made in environments exposed to contrasting stress conditions.

There was great interest in the suggestion by M. D. Gale (Plant Breeding Institute, Cambridge) that the *Rht* genes widely used in breeding short strawed wheats have a direct effect in increasing yield, possibly associated with their high endogenous gibberellic acid content. As there is a general correlation between straw height and grain yield, he suggested that breeders should select for tall strawed varieties carrying the *Rht* genes—that is for 'tall dwarfs'.

The effect of alien cytoplasm on the phenotype was considered by a number of workers. S. S. Maan (North Dakota State University) reported that the transfer of the *T. aestivum* genome to the cytoplasm of seven *Aegilops* species resulted in fully fertile plants with near normal growth habit, but that a similar transfer of the *T. durum* genome frequently resulted in plants with shrivelled, non viable seed. Using a cluster analysis, K. Tsunewaki (Kyoto University, Japan) grouped the cytoplasms of 26 species of *Triticum* and *Aegilops* into eight or nine major plasma types, which revealed the phylogenetic origin of the polyploid species. He also reported a promising male fertility-sterility restoration system comprising the cytoplasms of *Aegilops kotschyi* or *Ae. variabilis* and a fertility-restoring gene on chromosome 1B of *T. spelta*. The great interest in the effects of introducing alien cytoplasm between species of *Triticum* and *Aegilops* has led to the establishment of an international cooperative programme comprising Maan, Tsunewaki and I. Panayotov from Bulgaria.

A more remarkable example of wide crossing, involving a hybrid of wheat with barley, using wheat as the female parent, was reported by K. W. Shepherd (University of Adelaide, South Australia). Only one of the $F_1$ hybrid plants obtained had the expected 28 chromosomes; this was repeatedly backcrossed to wheat and monosomic addition lines selected. These were pollinated by tetraploid *Hordeum bulbosum*, and the resultant 22 chromosome haploids treated with colchicine to give disomic addition lines, which closely resembled the wheat parent, though the presence of barley proteins could be demonstrated by isoenzyme studies. It was suggested that the addition lines might be used for the transfer of physiological characters, such as salt tolerance, from barley to wheat; their possible use to transfer disease resistance was considered undesirable because of the danger of producing wheat varieties susceptible to strains of pathogens which previously only attacked barley.

The Congress also gave an opportunity for the visitors to see some of the trials and selection plots, mainly using traditional pedigree selection procedures, conducted by the Indian Agricultural Research Institute at Delhi and elsewhere. These trials showed the contrasting irrigated and rainfed conditions which must be considered by Indian wheat breeders in the conduct of their work and emphasised the need for agronomic experiments to show how new varieties should best be grown. □

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# Pions probe nuclei

*from P. E. Hodgson*

Two recent papers have shown how pions can be used to probe the finer details of nuclear shapes and sizes. The method is based on a comparison of positive and negative pion scattering in the region of the pion-nucleon (3,3) resonance, that is the resonance with quantum numbers corresponding to an angular momentum 3/2 and an isospin 3/2. The resonant amplitudes of negative pions with neutrons and of positive pions with protons is three times larger than the resonant amplitudes of negative pions with protons and of positive pions with neutrons. By measuring these amplitudes it is thus possible to find out about the relative numbers of neutrons and protons in various parts of the nucleus, and this makes it a powerful tool for the study of nuclear structure.

In the first of these papers, Egger *et al.* at the Swiss Institute of Nuclear Research (*Phys. Rev. Lett.* **39**, 1608; 1977) measured the elastic scattering of 130 MeV positive and negative pions from $^{40}$Ca and $^{48}$Ca. They found very marked differences between the cross sections both in magnitude and in the angular positions of the maximum and minimum cross sections. Analysis of this data shows that there is a difference of about 0.3 fm between the radii of the two nuclei, which is consistent with the density distributions calculated by Negele.

The second experiment uses the scattering of 230 MeV positive and negative pions by $^{18}$O to study the nuclear deformation of that nucleus. Iverson *et al.* at the Anderson Meson Physics Facility (*Phys. Rev. Lett.* **40**, 17; 1978) measured both the elastic and inelastic scattering of the pions and again found significant differences between them. The differences are quite small for the elastic cross sections but are very marked for the inelastic cross sections. These are in the ratio of 1.66 to 1 for the negative to positive pions. This is in contrast to the absence of any differences in similar measurements for $^{12}$C.

These differences in the inelastic scattering cross sections can be interpreted in terms of the deformation of the wavefunctions of the two neutrons outside the $^{16}$O core compared with that of the core itself. Distorted wave calculations using the collective model of the nucleus show that the observed inelastic scattering cross sections imply either that the deformation length of the neutrons in $^{18}$O is 1.3 times that of the protons, or that the deformation length of the valence neutrons is three times that of the core. The deformation length is defined as the product of the deformation parameter and the equilibrium radius of the deformed potential.

These results are preliminary, and the data will certainly be subjected to more detailed analysis. It is already clear that the comparison of positive and negative pion scattering, both elastic and inelastic, is likely to prove a powerful method of determining the shapes and sizes of the proton and neutron distributions in nuclei. As the authors of the second paper remark, pions may now be considered as beginning to deliver on their promise as a new and powerful tool in the study of nuclear structure. □

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## A hundred years ago

THE correspondent of the *Scotsman* at Ottawa describes a curious phenomenon which occurred in the end of February at Niagara Falls. In the vicinity of Table Rock the river-bed was dry for hundreds of yards towards the centre of the Horse-shoe Falls, whilst the river below the falls was about twenty-four feet below high-water mark. For three days the appearance of the river both above and below the falls led to the idea that the falls would entirely cease for a time.

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