the history of any one of which is to a certain extent the history of a scientific freemasonry." His countryman, Prof. Matschoss, of whose death we regret to learn, in the preface to his excellent book "Great Engineers" took much the same view, remarking that "Technology is not confined within frontiers, and there is nothing in it that anyone can do entirely alone. The threads run from nation to nation and from generation to generation."

The records of all important scientific societies give evidence of the international character of science, and it is one of their self-imposed tasks to recognize outstanding achievements in lands beyond their own. The lists of the foreign associates of the Paris Academy of Sciences, the roll of the Copley medallists of the Royal Society, and the table of the Nobel laureates all illustrate the scientific freemasonry of von Zittel. Unfortunately, war between nations always brings in its train boasting and jealousy, gravely injuring the feeling of brotherhood, but in the end histories of science have little to say about

dictators or tyrants, conquests or defeats. When the present disastrous struggle ends, it will be the privilege of men of science to attempt to allay national animosities and to resume speedily the friendly relations of happier times. It is much to be hoped that the day will soon come when it will again be possible to hold international gatherings, and to propose toasts similar to those given at the meeting of the American Institute of Electrical Engineers in 1901. On that occasion homage was paid to science in France, England, Germany, Italy and the United States by the toasts: "The land of Ampère; the country of Faraday; the successors of Ohm; the heirs of Volta and the legatees of Franklin".

Though the question of nationality cannot be said to be of capital importance, yet there is an urge to delve into the ancestry and early environment of notable men, and to attempt to trace the things which have influenced their careers. Nationality, of course, may be inherited or acquired. Usually the place of birth and ancestry conspire together to determine nationality, but sometimes place of birth has little to do with it. Cavendish was born at Nice, Black at Bordeaux, Lagrange at Turin, and Regnault at Aix la Chapelle, but everyone knows the first two were British and the other two French. All the early American men of science such as the Winthrops, Cotton Mather, Rittenhouse and Franklin were originally British subjects. Since, through the Revolution, Rittenhouse and Franklin became citizens of the United States, there has been a constant flow of men from many European countries across the Atlantic who have willingly abandoned their old nationality for a new. Graham Bell was born in Scotland, Elihu Thomson in England, Michelson and Berliner in Germany, Agassiz in Switzerland.

In most cases, there is no doubt about a man's nationality, but as has recently been seen in the discussion about Copernicus, the matter is sometimes complicated by various circumstances. On the occasion of the quatercentenary of Copernicus *The Times* wrote: "The middle of a great war between Poland and Germany is not perhaps the most suitable occasion for reviving an ancient controversy as to his nationality", and though Copernicus was born at Thorn, "the troubled history of that corner of Europe makes it difficult to speak with any certainty about his ancestry". There are many other corners of Europe with troubled histories—Alsace, Finland, Schleswig-Holstein and the various countries which made up the old Austro-Hungarian Empire. Many men have been good Austrians without a drop of Austrian blood in their veins. The great geologist Eduard Suess (1831–1914) was the son of a German merchant and was born in London. For nearly seventy years he lived in Vienna; but he retained his affection for England, which he called his 'native land'. When in 1929 a tablet was unveiled on No. 4, Duncan Terrace, Islington, London, his birthplace, Prof. J. W. Gregory said that "he made the higher study of geology international and thereby encouraged the growth of the international spirit". Another name famous in Austrian scientific circles was Littrow. Joseph Johann Littrow (1787–1840) and his son Karl

Ludwig Littrow (1811–77) were both directors of the Vienna Observatory. The elder of the two was born and educated in Bohemia, and in 1810 went to Kasan, Russia, where the younger was born. The famous naturalist Johann Gregor Mendel (1822–84) was always an Austrian subject, but his birthplace was the Silesian village of Heinzendorf, and his work on heredity was done at the old monastery at Brünn, Moravia. Ignaz von Born (1742–91), who was in the first rank of European mineralogists, and a councillor of state at Vienna, was a native of Carlsburg, Transylvania, now a part of Rumania.

That troubled corner of Europe, Alsace, now again in German occupation, belonged to France for nearly two centuries before it was annexed by Germany in 1871, only to become French again after the War of 1914–18. It has given a long line of distinguished men to France. Strasbourg was the birthplace of the chemists Wurtz, Schutzenberger, Friedel and Gerhardt. Pasteur once held a chair in its University and his statue was erected there. Other men of science have come from Colmar and Mulhouse, nearly all of them of French nationality. Another 'corner' of Europe—Holstein—was the birthplace of the astronomer, F. G. W. Struve (1793–1864). The Struve family is sometimes spoken of as German, but the astronomer was the son of a Danish schoolmaster and was born at Altona, a city which had been Danish for a century and a half. By their work at Dorpat and Pulkova, Struve and his son became subjects of the Russian Tsars and also great international figures.

Of all countries, with the exception of the United States, none has benefited more by the labours of men of science of foreign birth than Great Britain. To-day, history is only repeating itself, for our love of liberty and our free institutions have again and again made our land a sanctuary for men fleeing from religious or political persecution. When Louis XIV, by the Revocation of the Edict of Nantes in 1685, drove half a million of his most industrious subjects to seek asylum abroad, many of them came to England. To this we owe the Dollond, Demainbray and Desagulier families, all known in the history of science—the Dollonds for their optical work, the Demainbrays for their labours as the King's astronomers at Kew, and the Desaguliers, father and son, for their respective studies in natural philosophy and gunnery. With the Dollonds also came Abraham Demoivre, the mathematician and close friend of Newton. The accession of George I naturally led to closer relations between England and the Continent, and from Germany to Great Britain came Dillenius, the professor of botany at Oxford, John Müller, the first headmaster of the Royal Military Academy, Woolwich, and the most famous of all British astronomers, William Herschel. From Sweden came Solander, keeper of natural history in the British Museum; from Italy, Cavallo, the electrician; from Holland, Ingenhousz, physician and physicist; and from Switzerland, Dr. Marcet, whose wife, Mrs. Marcet, a Swiss woman wrote the book on chemistry which stimulated Faraday. Another native of Geneva resident in England was Deluc, the geologist and

meteorologist, and it may be recalled that W. T. Brande, the colleague of Faraday at the Royal Institution, was the son of a Hanoverian medical man. There are many other names inscribed in the history of science in Britain, like those of Rücker, Meldola, Sabine, Kater, Negretti and Siemens, which remind us of our debt to other nations.

Another chapter in the relations of Great Britain with Germany opened with the marriage of Queen Victoria and Prince Albert. It was largely due to the Prince and Sir James Clark, the Court physician, that the Royal College of Chemistry was opened in 1845 with Hofmann at its head. Three years previously, Liebig, accompanied by Dean Buckland and Lyon Playfair, had made a sort of triumphal tour through England. Playfair had studied under Liebig at Giessen and from that time onwards British students of science flocked to Giessen, to Göttingen, to Heidelberg and so on, to sit at the feet of Wöhler, Bunsen, Kirchhoff and other famous teachers. Tyndall, Frankland, Muspratt, Gilbert, Williamson, Gladstone, Sylvanus Thompson, Perkin, Smithells, Roscoe and Ramsay are a few of the distinguished men who worked in German laboratories. From Germany, too, came Voelcker, Dupré, Sprengel, Hugo Müller, Ludwig Mond, Messel, Dittmar, Schorlemmer and many besides to teach or engage in industry in Great Britain. The remarkable comradeship which existed between Continental and British chemists in the time of Victoria is fully shown in the series of memorial lectures delivered to the Chemical Society.

Though there is no question that Great Britain, and the British Empire also, have benefited greatly by the labours of men of foreign nationality, the debt has been by no means one-sided. As British chemistry students went to Germany, so foreign students came to England to learn engineering and shipbuilding. Mechanical engineering in Sweden, Russia, Italy and Switzerland owes much to such as Owen, Baird, Guppy and Charles Brown. It was William Wilkinson who erected the first blast furnaces at Le Creusot, and from the original works of Philip Taylor sprang the Forges et Chantiers de la Méditerranée near Toulon. One of the makers of modern Hamburg was the civil engineer William Lindley, whose son, Sir W. H. Lindley designed public works for Frankfort, Budapest, Baku and other places. At one time there was a British engineer in every port in the world from Tokyo to Buenos Aires.

All these facts go to show that there can be no such thing as isolation in scientific matters. In March 1942 Sir Henry Dale, in a letter to *The Times* about the tercentenary of Newton, said that his achievement in science is the heritage of all men. This applies equally to every scientific inquirer, from the most brilliant genius to the humblest of those who endeavour to increase natural knowledge; and in honouring such men as Kepler, Galileo, Harvey, Swammerdam, Berzelius, Newcomb, Fresnel, or Pavlov, we pay homage to the great band of seekers after truth wherever they were born or whatever their nationality.