operations of masticating and mixing unvulcanized rubber, which represents an annual expenditure of some £3 million in Great Britain, and, with a grant from Conditional Aid funds, the Association is preparing a series of technical manuals presenting the results of its work. The four projected will deal with compounding vulcanized natural and synthetic rubbers; electrically conductive and anti-static rubbers; ebonite; and chemical analysis and testing of rubber and raw materials used in rubber manufacture.

For the five years from April 1, 1954, the British Shipbuilding Research Association will receive a block grant of £40,000 per annum conditional upon obtaining £120,000 from industry, with an additional £100 for each £300 from industry up to a maximum of £10,000. A comprehensive series of tests, covering both propulsion and resistance, in ship-model testing-tanks on a range of models of ocean-going merchant ship forms has provided data leading to improvements in hulls, propellers and all ship/propeller combinations. Reliable data have also been secured for the first time about the resistance of a full-size ship, and considerable savings in steel as well as improvements in the construction of the ship have resulted from the work of the Association's structure-testing establishment at Glengarnock.

It has seemed appropriate to select for mention the work of the research associations the terms of grant of which have been reviewed during the year, so that an indication can be given of their contribution to the national welfare in response to these grants. Of the work of the remaining research associations, reference can only be made here to a few points of interest. Thus, the British Baking Industries Research Association has extended its work on the mechanism of crumb-softening action, the effectiveness of acetic and propionic acids as inhibitors of rope in bread, and, in collaboration with the Medical Research Council, the Ministry of Food and the British Flour Millers' Research Association, on the effect of flour and bread improvers on the health of the consumer. The British Cotton Industry Research Association has continued work in the field of productivity and on blends of various textile fibres to produce yarns and cloths with specific predetermined properties. The British Electrical and Allied Industries Research Association is still extending its network analyser, and its dispersion meter has found a new and valuable use in determining the completeness of the drying of transformers and cables during manufacture. A three-year survey of the incidence of fires in wiring installations is complete, and three full-scale models of its all-electric dryer for grass and grain are in use on farms; fundamental research on ferroelectrics has revealed the presence of both ferroelectric and anti-ferroelectric properties at different temperatures in single crystals of a niobate. The sources of germanium in Britain for semi-conductor devices was also surveyed. The British Non-Ferrous Metals Research Association reports that the investigation on melting copper alloys is now paying dividends: with the improved linings, several hundred melts of phosphorus-deoxidized copper can be carried out in place of fifty without relining the furnace. A simple treatment has been developed by which the corrosion resistance of copper alloys used in heat exchangers may be very considerably increased, and investigation of the conditions for producing lead of suitable and stable grain-size may lead to the more efficient use of lead for water pipes. The Wool Industries Research Association has developed a chromatographic method of analysis for lanthionine, and has designed an automatic controller for the woollen card as well as carried out much work on the effect of high-temperature dyeing on woollen fibres and the setting of individual fibres and their reactions to changes in relative humidity.

The immensely varied contribution to industrial advance and national welfare which the Department of Scientific and Industrial Research is making, either directly through its own research stations or indirectly through the research associations, or its support of fundamental research at the universities, is amply displayed in this report. Although it is apparent also that in terms of spending power the increased estimates provide for very little real expansion, it is no less clear that every care should be taken to see that those limited resources are spent on objectives that are unlikely to be achieved without government support. The annual report does not supply all the information required for a sound judgment on this aspect; but it goes a long way towards answering some essential questions and indicating others to which reasoned answers should be required.

ANTOINE-FRANCOIS DE FOURCROY (1755–1809)

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ANTOINE-FRANÇOIS DE FOURCROY, who was born in Paris on June 15, 1755, did not achieve lasting fame as an experimental chemist or the founder of a theory; but as a teacher, writer and organizer he was in the first rank, and made a valuable contribution to the progress of science during his lifetime.

His father was a pharmacist, and he was born without the advantages of wealth and influence. As a boy he was not brilliant, and after leaving the Collège d'Harcourt at the age of fourteen, with no definite plans for his career, he worked for several years as a clerk, continuing his education by reading widely in several languages. He became interested in medicine, and was fortunate in attracting the attention of Felix Vicq d'Azyr, the anatomist, who supported and encouraged him while he studied at the Écoles de Médecine. Fourcroy's student years were spent in poverty; he lodged in a garret, and lived by coaching younger students and translating foreign medical works.

While still a student, Fourcroy decided to make his career in scientific research and teaching, rather than medical practice, and he soon showed great ability. His first chemical memoir was read to the Academy of Sciences in 1777, three years before he graduated, and in 1779 he gave his first course of lectures, on chemistry and natural history, in J.-B.-M. Bucquet's laboratory at the Écoles de Médecine. Fourcroy had already established a considerable reputation when Bucquet died in 1780, aged thirty-four; but he was unable to succeed him as professor because the members of the Faculté de Médecine disapproved of his association with Vicq d'Azyr, the secretary of the Société Royale de Médecine, which was in many ways the rival of the Faculté. Fourcroy's progress was not, however, retarded. His chemical lectures continued to be popular, and in

1782 he started an annual course on materia medica in his private laboratory near Notre Dame.

P.-J. Macquer, the doyen of French chemists, died in 1784, leaving vacant the chair of chemistry at the Jardin du Roi. The chief two candidates were Fourcroy and C.-L. Berthollet (1748–1822) and, although Berthollet had the influential support of the Duc d'Orléans, Fourcroy was preferred. This was a fortunate choice, for Fourcroy was able to develop his great talent as a teacher, while Berthollet, the better experimental chemist but a poor lecturer, succeeded to Macquer's other post as technical director of the Gobelins dye-works. From 1784 until his death twenty-five years later, Fourcroy lectured at the Jardin du Roi (later called the Jardin des Plantes), and twice the lecture theatre had to be enlarged to accommodate the crowds who were eager to hear him. His knowledge of chemistry was profound, and his lectures included accounts of the latest discoveries. He was a lucid and eloquent speaker, and sometimes drew applause from his audience during a lecture.

In the laboratory, Fourcroy was as active as in the lecture theatre, and he published many memoirs on all branches of chemistry. His study of the action of ammonia on salts led to the discovery of double salts such as magnesium ammonium sulphate; but most of his inorganic research was of little significance. His chief interest was in the examination of organic substances, and in much of this work he benefited from the collaboration of N.-L. Vauquelin (1763–1829), a first-class experimental worker. They analysed many of the liquid and solid parts of plants and animals by extraction with solvents, examined the properties of the products, and in some cases tried to relate their results to those of the older method of analysis by distillation. Later they measured the relative amounts of carbon, hydrogen, oxygen and nitrogen in a number of organic substances, and although little of their work was of lasting value, it was influential at a time when organic chemistry was in its infancy.

Fourcroy was always interested in the application of science to medicine. In his course of materia medica he examined the composition and mode of action of the common medicaments, and showed that many were useless or even harmful, and some of his later memoirs dealt with the chemical effects of medicaments on the fluids and tissues of the body. He encouraged others to take a scientific interest in medicine by founding and editing a journal, *La Médecine Éclairée par les Sciences Physiques*.

Even before his election to the Academy of Sciences in 1784, Fourcroy frequently met Lavoisier, and at the end of 1786 he accepted the anti-phlogistic theory and soon became its most vigorous exponent. This was probably his most important contribution to chemistry, for his books were very widely read. In the first edition of his text-book, "Leçons Élémentaires d'Histoire Naturelle et de Chimie", published in 1782, he had favoured Macquer's modification of the phlogiston theory; but in the four editions published between 1786 and 1793, all of which were translated into English, he gave his support to Lavoisier's theory. In 1792 he summarized the new theory and its applications in a small book entitled "Philosophie Chimique", which was reprinted or revised four times and was translated into at least ten languages, and his lectures, which were attended by many foreign students, also contributed largely to the rapid spread of the theory.

Fourcroy supported the French Revolution, and in 1793 he was elected to the Convention. He intervened in few debates; but, while France was at war with most of Europe, he played a leading part in the application of science to such problems as the manufacture of gunpowder and cannons, in the organization of factories, and in the education of engineers and doctors.

In 1797 he was able to resume his scientific work, and found time to write his last and greatest book, "Système des Connaissances Chimiques", which appeared in eleven volumes in 1801; but his organizing ability could not be wasted, and Napoleon called him to the Council of State. He became director of public instruction, and was largely responsible for the foundation of the Université Impériale, which comprised the entire educational system of France from the elementary schools to the Institut. Fourcroy confidently expected to become the first 'grand master' of the Université, and he received a severe blow when Louis de Fontanes was given the office. He continued his scientific work and lectures, but the disappointment affected his health; and he died on December 11, 1809, the day that Napoleon made him a Count of the Empire.

BRITISH ASTRONOMERS AT THE TOTAL SOLAR ECLIPSE OF JUNE 20

By Prof. R. O. REDMAN, F.R.S.

THE forthcoming total eclipse of the sun of June 20 is one of rather unusual interest in that the maximum duration of totality on the centre line will exceed 7 min. and is not much below the maximum possible at any eclipse. It will be one of the longest eclipses of this century. The belt of totality starts in the Indian Ocean at sunrise, passes over Ceylon, the Andaman Islands, Thailand, French Indo-China, and the Philippines, and ends at sunset in the Pacific Ocean north of Fiji. Unfortunately, the weather prospects are poor along most of the track; the best chances of a clear sky are in eastern Ceylon, where totality will last for about five minutes. The central hills of the island will give some protection against the south-west monsoon, and mid-eclipse occurs at about 8 a.m. local time, which meteorologically is likely to be as favourable a time of day as any. Weather records from earlier years give a 60 per cent chance for clear sky; but the usual sunshine and cloudiness data are designed primarily for other purposes and give a rather imperfect assessment of the sky for intending eclipse observers, whose work can be ruined by factors not appearing in the records, for example, light cirrus clouds or excessive scintillation. Reports from astronomers already in Ceylon this year suggest that the chances of a really satisfactory sky at totality are well below the 60 per cent quoted.

Astronomers from Britain, France, Germany, Holland, Japan, Switzerland and the United States are intending to observe the eclipse. So far as is known, with the exception of two small groups who are to use aircraft in Indo-China and Fiji respectively, all are going to Ceylon and will be stationed at a number of sites in and near Polunnaruwa. In this article we shall confine ourselves to an outline of the British plans.