I have here indicated what will be the work of the twentieth century; to complete the theory of the ether and to show how all things lead to an intelligible and concrete reality, very different from the abstractions and confusions under which we now, for the time, labour. Yet the present is a phase through which we had to go: it is an intermediate era in physics, through which we are guided by great men, Eddington and Jeans and Dirac, men who are contributing a great deal to physics and astronomy, work which we could not do without, and which forms a necessary avenue to the clear open space beyond.

Before the end of the twentieth century, as I think, or at any rate in the twenty-first, the ether will be recognised as the one means of communication between the atoms, and the whole of physics will become once more luminous and clear, constituting a glorious epoch for our descendants. The ether will come into its own again, not only for practical purposes as the seat of all potential energy, but with a clear understanding of it as the one substance that holds the universe together, in which all matter is embedded, without which even locomotion cannot be properly understood, and which constitutes the physical vehicle for life and mind. OLIVER LODGE.

Scientific Centenaries in 1935

By ENG. CAPT. EDGAR C. SMITH, O.B.E., R.N.

GLANCING back once again over the history of science during the last few centuries with the object of recalling those men of science whose centenaries occur during the coming year, it is but natural to turn to the early records of the Royal Society.

In these, over and over again, is found the name of Robert Hooke, who was born on July 18, 1635, three hundred years ago. A scholar of Westminster School and a graduate of Christ Church, Oxford, he became the friend of Willis, Boyle, Wilkins, Seth Ward and others. On November 12, 1662, he was appointed curator of experiments to the Royal Society and on June 3, 1663, was elected a fellow of the Society. Two years later he was made professor of geometry in Gresham College, and it was in his apartments in Gresham's old mansion in the City of London that he passed the greater part of his life. A long list of papers and experiments testify to his ingenuity and versatility, and no doubt in due course tribute will be paid to his memory. "As to his Person," said Benjamin Martin in his "Biographia Philosophica", "he made but a mean Appearance, being very small and somewhat crooked; but he had an active, penetrating, indefatigable Genius, sparing no Pains in Quest of the Truth in Relation to whatever came under his Consideration. . . ." Hooke died on March 3, 1703 and was buried in St. Helen's Church, Bishopgate; a church which probably has more associations with the Royal Society than any other.

Two contemporaries of Hooke's abroad were Johann Becher (1635–1682) and Christoph Sturm (1635–1703). Becher was one of the first chemists to cast off the mystical language of the alchemists, and in his writings can be found the germ of the phlogiston theory. He wrote much, travelled widely, and only a short time before his death came to England to visit the Cornish mines. Sturm, who was also a German, was professor of physical science in the University of Altdorf, and is remembered as an advocate of the teaching of science in schools. In their day, Germany was slowly recovering from the inconceivable miseries of the Thirty Years War, during which, it is said, the population fell from 20,000,000 to 4,000,000.

It was in 1635 in the midst of that war that Wilhelm Schickard (1592–1635) and Johann Faulhaber (1580–1635) died. The latter was an able mathematician who was acquainted with Descartes, while the former was known to Kepler and to Gassendi. It was to Gassendi that Schickard sent his observations of the transit of Mercury of 1633.

The work of these scientific worthies belongs almost entirely to the seventeenth century, a period during which, says Cajori, the progress of physics was truly extraordinary. During the eighteenth century, he says, physics proper was cultivated by men of more limited powers than those of Galileo, Huygens and Newton. For all that, however, there was great activity in various branches of science, especially in mathematics and astronomy, and in England practical astronomy made wonderful advances.

To these advances a succession of clever mechanicians contributed, and of all the British men of science born two hundred years ago none has a more interesting record than Jesse Ramsden (1735–1800), who from a clothworkers' apprentice at Halifax rose to be the leading instrument maker in London. "Esteemed by the great, cherished by his friends and loved by his servants and workmen", Ramsden was called by Delambre "le plus grand de tous les artistes". From Ramsden's shop in Piccadilly came some of the finest telescopes and theodolites. He was elected a fellow of the Royal Society in 1786 and nine years

later was awarded the Copley Medal for his "Various Inventions and Improvements in Philosophical Instruments". Another instrument maker of note was John Coventry of Southwark, who was born in the same year as Ramsden but outlived him by twelve years.

The year 1735 also saw the birth of Gregorio Fontana (1735–1803), for many years a professor of mathematics at Pavia and Milan; of Charles Auguste Vandermonde (1735–1796) the French mathematician and chemist who had much to do with founding the Conservatoire des Arts et Metiérs; of Hugh Williamson (1735–1819) of Philadelphia, who was one of the observers of the transit of Venus of 1769, and also of the chemists Keir and Bergmann.

James Keir (1735–1820) began life in the army, but in 1768 settled at West Bromwich and devoted himself to chemistry, geology, glass-making and the writing and translation of scientific works. He was a friend of Erasmus Darwin, Watt, Boulton and Priestley, joined in the monthly meetings of the Lunar Society, and from 1785 onwards was a fellow of the Royal Society. Tobern Olof Bergmann (1735–1784) was for a long time professor of chemistry at Uppsala. "He was," said Senier, "the first to perform chemical analysis systematically and laid the foundation of that art." At his death the Academy of Sciences of Stockholm had a medal struck to commemorate his work.

Bringing the survey a century nearer to our own time, to the year 1835, there is a considerable list of deaths and a longer list of births to be recognised. This part of the survey may well begin with Edward Troughton (1753–1835) who, like Ramsden, came from the north to achieve distinction as a London instrument maker. He also was a fellow of the Royal Society and a Copley medallist. His shop was in Fleet Street, and astronomical instruments of his making went to Greenwich, Paris, the Cape, Cracow, Brussels and elsewhere. Airy described Troughton's mode of graduating arcs of circles as "the greatest improvement ever made in the art of instrument making".

Astronomy is also represented by Dr. John Brinkley (1763–1835) sometime Bishop of Cloyne. Born in Suffolk, he was senior wrangler in 1788 and four years later became Andrews professor of astronomy in Trinity College, Dublin. He also became the director of Dunsink Observatory and was the first Royal Astronomer of Ireland.

Another Copley medallist who died in 1835 was Capt. Henry Kater, one of the earliest workers on the trigonometrical survey of India. Ill-health brought him back to England and after further service in the Army, in 1814 he was placed on half-pay, from which time he devoted himself to science. He was well known for his accurate pendulum experiments and his study of standard weights and measures, and, had his life been prolonged, his services would undoubtedly have been used in connexion with the replacement of the British standards destroyed in the burning of the Houses of Parliament in October 1834.

Physics is also represented by Leopoldo Nobili (1784–1835) of Florence, who invented the thermopile afterwards used with great skill by J. D. Forbes and Melloni.

To this record of men of science who passed away a century ago may be added the Irish geologist, John MacCulloch (1773–1835), who abandoned medicine for the study of the rocks and became geologist to the Trigonometrical Survey; Gilbert Thomas Burnett (1800–1835), the short-lived professor of botany in King's College, London; the great French surgeon Baron Guillaume Dupuytren (1777–1835), who from the humblest ranks raised himself to the position of the foremost surgeon in Europe, but, falling sick, refused to permit an operation upon himself, preferring as he said rather to die at the hand of God than of man; Thomas Charles Auguste Dallery (1754–1835), a French pioneer of steam navigation and screw propulsion, and lastly Sir Edward Banks (1769–1835), who with his partner William John Jolliffe (1774–1835), built Waterloo, Southwark and London Bridges, and was the principal contractor of his day.

As the frontiers of science are extended, and its territories enlarged, so does the number of explorers ever increase. Of those who have made notable contribution to science and have passed away in recent times, the columns of NATURE, since its foundation in 1869, contain biographical sketches of many hundreds, and by the aid of these it is possible to recall briefly some of the outstanding men of genius and talent who were born a century ago. Foremost among these, perhaps, must be placed the distinguished American astronomer, Simon Newcomb, who was born on March 12, 1835, and died on July 11, 1909. Loewy, writing in NATURE of May 4, 1899, said: "Newcomb must be considered without contradiction as one of the most celebrated astronomers of our time, both on account of the immensity of his work and the unity of view which marks the choice of the subjects treated by him".

Two days after Newcomb was born in Nova Scotia, Giovanni Virginio Schiaparelli, the Italian astronomer, was born in Piedmont. Schiaparelli died just a year after Newcomb, on July 4, 1910. The English astronomer, Sir William Huggins, had only recently passed away and on July 5, 1910, the *Times* wrote, "As Huggins stood at the

head of English-speaking astronomers, so Schiaparelli stood at the head of the astronomers on the Continent".

Another astronomer who was born a century ago was Friedrich August Theodor Winnecke (1835–1897), whom Sir David Gill called "the greatest teacher of practical astronomy since the days of Bessel"; and another, Jean Charles Rudolphe Radau (1835–1911), who though German by birth spent most of his life in France and at the time of his death was a member of the Paris Academy of Sciences and the Bureau des Longitudes.

Chemical science of the nineteenth century is represented by Adolph von Baeyer (1835–1917), August Dupre (1835–1907), Rudolph Fittig (1835–1910) and Johann Wislicenus (1835–1902). All were of German birth, but Dupre became a naturalised Englishman and as such held important Government posts. Fittig, von Baeyer and Wislicenus all received the Davy Medal of the Royal Society. One of Fittig's earliest appointments was to the University of Tübingen, and it was in 1871 that Sir William Ramsay, then a youth of nineteen wrote home: "I go regularly to Fittig's lecture at 8. He lectures very distinctly and clearly. It is really very beautiful to see the way the organic compounds are arranged". Of the career of Wislicenus, and of the charm of his character, much is contained in the memorial lecture delivered in 1905 to the Chemical Society by W. H. Perkin, Jr.

The progress of science is furthered by many means, and this is illustrated by comparing the careers of the three physicists Joseph Stefan of Austria, Elisha Gray of the United States and George Carey Foster of University College, London, who were all born in 1835. Stefan by his researches furthered our knowledge of liquids and gases, light and sound and electricity, and his name is now recalled by the Stefan-Boltzmann law of radiation. Gray was a practical electrician with more than sixty patents to his credit, and though originally a professor he was afterwards connected with manufacturing. It will be remembered that on February 14, 1876, he lodged a caveat for a telephone with the American Patent Office only a few hours after Alexander Graham Bell had visited the office on a similar errand. Carey Foster, on the other hand, although a contributor to scientific literature, was known for the part he played in furthering the best interests of University College, in supporting the claims of women to university privileges and in extending the use of physical laboratories in the teaching of science.

It need scarcely be said that this list of men of science born in 1835 who were devoted to physical subjects could be made longer, but it is perhaps unnecessary to do so. Finally, therefore, attention is directed to the names of one or two distinguished naturalists whose centenaries occur this year. Of these, Alexander Agassiz (1835–1910), the son of Louis Agassiz, was for a time superintendent of the well-known Calumet and Hecla Copper Mines, Lake Superior; but was best known for his work as a zoologist and oceanographer. Born at Neuchâtel, Switzerland, he accompanied his father to the United States in 1846, and there he passed the remainder of his life, holding important positions and taking part in many scientific expeditions. Another naturalist connected with North America was Joseph Frederick Whiteaves (1835–1909), who was born at Oxford and worked there under John Phillips. A visit to Canada in 1861, however, led to his studying the geology of Quebec, and he became palæontologist, zoologist and assistant director of the Geological Survey of Canada. In 1907 he was awarded the Lyell Medal of the Geological Society of London. Of Sir Archibald Geikie (1835–1924) it is but necessary to recall that he was in turn director of the Geological Survey of Scotland, Murchison professor of geology and mineralogy in the University of Edinburgh and director of the Geological Survey of the United Kingdom. He was born on December 28, 1835 and died on November 10, 1924.

Obituary

Prof. B. H. Buxton

BERTRAM HENRY BUXTON was the eldest son of Mr. Charles Buxton, M.P., of Fox Warren, Cobham, Surrey. He was born in 1852 and was educated at Eton. He entered the business with which his family was associated, but did not find it congenial. Preferring travel, he was a frequent visitor to the United States; on one of his visits, medicine attracted him. Having voluntarily undertaken duty on board a passenger vessel in quarantine because of cholera, he followed up his observations through the Health Officer of the Port of New York, who introduced Buxton to bacteriology. At Cornell he studied in the Post Graduate Laboratory and rapidly became proficient. His keen mind quickly appreciated medicinal science. The University gave him a doctor's degree, and finally he occupied the chair of bacteriology.

Buxton's work was outstanding, his technique brilliant; no detail was too small for his scrutiny or attention. He was among the first to recognise the differing strains of typhoid bacillus in culture; he made notable contributions to the study of erysipelas and typhoid fever, and at the Memorial Cancer