Great Britain a big interest in radium as a possession. This will inevitably entail continuous technical and chemical work, such as the filling, redistribution and concentration of radium in containers. The National Physical Laboratory has served the country well in physical measurements, but radium services have always been and will remain incomplete until a physical chemistry laboratory becomes part of the national radium and cancer service.

It is very doubtful whether any country of size and population of Great Britain is better supported and staffed in the fight against cancer, and to their credit it should be remembered that the voluntary hospitals have borne the brunt of radiotherapeutic research. It now remains to be seen how successfully individual efforts can be co-ordinated to the common good.

S. RUSS.

Scientific Centenaries in 1939

By Eng.-Capt. Edgar C. Smith, O.B.E., R.N.

ON May 26, 1639, three hundred years ago, in the ancient convent of the Jacobins, in the historic Rue St.-Honoré, Paris, there passed away at the age of seventy-one years the refugee Italian philosopher Tomaso Campanella, one of those inquiring men of unquenchable spirit, who by their determination to destroy "those errors which had become venerable by antiquity" paved the way for the free exercise of thought and investigation which is one of the treasures of the world to-day. Born at the little town of Stillo, Calabria, on September 5, 1568, he was a contemporary of Kepler and Galileo, and like the latter he incurred the hostility of the Church, although a member of it. Owing to his political activities, he was kept in confinement in Naples by the Spanish Government for more than a quarter of a century, but he was able to write several books, among which was "An Apology for Galileo". He was nearly sixty years of age when set free, but even then was kept under close observation, and in 1634, when sixty-five, he escaped from Rome to Marseilles. In France he was befriended by Louis XIII and Richelieu, and was given lodgings in the convent of the Jacobins in Paris.

The year 1639 also witnessed, not the birth or death of a famous astronomer, but the epoch-making astronomical observation of a transit of Venus, by the young Lancashire clergyman Jeremiah Horrocks. On Sunday, November 24, 1639, in between his religious duties, Horrocks had the intense gratification of witnessing, as he had expected and laboured for, the passage of the planet across the sun's disk. His friend Crabtree at Broughton, near Manchester, through Horrocks, in the late afternoon of that Sunday, also caught a glimpse of the same spectacle. "Thus did two young men, cultivating astronomy together in a state of almost complete seclusion in one of the northern counties of England, enjoy the privilege of witnessing a phenomena which human eyes had never before beheld, and which no one was destined

again to see until more than a hundred years had passed away" (Grant). Hundreds of observers watched the transits of 1761 and 1769, and those of 1874 and 1882, and it was through the interest aroused by that of 1874, that a tablet to Horrocks, with an inscription by Dean Stanley, was placed on the memorial to Newton's nephew, John Conduitt, at the west end of Westminster Abbey.

Cambridge had no chair of mathematics when Horrocks was an undergraduate at Emmanuel College, and it was not until 1663 that the Lucasian professorship was founded. The first occupant of the new chair was Barrow, the second was Newton, the third was Whiston and the fourth was Nicolas Saunderson, who died at the age of fifty-seven years on April 19, 1739. Saunderson had held the chair twenty-eight years, having been appointed to succeed Whiston, who in 1710 was deprived of his post owing to his religious opinions. At this time, mathematics at Cambridge may, as Prof. Turner said, have entered a dark century which it is difficult to contemplate, but assuredly Newton had no more devoted disciple than Saunderson. Blind from the age of a year, Saunderson owed his knowledge of mathematics to the patience and generosity of friends, one of whom, Joshua Dunn, took him to reside at Cambridge in 1707. Lord Chesterfield, who was at Cambridge in 1712-14, described Saunderson as a professor "who had not the use of his own eyes, but taught others to use theirs".

Contemporaries of Saunderson in Italy and France, who made contributions to physical science and who also died in 1739, were Eustachio Manfredi (1674-1739), the elder of the two Bolognese mathematicians and hydraulic engineers bearing that surname, and Charles Francois Du Fay (1698-1739), who repeated and extended Gray's electrical experiments and was the discoverer of two kinds of electricity which he named the *vitreous* and the *resinous*. He also noticed the discharging power of flames. Du Fay had first been a soldier, but

abandoned the army for science and at his death was comptroller of the Jardin des Plantes, in which post he was followed by Buffon. Manfredi was for a number of years astronomer to the Bolognese Institute and was made a foreign member of both the Paris Academy of Sciences and the Royal Society.

Another tercentenary of much interest is that of the birth of Thomas Tompion (1639–1713), the 'Father' of English clockmaking, whose grave is in the nave of Westminster Abbey.

Among the men of science born two hundred years ago was the Scottish natural philosopher John Robison (1739–1805), an interesting figure in many ways. When twenty years of age, as a tutor to the son of an admiral, he was with Wolfe at the landing at Quebec; at twenty-three years of age he assisted in testing at sea John Harrison's chronometers. He lectured on chemistry at Glasgow, held the chair of natural philosophy at Edinburgh, was the first secretary of the Royal Society of Edinburgh and was the intimate of Watt, Black, Hutton, Playfair, Adam Smith and Hume. His son, Sir John Robison, was a founder of the Scottish Society of Arts.

The mathematicians George-Simon Klugel (1739–1812) and Jacques-Antoine-Joseph Cousin (1739–1800) were also born in the same year as Robison. Klugel, a professor at Halle, was the author of a dictionary of mathematics (1803–8), which was added to by some of his countrymen, while Cousin held a chair at the Collège de France for thirty-two years and another at the Ecole Militaire for twenty years. During the French Revolution, he held public offices with success, and though imprisoned at one time, to him fell the task of ordering the use of the new system of weights and measures.

To these names may be added those of Hewson and Townsend. William Hewson (1739–74) was associated as pupil and assistant with both John and William Hunter, and at the age of thirty-one years was awarded the Copley Medal for researches on the lymphatic system in oviparous vertebrates. His promising career was cut short by poisoning from a wound received while dissecting. The Rev. Joseph Townsend (1739–1816), rector of Pewsey, Wiltshire, travelled and studied mineralogy, and in his writings endeavoured to reconcile the Mosaic record with the findings of science. He was a close friend of William Smith and was one of the first honorary members of the Geological Society.

William Smith (1769–1839) was one of three engineers who achieved fame, and passed away a century ago, the others being William Murdock (1754–1839), the right-hand man of Boulton and Watt, and the inventor of gas-lighting, for which he was awarded the Rumford Medal in 1806, and Gaspard-Clair-François-Marie-Riche de Prony

(1755–1839), writer of many scientific and engineering works, engineer-in-chief of the Corps des Ponts et Chaussées and director of the Survey of France. Smith was a contemporary of Telford and Macadam, and like them travelled on his professional duties the length and breadth of Great Britain. His surveys and inspection of canals, drainage works, mines, quarries, embankments and suchlike all yielded him material for his famous geological map of England and Wales published in 1815, "the first attempt," said Von Zittel, "to represent on a large scale the geological relations of any extensive tract of ground in Europe". Smith in his later years fell on hard times, but seven years before his death he was given a Civil List pension of £100 a year. Another English man of science who died in 1839 was Davies Gilbert, who though himself an accomplished mathematician and physicist, furthered the advance of science more by his public activities than by his researches. He was president of the Royal Society from 1827 until 1830 and for a long while sat in Parliament. "He was," wrote Weld, "emphatically the representative of scientific interests in the House of Commons, and contributed by his exertions to carry many very important objects."

When Smith was laying the foundation of his fame, geology as we know it was in its infancy; when he died, geological societies were active in England, Scotland and France, the Geological Survey of Great Britain had been founded, and instead of being the pursuit mainly of a few men of leisure and of independent means, the science could count its students by the hundred. The growth of the science during last century is to some extent reflected by the fact that the year 1839 saw the birth of at least six men who achieved distinction as geologists. Henry Govier Seeley (d. 1909), a link with Sedgwick, and a Lyell medallist, was born on February 18; Arnold von Lasaulx (d. 1886) of Bonn, a pioneer in microscopic petrography, was born on June 14; James Geikie (d. 1915), the holder of the Murchison chair at Edinburgh, was born on August 23; Karl von Zittel (d. 1904) of Munich, the author of the well-known "History of Geology and Palæontology", was born on September 25; Edmund Mojsisovics von Mojsvar (d. 1907) a pupil of Suess, and vice-director of the Geological Institute of Vienna, was born on October 18, while the French geologist Albert de Lapparent (d. 1908) who served as president of the French Geological Society and as permanent secretary to the Paris Academy of Sciences, was born on December 30, 1839.

Of men famous in other branches of science who also were born a century ago, the list includes the names of Mond, Eliot, Kundt, Gibbs and Thurston, Ludwig Mond (1839–96), the great industrial

chemist, came to England fresh from the laboratories of Kolbe, Bunsen and Kirchhoff, and stayed to build up the famous firm of Brunner, Mond and Co. and to found the Davy Faraday Research Laboratory at the Royal Institution. Sir John Eliot (1839–1908), from St. John's College, Cambridge, went to teach mathematics in India and became the Director-General of the Indian Meteorological Service, benefiting both those ashore and afloat by his study of cyclones. August Kundt (1839–94), the successor of Helmholtz at Berlin, is remembered for his original investigations in sound and light. Josiah Willard Gibbs (1839–1903), of Yale, was Copley medallist in 1901. He was", said Sir William Huggins, "the first to apply the second law of thermodynamics to the discussion of the relation between chemical, electrical and thermal energy". His name will always be associated with the Phase Rule.

In his own particular sphere, none occupied a more prominent place than the American engineer and educationist Robert Henry Thurston (1839–1903). At the Stevens Institute, Hoboken, Thurston organized the first mechanical engineering laboratory in the United States, while at Sibley College, Cornell University, whither he went in 1885, he saw the number of engineering students under him grow from a total of sixty to 900. He was a founder and the first president of the American Society of Mechanical Engineers.

In conclusion, attention may be directed to one or two of the outstanding scientific books published in the year 1839, and one or two events which excited considerable interest, or proved of lasting importance, to the world of science. Among the books were the first volume of Faraday's "Experimental Researches in Electricity" and Darwin's "Journal and Remarks, 1832–36", which appeared as the third volume of Fitz Roy's

"Voyages of the Adventure and Beagle". Of Darwin's work the *Quarterly Review* said, "We find ample materials for deep thinking; we have the vivid description that fills the mind's eye with brighter pictures than painter can present, and the charm arising from the freshness of heart which is thrown over these virgin pages of a strong intellectual man, and an acute and deep observer". Another notable book was Murchison's "The Silurian System", which Sir Archibald Geikie called a "splendid monograph with which it was now possible to carry the vision across a vast series of ages, of which hitherto no definite knowledge existed", and yet another, W. H. Miller's "Treatise on Crystallography".

The year 1839 was also marked by the announcement by the naturalists Theodor Schwann (1810–82) and Matthias Jakob Schleiden (1804–81) that all the higher animals and plants are made up of cells; by the invention by Sir W. R. Grove of his battery experiments with which Schönbein was led to his observations on ozone; by the discovery by Charles Goodyear of his process of the vulcanization of rubber, and by the first trials of the historic pioneer screw-driven vessel *Archimedes*. But nothing excited more enthusiasm in scientific circles than the publication of the account of Daguerre's method of obtaining pictures on metal plates. On January 7, 1839, Arago communicated Daguerre's invention to the Paris Academy of Sciences, and in the summer the French Government purchased the invention, making the inventor an officer of the Legion of Honour and awarding him a pension of 6,000 francs. A fortnight after Arago lectured at the Academy of Sciences, Faraday at the Royal Institution described Fox Talbot's invention of "photogenic drawing". These were both notable steps in the early progress of photography.

Potato Problems*

By Dr. S. Linné, Ethnographical Museum of Sweden, Stockholm

THE native peoples of America were clever botanists, and the culture inherited from the Indians has supplied humanity with numerous cultivated plants of inestimable value; for example, the potato, maize, cacao, tobacco, tomato, etc. The potato is certainly the most important,

along with maize. In four Masters Lectures before the Royal Horticultural Society, Dr. Salaman has presented the latest discoveries and the results of his own investigations and of those of others concerning the potato in ancient and present times in America, and its introduction into Europe.

It is certainly not surprising that this important cultivated plant, and the question as to its origin, have attracted the attention of botanists, but Dr. Salaman is the first scientist to have studied the potato problem not only from an archaeological,

*The Potato in its Early Home and its Introduction into Europe, Masters Lectures, 1936, by Redcliffe N. Salaman (*Journal of the Royal Horticultural Society*, Vol. 62. Pp. 53+46 figs. London, 1937.) A brief summary in which certain points of view have been revised has since been given in a discourse entitled "The Origin of the Potato and its Influence on Man's Early Settlement in South America," published in the *Proceedings of the Royal Institution of Great Britain* (30, No. 141, pp. 26+9 figs., 1938).