This incidence of bitterness among the smaller eggs laid by members of four different orders, Passeriformes, Charadriiformes, Gruiformes and Columbiformes, raises an interesting ecological question, and suggests that this quality may have been developed as a deterrent to attack by potential egg-eating predators. Obviously, the point requires further investigation, especially in the light of field observations, but the suggestion appears to be supported by three types of evidence.

In the first place, while distasteful properties of the egg appear to be neither directly related to the feeding-habits nor to the palatability of the parent bird, they are, on the other hand, often associated with small size and with conspicuousness. Size is an important factor in the vulnerability of a species in Nature. In the absence of compensating adaptations, smaller birds are liable to attack by a wider range of predators, and are less able to protect themselves and their eggs during the incubation period than larger species. Consequently any deterrent property such as relative distastefulness in the eggs of such birds is likely to be of selective value in the interspecific struggle for existence—especially if it is associated with conspicuous coloration easily recognized and remembered by potential predators.

Secondly, Rensch[6] has shown, in his work on the sensitivity of birds to various tastes, that the lower limit of (externally ascertainable) taste perception is not markedly different from that of man; and that while relative insensitivity to bitterness is characteristic of birds feeding on seeds or insects which often have a sharp or bitter flavour, other species, and in particular birds of prey, such as the goshawk (*Accipiter gentilis*) and tawny owl (*Strix aluco*), are especially sensitive to bitterness.

A third approach to the question is through feeding experiments with egg-eating predators. We have already noted that there is a fair agreement between the palatability ratings of man and the apparent preferences of the ferret, rat, hedgehog and mongoose, and that this agreement is closest for the eggs rated as least edible by man. The series of thirty-five egg-species used in the rat tests includes eleven species rated as bitter, and all these occur in the lower half of the palatability sequence. Among eighteen species used in the hedgehog experiments, the three which appear at the end of the list as least palatable to these animals are the only three markedly bitter eggs offered.

In conclusion, it may be noted that previous work on the relative edibility of the flesh of birds affords a series of facts parallel in many respects to those here considered. Thus cryptic coloration, whether of plumage or egg-shell, appears to be correlated with palatability; and conspicuousness, in otherwise vulnerable species, often to be associated with a distasteful or deterrent property. I hope to continue the present investigation next season, and should be glad to hear from anyone (*a*) who has tasted eggs of tropical or other species not usually eaten by man, or (*b*) who might be willing to submit newly laid eggs (of species not included in the above series) for examination.

[1] Cott, H. B., *Nature*, **156**, 736 (1945).
[2] Cott, H. B., *Proc. Zool. Soc. London*, **116**, 371 (1946).
[3] Swynnerton, C. F. M., *Ibis*, (10), **4**, 529 (1916).
[4] Davies, G., Report of the Food Investigation Board for the Year 1936, 51 (1936).
[5] Murphy, R. C., "Oceanic Birds of South America" (New York, 1936).
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SCIENTIFIC CENTENARIES IN 1948

By Eng.-Capt. EDGAR C. SMITH, O.B.E., R.N.

THE past year has seen the commemoration of the centenaries of many men and institutions, and thus homage has been paid, memories recalled, interest aroused and history enriched. Notable among commemorations in the realm of science and technology were those associated with the Chemical Society, the Institution of Mechanical Engineers, the Royal Netherlands Institution of Engineers, King's College Engineering Society, and with Edison, Graham Bell and Denis Papin. Papin's work (see *Nature*, Sept. 27, 1947, p. 422) belonged mainly to the seventeenth century, which saw the foundation of the Royal Society in 1660 and of the Paris Academy of Sciences in 1666. Both these bodies sprang from earlier meetings of men with scientific leanings, and the meetings in France are recalled by the tercentenary of the death of Marin Mersenne, who carried on a large correspondence with men of science and joined with Mydorge, Roberval, Pascal and others in friendly discussions. Born at Souitière (Sarthe) on September 8, 1588, he was educated at La Flèche, where for a time Descartes was his school-fellow, studied at the Sorbonne and entered the priesthood. He became the superior of a convent of his order in Paris, and he died there on September 1, 1648. An amiable and conciliatory man, he was given to experimenting, translated Galileo's mechanics, contributed to mathematics and was much devoted to music.

Turning back to the later part of the Renaissance, the year 1548 saw the birth of Simon Stevin, the Dutch mathematician, a friend of Prince Maurice of Orange, by whom he was made quartermaster-general of the Dutch Army. His best work was done in fortification and military engineering; but he is remembered for his invention of decimal fractions and as one of the first to revive the study of statics. Cajori wrote of him as "a man remarkable for attainments in science, independence of thought and extreme lack of respect for authority". His statue was erected at Bruges in 1847.

It was such men as Stevin and Mersenne, whose lives overlapped those of Kepler, Galileo and Newton, who helped to pave the way for the great discoveries and advances made in the eighteenth century, so rich in the names of famous men, of whom the first to be mentioned is John Bernoulli, who died at Basle on January 1, 1748. No fewer than eight members of the Bernoulli family achieved fame as mathematicians, John being the eldest. His equally distinguished brother James died in 1705 at the early age of fifty, but John lived to be eighty years of age, leaving two sons, Daniel and John, and a grandson, another John, to maintain the family traditions. Especially remembered for his work on the calculus, John the first had a temperament in marked contrast to that of the priestly Mersenne; but, said Ball, "he was, however, the most successful teacher of his age and had the faculty of inspiring his pupils with almost as passionate a zeal for mathematics as he felt himself". Born at Basle on August 7, 1667, from 1695 to 1705 he held a chair of mathematics at Groningen and then returned home to fill the chair left vacant by his brother's death. For twenty years he corresponded with Leibniz. He was a foreign associate for forty years of the Paris Academy of Sciences, and D'Alembert declared that whatever he

knew of mathematics he owed to the works of this great mathematician.

Bernoulli's fame was earned by work steadily pursued over half a century; the name of his contemporary, the German physicist and ecclesiastic, Ewald Georg von Kleist (1700–48), is remembered for a single electrical experiment made in 1745 with a phial, a nail and an electrical machine. Much the same experiment was made a year later by Musschenbroek at Leyden, giving rise to the so-called Leyden jar, a piece of apparatus which became popular with itinerant showmen. Kleist, who was dean of the cathedral at Cammin, in Pomerania, made his experiment in his house, and a tablet thereon, erected in 1898, recalls the episode.

If John Bernoulli be regarded as the outstanding man of science who died in 1748, the most eminent born that year was undoubtedly the French chemist Claude-Louis, Comte Berthollet, one of that distinguished group who made Paris the scientific centre of the world in the days of Napoleon. Though born at Talloires near Annecy, in the Savoy, then an Italian possession, and educated partly at Turin, Berthollet passed the greater part of his life in the French capital, near which he died in 1822. As the discoverer of the composition of ammonia, the supporter of the views of Lavoisier, the director of the Government dye-works, a reorganiser of the Academies and the companion of Napoleon, he enjoyed a great reputation. Sir David Brewster, who was in Paris in 1814, related how he was taken by Laplace, Biot and Poisson to see Berthollet at his house at Arceuil, and how Berthollet and his wife met them: "A more homely pair you never saw, and though very rich, they were dressed little better than a decent Scotch farmer and his wife". It was at Berthollet's house that the English chemist and experimentalist Sir Charles Blagden (1748–1820) died suddenly. An army surgeon, Blagden was a legatee of Cavendish, a friend of Sir Joseph Banks, and during 1784–97 was secretary of the Royal Society. Before his election, there had been dissensions among the fellows of the Society, but on his assumption of office, records Weld, "The ordinary meetings resumed their former scientific appearances, and if harmony was not entirely restored, at least there was no longer any violent attempts to interrupt the regular business of the Society".

Two other distinguished French men of science were born in the same year as Berthollet, one being the botanist Antoine-Laurent Jussieu (1748–1836), long connected with the Jardin des Plantes, the other Jacques-Dominique Comte de Cassini (1748-1845), the last of the four Cassinis who directed the Paris Observatory. The Bernoullis, the Jussieus, and the Cassinis are all examples of science appealing to several members of the same family, and another such family is recalled by Johann Friedrich Gmelin (1748–1804), who held chairs at Tübingen and Göttingen. He and his relations were known as physicians, chemists and botanists. The year 1748 also saw the birth of Scipione Breislak (died 1826), an Italian geologist and a friend of Cuvier, of Pierre Louis Guinaud (died 1824), the watchmaker of Les Brenets near Le Locle in the Swiss Jura, who made important advances in the manufacture of optical glass, and of John Playfair (died 1819) of Edinburgh. It is perhaps difficult now to realize the great admiration and esteem felt in Scotland for Playfair. One of the most cultivated men of his time, he started his career as a minister, successively held the chairs of mathematics and natural philosophy in the University of Edinburgh, was a founder of the Royal Society of Edinburgh, and the centre of an interesting circle of literary and scientific men. Among his greatest friends was James Hutton. Five years after Hutton's death in 1797, Playfair published the classic "Illustrations of the Huttonian Theory of the Earth", a book Geikie advised every young student of geology to read (see *Nature*, Nov. 22, 1947, p. 694). "How different," wrote Geikie in 1897, "would geological literature be to-day if men had tried to think and write like Playfair." Finally, mention must be made of the tragic figure, Phillippe-Frédéric, Baron de Dietrich (1748–93), who like Lavoisier, Bailly and Bochart de Saron fell beneath the guillotine. A mineralogist of note, a member of the Academy of Sciences, a royal commissioner of mines and a magistrate of Strasbourg, during the Revolution he fled to Switzerland, but returning to France voluntarily he was tried once and acquitted, only to be condemned by the revolutionary tribunal. He was executed on December 28, 1793. By one account, it was at Dietrich's house at Strasbourg that Rouget de Lisle composed the "Marseillaise".

Moving forward another hundred years to the middle of last century, as might be expected inventors and engineers take their places besides the devotees of science, and no one will question the greatness of George Stephenson, universally honoured as the 'father of railways', who died at his home, Tapton House, near Chesterfield, on August 12, 1848, at the age of sixty-seven. Of scarcely less stature was Jons Jakob, Baron Berzelius, the Swedish chemist, who passed away at Stockholm five days earlier, at the age of sixty-eight. In the gardens at Stockholm "not far from the statues of kings, amidst trees, with a fountain playing before it, is the bronze figure of Berzelius, the great chemist. He is enveloped in a thick heavy mantel, the stoic fur of the philosopher, and the face and the whole pose indicate the union of perseverance and intelligence which belong to such conquerors in the field of science." Sir William Ramsay once said of Berzelius that "he believed that since the time of Boyle none had done more for the advancement of chemistry". To the same period belong the labours of the German engineer Johann Albert Eytelwein (1764–1848), and the French engineer Baptiste-Alexis Legrand (1791–1848), for sixteen years head of the Corps des Ponts et Chausseés, and also the Alsatian mechanician Joshua Heilmann (1796–1848), who secured for himself a place among the improvers of textile machinery. On January 8, 1848, Caroline Herschel, long the assistant of her brother Sir William Herschel, died in Hanover when nearly ninety-eight. Twenty years before, the Royal Astronomical Society had awarded her its Gold Medal, and seven years before her death had placed her name among its honorary members, the first woman to be so honoured. Another astronomer who worked in the early part of the nineteenth century was the Jesuit father, Francesco de Vico (1805–48), who six times won the gold medal offered by the King of Denmark for the discovery of telescopic comets. De Vico's work was done in Rome; but the political disturbances of 1848 led him to join Georgetown College in the United States. Travelling to England on business, he contracted typhus and died in London on November 15, 1848. To these names may be added those of Sir George Steuart Mackenzie (1780–1848), who discovered the identity of diamonds and carbon; Wilhelm Albrecht (1786–

1848), who introduced scientific methods into agriculture in western Germany and directed the Normal Agricultural Institute at Geisberg; George Augustus Goldfuss (1782–1848), professor of zoology and mineralogy at Bonn; Josiah Christopher Gamble (1776–1848), one of the founders of the British chemical industry, and Sir John Barrow (1764–1848), who from being a timekeeper in a Liverpool iron foundry rose to be the Secretary of the Admiralty and became the virtual founder of the Royal Geographical Society. The cottage at Ulverston in which Barrow was born now bears a memorial tablet, while on the summit on the hill behind is the tower erected in his memory.

In an age which has seen the spread of education, the founding of many colleges, universities, laboratories and scientific societies, a remarkable increase in inventions and the harnessing of science to industry, the centenaries of men of science born a century ago, who as investigators, teachers, writers or administrators have left their mark, fall fast and thick. Each year, indeed, brings a longer and longer list. Taken in chronological order, the year 1848 saw the birth in February of Josiah Richard Perrett (died 1918), who from a dockyard apprentice rose to be the chief naval architect at Elswick, where he built many fine warships. In March occurred the birth of Shelford Bidwell (died 1909), known for his work in electricity and magnetism, who served as president of the Physical Society during 1897–99; of the Austrian scientist Josef Maria Pernter (died 1908), for many years a leader of meteorology in his country; of the German pioneer of flight, Otto Lilienthal, who was accidentally killed while gliding in 1896, and whose monument is to be seen at East Lichterfelde, Berlin; and of Henry Marion Howe (died 1922), the leading American metallurgist of his day.

The Rev. Frederick John Jervis-Smith (died 1911), of Trinity College, Oxford, who represented his University at the tercentenary of Torricelli at Faenza in 1908, was born in April 1848; and Vero Charles Driffield (died 1915), the eminent manufacturing chemist and collaborator with Hurter, was also born in the same month. In July of that year the physicist Baron Roland von Eötvös (died 1919) was born at Budapest. A pupil of Helmholtz, Kirchhoff and Bunsen, he founded the Hungarian Mathematical and Physical Society and for many years was president of the Hungarian Academy of Science. In the following month Paul Henri (died 1905), brother of Matthieu-Prosper Henri (1849–1903), was born at Nancy. Their outstanding work at the Paris Observatory gained for them both the associateship of the Royal Astronomical Society. Seldom, if ever, have two brothers been such close collaborators. The famous German chemist, Victor Meyer (died 1897), was born in Berlin on September 8, 1848, and became Bunsen's successor at Heidelberg, where Sir Edward Thorpe first knew him. Thirty years later, Thorpe delivered the memorial lecture on Meyer to the Chemical Society, giving a fascinating picture of one whom he first remembered as a "bright-eyed youth, quick of movement and action, ready and fluent of speech and full of zeal". In many of his characteristics, Meyer, said Thorpe, was not unlike Davy.

The list of physicists born in 1848 includes also Sir Arthur Rücker (died 1915), Henry Augustus Rowland (died 1901), and Sigmund von Wroblewski (died 1888). Rücker was born on October 23 and Rowland on November 27. A Royal Medallist and secretary of the Royal Society, Rücker was professor of physics for fifteen years at the Royal College of Science, London, and then principal of the University of London. Rowland held the chair of physics in the Johns Hopkins University, Baltimore, from its foundation in 1876, a post for which he was recommended by Maxwell. Wroblewski, like many of his compatriots, suffered for taking part in the Polish insurrection in 1863, and spent six years in exile in Siberia. Afterwards he was able to work under Helmholtz; in 1874 he went from Berlin to Strasbourg, and in 1882 became professor of experimental physics in the University of Cracow; where, working with Karl Olszewski, he liquefied in considerable quantities the three gases oxygen, nitrogen and hydrogen. He met his death on April 16, 1888, at the early age of forty, through the accidental overturning of a lamp.

Finally, it may be recalled that on May 12, 1748, Thomas Lowndes died at the age of fifty-five, leaving his property in Cheshire to found a chair of astronomy at Cambridge, the first occupant of which was Dr. Roger Long (1680–1770), vice-chancellor of the University from 1733 until 1769. The reason for Lowndes' bequest is obscure, for his activities had been concerned with the colonization of South Carolina, the manufacture of potash, the decay of England's wool industry and the supply of salt to the Navy.

OBITUARIES

Prof. Max Planck, For.Mem.R.S.

Prof. Max Planck died on October 4 in Göttingen at the age of eighty-nine. The burial service was held in the crowded church of St. Alban, where addresses of appreciation were given by the officiating minister and by Profs. O. Hahn and M. von Laue. It is hoped to hold a larger memorial service in the spring of next year, probably on the ninetieth anniversary of Planck's birthday.

Planck was born in Kiel on April 23, 1858. His father was professor of constitutional law in the University of Kiel and later in Göttingen. He took the degree of doctor of philosophy at Munich at the age of twenty-two, the subject of his thesis being the second law of the mechanical theory of heat. In 1885 he was appointed professor *extraordinarius* in Kiel. His association with the University of Berlin began in 1889 and lasted for fifty years: he was appointed professor *ordinarius* in 1892. In 1920 he was awarded the Nobel Prize for Physics and in 1926 was elected a foreign member of the Royal Society. He was granted the title of professor emeritus in 1926; but this was not to usher him to a period of retirement, for shortly afterwards he became president of the Kaiser Wilhelm Institute for the Promotion of Science, an appointment which he held until 1937. Planck's original and critical writings extended from about 1879 until shortly before his death. He was, indeed, engaged in writing down some of his latest views during his visit to Great Britain last year.

In his early twenties, Planck attended lectures given by Kirchhoff in Berlin. He had a great admiration for Kirchhoff's work, and it may be supposed that this was one of the influences which directed him to the study of thermodynamics and the theory of radiant heat.