

Tees. As they develop they drift southwards as larvae and onshore into the north Yorkshire nursery ground. Here, after metamorphosis, the 0 group fish establish a depth distribution related to size. The 0 group over-winter in the nursery ground and begin the migration to the parent spawning ground as 1 group fish.

In her talk on local and annual variations in the recruitment of the limpets *Patella vulgata* and *P. aspera*, Dr R. S. Bowman (University of Leeds) described how, at Robin Hood's Bay, Yorkshire, she chose fixed-site monitoring as being a more sensitive and accurate method of measuring input of settlers than random sampling. Annual input varies widely in both species; this, she said, seems to result from the effect of summer air temperatures on gonadal development in *P. aspera* and on the susceptibility of newly-settled spat to hard frost in *P. vulgata*.

Dr J. B. Buchanan (University of Newcastle upon Tyne) discussed the life history of the burrowing decapod crustacean *Calocaris macandreae*. A monitoring programme off the Northumberland coast over a ten-year period has shown that this species holds its population density at an average of eighteen individuals per square metre, with a coefficient of variation of only 5.4 per cent. An analysis of grab samples revealed that the species is evenly distributed on the ground and experiments in the aquarium tanks of the Dove Marine Laboratory showed it to defend individual territories which are in the form of burrow systems.

Mr R. Foster-Smith (University of Newcastle upon Tyne) described the effects of turbidity on the feeding of *Mytilus edulis*, *Cerastoderma edule* and *Venerupis pullastra*. He has found that *Mytilus* is more capable than the other species of withstanding high concentrations of suspended matter, and does this by rejecting a greater proportion of filtered material than either *Cerastoderma* or *Venerupis*.

The special lecture, given by Dr J. A. Allen (University of Newcastle upon Tyne), was also devoted to benthic molluscs but to a group far less familiar than Mr Foster-Smith's cockles and mussels, namely the bivalves of the abyss. Here the bivalve fauna is dominated by the deposit feeding sub-class Protobranchia, whose food consists largely of refractile scleroproteins such as are found in the matrix of the exoskeletons of dead diatoms or Foraminifera. Morphological adaptations invariably include the elongation of the hind gut, thus increasing digestion time. Growth rate of these animals is very low but the life span may be commensurately long, sometimes in excess of a hundred years, with maturity attained at the end of the life span.

## PHYSICS EXHIBITION

### 1+1=2+?

For the first time, the annual Physics Exhibition, organized by the British Institute of Physics, was held last week at Earl's Court, London, rather than at the more inaccessible, and inelegant, Alexandra Palace. Also, on this occasion the exhibition took place at the same time and in the same place (though on a different floor) as Labex International, an exhibition of scientific instruments.

In the past few years the Physics Exhibition has experienced a disappointing decrease in the number of exhibitors, and at least one of the motives for linking up with Labex International was to try to rectify this state of affairs. Dr L. Cohen, secretary of the Institute of Physics, said last week that the number of exhibitors was about the same as last year, possibly slightly greater. Nevertheless the recent decision to hold the exhibition only every two years from now on still stands.

Several of the exhibits at the Physics Exhibition are traditionally educational in character, and this year one of the most interesting was an inexpensive apparatus for measuring the speed of light. It was devised by the Physics Department of King's College, London, and can be built for about £25 together with the apparatus usually found in school science laboratories (see *J. Phys. E.*, 5, 1142; 1972). The principle is to modulate the output from a gallium arsenide-phosphide light-emitting diode and to compare the phase of this output with the phase of the signal detected at another diode a metre or two away.

Another inexpensive piece of educa-

tional equipment on show was the sound level detector developed for the Technology Foundation Course of the Open University. This is being used by students to measure vehicle and machinery noise as part of their practical work.

One of the more extensive displays was undoubtedly that put on by Harwell to illustrate the many facets of research in which that establishment is now engaged. Among the activities publicized were research on multifilamentary Nb<sub>3</sub>Sn superconductors and the work of the establishment's non-destructive testing centre.

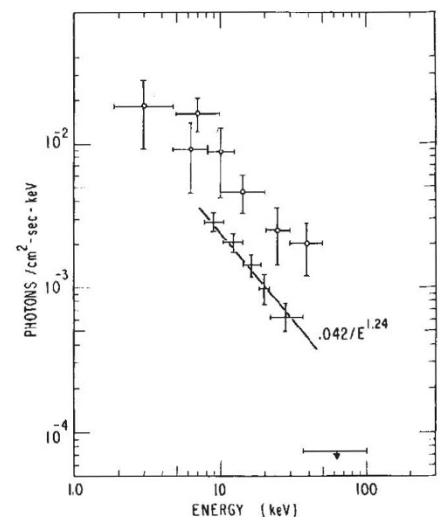
Although the a.c. linear motor is now quite celebrated for its role in high speed transport, d.c. linear motors are less well known even though they have important advantages in the context of, for example, machine tools. In such a motor built at the Wolfson Centre for the Technology of Soft Magnetic Materials by the University of Wales Institute of Science and Technology and shown at the exhibition, the field excitation is provided by ferrite permanent magnets and the armature is a steel bar wound with copper wire. The speed of the motor can be varied simply by altering the current flowing through the armature.

Time alone will tell to what extent the next Physics Exhibition in 1975 will benefit from the decision to hold the event less frequently. It is certainly true to say, however, that many people who have not visited the exhibition every year in the past will be more encouraged to do so regularly in the future, and this should have a beneficial effect on the number of exhibitors.

## SMC X-1 Observed at Energies > 7 keV

OBSERVATIONS of the binary X-ray source SMC X-1 are reported in next Monday's *Nature Physical Science* (April 23). These observations, made from the satellite OSO-7, extend to energies greater than 7 keV, thus complementing the Uhuru observations in the range 2 to 6 keV. The period found is consistent with the 3.8927 day period of the Uhuru data.

Ulmer *et al.* have also extended the known spectrum of SMC X-1, by means of the OSO-7 observations, to 35 keV (see diagram). The best fit to their data is a slope of  $0.04E^{-1.24 \pm 0.09}$  photon  $\text{cm}^{-2} \text{s}^{-1} \text{keV}^{-1}$ , which agrees well with the rocket data of Price *et al.* (*Astrophys. J. Letters*, 168, L7; 1971) which were obtained in 1970. The integrated luminosity from 7 to 35 keV is  $4.5 \times 10^{38}$  erg  $\text{s}^{-1}$ , assuming a distance of 63 Mpc, and there is evidence, say Ulmer *et al.*, that the spectrum steepens between 35 and 60 keV.



Spectrum of SMC X-1. +, OSO-7 observations reported in next Monday's *Nature Physical Science*; o, rocket observations made in September 1970 (see text).