the Canadian point of view, referred to the importance of ensuring that representatives on the various bodies are chosen by scientists who are competent and knowledgeable about the work being done in all parts of the world. He believes that the existing organization is as good as any likely to be devised, provided the support of really first-class men is obtained and any moribund or inefficient parts that might develop in the organization are discarded. Dr. J. B. Koepfli's address, "Science and Foreign Relations", described the events leading to the creation in February 1951 of the Office of Science Adviser to the United States Department of State, and the way in which the activities of the Office are assisting international co-operation in science and encouraging international scientific organizations. The two main difficulties in its work, he thinks, are the administrative delays in the admission of foreign scientists into the United States and the legislative ceiling to the United States support of the International Council and the Scientific Unions. Scientists, he suggested, can help to overcome both these obstacles by fostering among themselves a fuller understanding of the United States' objectives and immigration laws, and by making the plans and work of the Council and its Unions more widely and fully known.

The address by Prof. A. von Muralt on international and national aspects of science directed attention to the importance of finding new ways of maintaining the atmosphere in which scientific development is best fostered, including new ways for arranging scientific congresses in view of the numbers attending, and new techniques for handling the dissemination and co-ordination of knowledge. While not over-rating the influence of scientific men, he believes that their efforts at international co-operation in science can contribute notably towards a wider understanding between all countries.

PHYSICAL APPLICATIONS OF HIGH-SPEED ROTATION

THE substance of a lecture entitled "Some Scientific Applications of High-Speed Rotation", delivered by Prof. P. B. Moon on April 27, 1951, to the South Wales Branch of the Institute of Physics, is printed as a special article in the *British Journal of Applied Physics* (4, 97; April 1953). First, brief reference is made to the familiar classical examples such as those to be found in the measurement of the velocity of light, the molecular pump and the centrifuge, and to the fundamental researches of Oliver Lodge (1897), where an attempt was made to 'drag' the ether by rotating disks, and of Blackett (1952), where the test was made, though unsuccessfully, to detect the magnetic field produced by a massive body rotating with the earth. The principles of rotor design are then discussed, and the best shape of rotor for attaining the highest practicable linear velocity at the periphery is considered. It is pointed out that, while the ideal shape is independent of the material and of the size, it is governed by the criterion of equal stress at all parts of the rotor. For a thin rod spinning about an axis perpendicular to its length, the ideal shape is that of a Gauss error-curve, and for a disk-like rotor the disk should be thin at the edge and the profile that of the Gauss error-function.

The various methods that have been used for driving rotors and their particular advantages and applications are next discussed. A detailed description is given of the particular method[1] introduced recently at the University of Birmingham, which Prof. Moon claims is nearly as simple as that of Colwell and Hall and nearly as effective as that of Beams. The rotor used consists of a doubly tapered steel rod with a small ball of hardened steel at its base. The ball runs on a glass plate, and an electromagnet suspended by a short thread to act as a conical pendulum supports and takes up about 90 per cent of the weight of the rotor. Peripheral speeds of up to 10^5 cm./sec. have been attained with a six-inch rotor. Various examples of such rotors are shown diagrammatically, and it is explained how the method has been applied at Birmingham to the production of high-speed beams of heavy atoms and molecules.

Rotating shutters for neutrons is the main application of rotational technique in the field of nuclear physics. Sectored disks of cadmium, which is highly opaque to very slow neutrons, were first used by Dunning and co-workers in 1935, but recent developments at the University of Chicago, as explained by Prof. Moon, have produced a 'sandwich' type of shutter composed of alternate layers of cadmium and aluminium enclosed in a strong steel shell which serves for the interruption of faster neutrons. Another shutter of this type consists of a slotted steel shaft rotating in front of a similar, coaxial, but fixed, shaft.

Finally, Prof. Moon's own particular application[2] of high-speed rotation in the field of nuclear physics is briefly described. A strong radioactive gold source of low mass is carried on the tip of a high-speed rotor, and by virtue of the Doppler effect sufficient energy is restored to the gamma radiation to produce resonant nuclear scattering in liquid mercury (10 per cent mercury-198).

[1] *J. Sci. Instr.*, **25**, 348 (1948).
[2] *Proc. Phys. Soc.*, A, **64**, 76 (1951).

THE MUTATION THEORY OF EVOLUTION

WHILE the majority of biologists agree that evolution proceeds by mutation and natural selection, Prof. L. P. Martin, of McGill University, suggests that the mutation–selection theory is not wholly convincing as a means of explaining natural evolution (*Amer. Sci.*, **41**, No. 1; January 1953). This dissent is not so much due to a failure to master the facts as to the grasp of some facts which Martin believes geneticists are apt to overlook.

None of the facts, nor all of them together, establishes the mutation–selection theory beyond all doubt.

Among the difficulties raised by Martin and his fellow recusants is that, though the occurrence of mutations in both wild and domestic populations is clearly established and though they are important in the genesis of our domestic breeds of animals and plants, even giving rise to some disease-resisting strains, yet all mutations seem to be in the nature of injuries which, to some extent, impair the fertility and viability of the affected organisms. The impaired stamina of present-day domestic breeds is shown by their inability to survive in natural conditions, except in exceptional and sheltered environments. Resistance to disease conferred by some mutations seems to be

illusory, for it is not a real or positive resistance but rather the removal of a host from an extremely narrow and specific range of susceptibility to a specific parasite. Lastly, the superior viability of a few mutations in an unusual environment is no evidence that they are not injuries, for injured organisms are sometimes more viable than normal ones in exceptional environments. In his experiments in 1944, for example, Leblond has shown that rats injured by thyroidectomy are more viable than normal rats in lowered oxygen pressures.

A truly progressive or 'beneficial' mutation must result in an improvement over the normal condition; but there is no clear evidence of the existence of such helpful mutations. In natural populations endless millions of small and great genic differences exist; but there is no evidence that they arose by mutation. All the available evidence tends to show that mutation is a pathological process which has had little or nothing to do with natural evolution, though mutations are extremely useful to man in his development of new domestic breeds. Nor is there convincing evidence that such a condition as a fully viable mutation ever occurs, while thousands of normal variations found in natural populations presumably arose by some as yet unknown and probably very subtle process; it is most unlikely that they arose by mutation.

While there is no doubt that species have evolved and that mutations and natural selection may be associated with the process, inferential evidence that the effects of long-continued over-use or disuse of a part can in time become hereditary is also impressive. Prof. Martin believes that the evidence for such inheritance is much stronger than is commonly realized, but that it is too often neglected or set aside from a mistaken notion that the mutation–selection theory offers a better established and less speculative explanation of all the known facts.

IDENTIFICATION OF FLAVONES BY THE ULTRA-VIOLET ABSORPTION SPECTRA OF THEIR IONS

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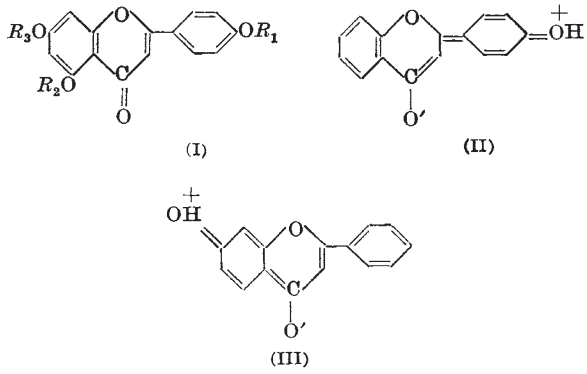
It is well known that the ultra-violet absorption spectra of the ions of many polar-substituted compounds are markedly different from the spectra of the compounds themselves, usually the main band having shifted 20 mμ or more towards the red and increased in intensity. This fact has been used to a considerable extent in the study of the ionization of many weak acids and bases, including phenols[1]. However, so far as we are aware, no use has been made of these differences for identification purposes, although it is apparent from some of the data presented that certain polar compounds which have similar normal spectra may be differentiated by comparing the spectra of their ions (compare 4-*t*-butyl-2 : 6-dimethyl and 2 : 6-di-*t*-butyl-4-methyl phenol[1]).

In the case of compounds, such as the flavones, containing a number of similar polar groups, each group will contribute to the total bathochromic shift on ionization, and if one or more is blocked (for example, by methylation or glycosidation) the resulting shift should be substantially different. Since it has been shown that, except for flavonols and their 3-glycosides, the normal ultra-violet spectra of most flavone and flavonol glycosides are similar to those of the parent aglycone[2], it was felt that the spectra of the ions might afford an elegant method of differentiating such compounds which had been obtained in too small a quantity (for example, separation by paper chromatography[3,4]) for the normal chemical methods to be applied. From the results obtained, it is evident that the position of attachment of sugar in flavone glycosides can be determined from the spectra of the ions of either the compounds themselves, or the partial methyl ether of the corresponding aglycone obtained from them on a micro scale[4] by methylation and subsequent hydrolysis.



The solubility of flavones in various alkaline media has been studied by Briggs and Locker[5], and it was apparent from their results and those of Coggeshall and Glessner[1] that the greatest differentiation of the spectra of the ions would be obtained at an alkali concentration below which complete ionization of all the phenolic hydroxyl groups took place. Although we have not as yet examined this point critically, we have found that 0·002 *M* sodium ethoxide in absolute ethanol is a suitable medium. The normal spectrum of the compound was first determined in absolute ethanol (2·5 ml.) using 1-cm. cells in a Hilger 'Uvispec' spectrophotometer over the range 220–450 mμ at 10-mμ intervals. Sodium ethoxide solution (0·5 ml. 0·012 *M*) was then added and the spectrum of the ion determined over the same wavelength interval. No attempt was made to determine accurately the position of the absorption maxima and minima or the molar extinction coefficient (ε), since the method has been envisaged specifically as a diagnostic one, and therefore devised to be as simple as possible in operation; but the spectra of the compounds themselves agree well enough with the published data[6] both in position and relative ε values of the absorption maxima. The $\lambda_{max.}$ quoted in Table 1 were obtained by interpolation, and the optical densities (*D*) are given as a percentage of

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