moisture, but since the War these defects have been overcome and the product has been made more attractive. Changes in fashion and the increasing demand for elegance in wearing apparel have greatly extended the market. At the same time, the price of natural fibres, such as wool and cotton, had soared to unprecedented heights, while the price of artificial silk was falling substantially and seemed less likely to fluctuate. Economic conditions were thus favourable to a rapid expansion in its production.

Artificial silk differs from other textile fibres in being a continuous smooth filament without scales or protruding hairs. Though not so strong as cotton or so elastic as wool, it has the advantages of softness and peculiar dyeing properties. It can be used alone or in combination with other textile materials for the production of a large variety of manufactured articles. By utilising artificial silk, the older textile industries have been enabled to produce new kinds of fabrics as well as novel designs and original forms of ornamentation.

Though the industry originated in France, leadership had passed to Germany and Great Britain by 1913. In 1922 the United States took the first place in regard to the volume of production, while more recently a notable feature has been the rapid rise of Italy to second place.

In Britain, Germany, the United States, and Italy there has been a marked tendency towards increasing the scale of production, as it has been found that the large firm can introduce important economies of production. A movement towards international syndication has also become noticeable, and this would appear to have been due in the main to a desire to improve marketing facilities. There has been a rapid growth of important and intricate international agreements among producing firms, and in this movement British interests have taken a leading part. In 1927 the three largest firms in Britain, Germany, and Italy entered into agreements with each other, and it is said that this combination controls more than 70 per cent of the world's production of artificial silk.

Obituary.

Sir Horace Darwin, K.B.E., F.R.S.

SIR HORACE DARWIN, whose death on Sept. 22 is widely regretted, was born in 1851, the fifth son of Charles Darwin and the third of the group of brothers to become a fellow of the Royal Society. He was educated at Trinity College, Cambridge, taking his degree as a Senior Optime in 1874. Immediately afterwards he entered the works of Messrs. Easton and Anderson and went through the ordinary apprenticeship course in the shops. While there he designed and built his first instrument, a klinostat, for demonstrating responses of a plant to the stimulus of gravitation. At the end of his apprenticeship he returned to Cambridge, and shortly afterwards joined Dew Smith, who was engaged in designing and making instruments for physiological investigations.

Michael Foster had recently come to Cambridge, at first as Trinity prælector in physiology, later as professor, and found that for nearly all the apparatus he required, only German instruments were available. Darwin and Dew Smith became partners and started the organisation which at a later date grew into the Cambridge Scientific Instrument Company. During this period, along with his brother George, he designed a bifilar seismograph which was set up in a basement room at the Cavendish Laboratory. The rocking microtome, developed from an idea of W. H. Caldwell, was one of the instruments designed during the partnership which has proved of very great value to biologists.

At first the apparatus dealt with was mainly that needed in a biological laboratory, but before long the range was extended. Callendar's work on the platinum thermometer (1883–95) directed attention to the electrical method of measuring temperature; the need for resistance boxes designed for thermometry was further emphasised by Griffith's experiments on the mechanical equivalent of heat (1893), and electrical instruments of various kinds were taken in hand. After ten years the partnership came to an end. Dew Smith retired, and in 1895 the Cambridge Scientific Instrument Company was constituted. Darwin was chairman and the chief shareholder.

It was soon recognised that we had at Cambridge a firm of instrument makers the work of which would bear comparison with any in the world, while the head of the firm was a man with a genius for design and a knowledge of mechanics which enabled him to express his design in the simplest form consistent with the purpose for which the instrument was intended. In 1903 the value of his work was recognised by his election as a fellow of the Royal Society.

In 1909, at the suggestion of Lord Haldane, Mr. Asquith appointed the Advisory Committee for Aeronautics "for the superintendence of the investigations at the National Physical Laboratory and for general advice on the scientific problems arising in connexion with the work of the Admiralty and War Office in Aerial Construction and Navigation." Darwin became a member, and threw himself into the work with his usual energy and devotion. It was clear that measurements both on the full scale and in the wind tunnels at the laboratory were needed; for these instruments were required, and the Committee turned to him for suggestions and advice. Methods for measuring the stresses in the structure of an airship and the strength of the fabric interested him; the vagaries of the compass soon attracted the attention of the Committee, and with some of these he dealt in notes submitted to his colleagues. At a later date he watched with keen appreciation the work of Keith Lucas on the compass, and realised the importance of a 'turn indicator,' a device to assist the pilot in maintaining a straight course. His own instrument for this purpose proved of value in a critical time.

During the War Darwin was an active member of various committees, and in 1917 became chairman of the Air Inventions Committee. His height finder, for determining the height and position of an object in the air, developed as it was by A. V. Hill and his associates, was perhaps the most important of the devices for which he was personally responsible, but his advice and help were sought continually by many workers.

Darwin's own views as to instrument design are expressed in his Wilbur Wright Lecture delivered in 1913, or more fully in the article which he contributed with his colleague, Mr. C. C. Mason, to the "Dictionary of Applied Physics" (vol. 3, Instruments, the Design of Scientific). Maxwell in 1876 and Kelvin on many occasions had laid stress on the importance of geometric design; he quotes with approval Maxwell's statement ("Handbook to Loan Collection of Instruments," 1876): "When an instrument is intended to stand in a definite position on a fixed base, it must have six bearings so arranged that if one of the bearings were removed the direction in which the corresponding point of the instrument would be left free to move by the other bearings must be as nearly as possible normal to the tangent plane at the bearing." He then shows by examples the advantages of adopting a geometric design, though he is careful to point out that there are cases when it is best to disregard the principle entirely. As to the qualifications of the designer: he is to be "a mechanical engineer with much scientific knowledge, well acquainted with the methods of manufacture available, and in order to avoid unnecessary cost the instrument should not require great skill to make."

Those who knew him and his work will agree that Darwin filled the bill far more completely than any of his contemporaries. His father's letter congratulating him on having passed his previous examination, quoted in the *Times*, applies in full measure to him. Discussing what makes man a discoverer of undiscovered things, Charles Darwin wrote: "The art consists in habitually searching for the cause and meaning of everything which occurs. This implies sharp observance and requires as much knowledge as possible of the subject investigated."

It was Darwin's habit to study from all sides the purpose for which he was asked to design an instrument, to acquaint himself by careful observation with the details of the experiment or measurement to be carried out, and then when thoroughly saturated with the problem, to evolve, sometimes with extraordinary rapidity, a piece of apparatus suited for the work. His interest extended to all the instruments made by his Company, though in a varying degree. Among those which find a place in the booklet describing special instruments for which he was more directly responsible, are a cathetometer made twenty-five years since for the National Physical Laboratory—a similar instrument is now being constructed for Japan—a spectroheliograph designed for the Solar Physics Observatory at Kodaikanal, a camera for taking star photographs—the result of a suggestion made by Prof. Turner—and various forms of comparator, specially those built for the Indian Geodetic Survey, in which were embodied a number of suggestions due to Sir David Gill. Some of his aeronautical instruments have already been mentioned. Experiments to determine the value of g always attracted him; the half-second pendulums made at Cambridge are well known, and the last piece of apparatus he was able to design himself was a vacuum box for Sir Gerald Lenox-Conyngham, in which to swing the pendulums for a projected survey. The drawings for this are in pencil on squared paper and are dated August 1925.

The changes which have taken place during the last fifty years in British instruments are far-reaching, and throughout the industry Darwin's influence was felt; he was a leader in the advance, the guide who pointed out the direction in which improvement was to be found, the friend who never grudged the help he was able to give.

This is not the place to write in detail of Darwin's other activities. He was a member of the Cambridge Town Council for some years, Mayor in 1896–97, and in 1919 he was appointed one of the Royal Commission to inquire into the Universities of Oxford and Cambridge. He married in 1880 the Hon. Emma Farrer, and leaves two daughters; his only son was killed in the War. R. T. G.

The oldest seismologist in Italy, or indeed in the world, Prof. Giulio Grablovitz, died on Sept. 19. He was born at Trieste in 1846. Though without academic training, his fitness for geophysical studies was recognised by his appointment in 1885 as director of the geodynamic observatory of Casamicciola, founded as the result of the disastrous Ischian earthquakes of 1881 and 1883. At this observatory he remained for more than forty years, until its suppression in 1926, furnishing it entirely with instruments of his own design, his horizontal pendulums, and his well-known geodynamic levels. He was also a member of the government commission which planned the geodynamic branch of the central meteorological office, and was one of the founders of the Italian Seismological Society. C. D.

We regret to announce the following deaths:

Prof. Panagie Cawadias, a distinguished archæologist of Athens, who was an honorary member of the Section of the History of Medicine of the Royal Society of Medicine, on July 21, aged eighty years.

Dr. S. F. Clarke, professor emeritus of natural history at Williams College, known for work on the hydroids of the American coast and on the embryology of the alligator, on Aug. 1, aged seventy-seven years.

Dr. P. E. Goddard, curator in anthropology in the American Museum of Natural History, who was known for his studies on the linguistics of the Apache Indians, on July 12, aged fifty-eight years.

Dr. C. L. Wilbur, Chief Statistician of the Division of Vital Statistics of the U.S. Bureau of Census from 1906 until 1914, on Aug. 9, aged sixty-three years.