being sought. Among the *faits accomplis* of Canadian chemists may be mentioned standardization of tests for honey, improved maple products, a method of drying apples and other fruits with better retention of flavour, and a wax mixture for use in plucking poultry.

Dr. N. H. Grace dealt with projects and achievements in the field of biology. Growth-promoting substances are now added to the dusts used for disinfecting seeds. The development of rust-resistant varieties of wheat is estimated to have saved the prairie provinces about 38 million dollars this year. Research is proceeding on the factors that determine the malting quality of barley with the view of growing more barley of better quality. In 1937, some 80,000 tons of bacon were sent to Britain, prepared in twenty-six plants, each using its own method; research is now being directed towards improving both quality and uniformity.

Methods have been developed for altering the heritable characters of plants by heat and chemical treatment, and progress in producing a drought-resisting and soil-binding forage crop for western Canada has been effected by crossing a Russian grass with the best Canadian wheat varieties. From poplars and conifers it is hoped to produce, by crossing, rapid-growing varieties of trees possessing hybrid vigour and disease-resistance that may be vegetatively propagated with the aid of 'plant hormones'.

Admiralty Laboratories at Sheffield

THE new Admiralty Laboratories at Janson Street, Sheffield, were opened on December 15 by Sir William Bragg, president of the Royal Society.

These laboratories, which have been constructed to cope with the ever-increasing amount of Government work, are designed in such a fashion as to incorporate all recent developments in laboratory architecture. The two large analytical laboratories, for ferrous and non-ferrous analysis respectively, embody many unusual features. One was struck with the arrangements which have been made for the conducting of chemical analysis on a large scale; indeed the expression 'mass-production' might be used with respect to the systematizing of analytical methods, certain benches, for example, being given up solely to determinations of one particular element. The carbon combustion room was particularly intriguing in its lay-out, containing several combustion apparatus all set in a line and arranged for rapid analysis of carbon in steel. A particular feature is made of spectrographical analysis, for which purpose Hilger quartz spectrographs are used. This method of analysis has been brought to a high state of efficiency, and complete reliance can be placed on the results obtained.

One was particularly impressed not only by the orderly and systematic arrangement of plant and apparatus, but also by the system with which the work is carried out; even the chemical store is a model of order and forethought. The heat-treatment laboratory, containing Birlec and Wild-Barfield high-temperature furnaces with temperature control devices, supplies all that is required for experimental heat-treatment purposes, and it is understood that a high-frequency furnace is shortly to be installed. One of the most pleasing features is the lighting, the lower half of the windows being of Thermolux glass, which provides insulation from both heat and from the glare of the sun, whilst the walls of the laboratories are of a very pleasing tone of semi-glazed fireclay tiles. The air-conditioning system is novel, and no signs of fumes can be detected anywhere in the laboratories.

These new laboratories are capable of turning out all the work that is necessary, and their constructional arrangement has considerably speeded up the rate of analysis. They are most pleasing premises to work in, and those in authority are to be congratulated on this new development, which is significant of the scientific progress in metallurgical work for which the Admiralty has been responsible in the past.

J. H. A.

British Institute of Radiology

Annual Congress

THE twelfth Annual Congress of the British Institute of Radiology was held in the Central Hall, Westminster, on December 7–9, and in connexion with the Congress there was an exhibition of apparatus organized by the British X-ray industry. The Congress was opened by the president, Mr. W. E. Schall, the opening address being followed by the nineteenth Mackenzie Davidson Memorial Lecture, delivered by Dr. G. Shearer on "X rays—Their Influence in Pure and Applied Science". In the course of this lecture, Dr. Shearer noted that twenty-five years have elapsed since Moseley first observed the regularities in the *K* and *L* X-ray spectra of the elements which pointed to the general similarities in the internal structures of various atoms and led ultimately to a fairly complete understanding of atomic structure and to the placing of electrons in their appropriate energy levels. This same series of observations has also led to the use of X-rays in the study of the solid state, with results of great practical and industrial importance. From the study of simple crystals by W. H. and W. L. Bragg, the work has advanced to such an extent that complex molecules such as the proteins can now be studied, and the results, incidentally, linked up with the work of the organic chemists. Another phase of X-ray work

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entailed the study of materials from an industrial point of view, and in many cases the physical properties of materials can be correlated with the size and perfection of the individual crystalline components, while the X-ray method is the method of choice in investigations into the phase relations in alloy systems.

The physical papers dealt with certain lesser-known uses of radiations. F. I. G. Rawlins gave a paper on "X-rays in the Study of Pictures", dealing with the work carried out, largely at the National Gallery, on the X-ray study of the works of various old masters. He showed how, using radiation excited at very low kilovoltages (about 10 kv.), the lower structures of paintings could be revealed and the existence of alterations and restorations detected. In many cases, such studies have served to verify the traditional histories of the pictures. Dr. F. G. Fraser outlined the X-ray work of the British Museum (Natural History) in his paper on "Radiography in Zoological Research". He pointed out how the complete study of the skeletal structures of specimens too rare to be subjected to ordinary anatomical dissection was often helpful in placing animals in their correct zoological classifications.

A different type of investigation was considered by L. G. Nickolls in his paper on "The Use of Invisible Radiation in Police Work". This was mainly concerned with the use of ultra-violet and infra-red radiations in the detection of forgeries and overprinting in documents and identifying the positions of various stains on materials. As regards forgeries, etc., Mr. Nickolls pointed out that, from the point of view of criminal detection, it is important not only to establish the presence of alterations but also to read the words which have been erased. In order to do this, it is important to photograph the document in such a way that the background disappears. This can often be done by means of light in various selected wave-lengths, and certain bands in the ultra-violet region have proved of great use. Similarly, infra-red radiation serves to reveal marks embedded in the lower fibres of paper. As special cases, examples of frauds connected with motor-car licences and with stamps were given. The characteristic fluorescence of practically all physiological fluids under ultra-violet light sometimes served to identify their presence, but more usually fluoroscopic examination is used to reduce the areas to be examined by the more chemical methods.

Science News a Century Ago

Royal Astronomical Society

AT the December 1838 meeting of the Royal Astronomical Society, several communications were made. The first of these was an extract of a letter from Bessel to Sir John Herschel alluding principally to the means which he had employed to ascertain the effect of temperature upon measurements made with the heliometer, which consisted in observing such of the stars in the Pleiades as were visible in the coldest winter, by night, and in the warmest summer, by day. "At the approaching disappearance of Saturn's ring", he also wrote, "sufficiently powerful telescopes will probably show *all* the satellites of the planet. I believe that large reflecting telescopes will begin to supersede achromatic ones; at least, I have no doubt they are capable of greater perfection. They *can* be made with mathematical precision, which is not the case with achromatic telescopes. I think also that opticians would have devoted their attention to them in preference, if they had not been discouraged by their more rapid destructibility. If the method of making an indestructible *metallic* surface could be discovered, I should no longer doubt of a still further perfection of the reflecting telescope. Could not *hard* steel be made available? and would it not, if proper care was taken of it, be less destructible than the common metallic reflector?"

The other communications included one by the Rev. R. Main on "Errors of Heliocentric Longitude and Ecliptic Polar Distance of the Planet Venus"; another from Airy, the Astronomer Royal, "A Catalogue of 726 Stars reduced to the Year 1830; and deduced from the Observations made at Cambridge in the years 1828–35"; an extract from a letter from Henderson to Baily relative to the eclipse of the sun on May 15, 1836; and also an extract from a letter of Lassell to Sheepshanks relative to observations made with a small sextant. The instrument was of only 3 in. in radius and was by Dollond. Lassell had made observations on various stars for time and latitude for the express purpose of determining how near to the truth he might be able to approximate by its means. He found that in ordinary circumstances, the mean of one set of altitudes east and another west, would give the time truly within one second, and that a set of each north and south, at something like equal altitudes, would give the latitude within eight or ten seconds.

Armstrong's Improved Water Wheel

WILLIAM GEORGE ARMSTRONG, afterwards Lord Armstrong, who was born in 1810 and died in 1900, was trained as a lawyer, and it was not until 1847 that he joined the small firm which was developed into the famous Elswick Works. Armstrong first obtained success as a maker of hydraulic machinery.

Armstrong's attention had been directed to the use of water-power in 1838, and the *Mechanics' Magazine* for December 29 of that year contained a contribution from him entitled "On Hydraulic Power". In this he referred to the limitations of the overshot water-wheel and the need for an appliance for utilizing the head of water from streams in hilly districts. The first step he considered necessary was to confine the water within a pipe. It was, he said, extremely important that the motion of the water through the pipe should be slow, "otherwise much of the force of gravity would be expended in the production of motion, and the power exerted in the machinery would in consequence be greatly diminished" He had heard that machinery with cylinders and pistons had been used, but to these there were objections. He then described and illustrated an apparatus suitable for the purpose. In this the water flowed through a tube formed into a semicircle. The inside circumference of the semicircle was slotted. A horizontal axis carried a wheel with an edge rim which revolved in this slot. The edge rim of the wheel had four circular apertures, fitted with disks, which would just pass through the pipes. The water acting in turn on these disks caused the wheel to revolve. Curiously enough, Armstrong did not mention the use of the hydraulic turbine of Fourneyron.

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