

LETTERS

Apparent depth

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mensurate returns in the form of increased sales of the proceedings. Any subsidy designed to bring the price within the reach of an individual teacher's pocket might therefore have to be very substantial.

APPARENT DEPTH

The letter from R M Helsdon (*Phys. Educ.* 1977 12 67) rejects the usual derivation of the formula for apparent depth on the assumption that no perception of distance is possible with monocular vision. There are in fact various mechanisms by means of which a single eye can perceive distance, although binocular vision is often much more sensitive. One mechanism depends upon the observation of parallax, which gives a commonly used method of determining apparent depth. Another depends upon the need for accommodation to focus clearly objects at various distances. This need is greatly increased by magnification so that there is a very small depth of focus with even a low-power microscope, permitting precise measurements of real and apparent depth. These two monocular methods must be known to practically every teacher of physics. Who knows of any binocular method?

If Mr Helsdon's argument were to be substantiated practically the whole of elementary geometrical optics would have to be changed, since this is primarily concerned with calculating the positions of images which are observed using one eye only. *J W Warren*

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R M Helsdon replies:

In reply to J W Warren's comments I would point out

Queries in physics

Q382 (from *QIP* 41)

We now have electrical methods of measuring pH, oxygen concentration and flammable (reducing?) gas concentration. Is there an electrical method of measuring nitrate concentration, in order to monitor excess nitrate fertilizer getting into rivers?

Q385 (from *QIP* 41)

Could a 'one-way heat pipe' be used to transfer energy from solar heating panels to a warm water storage tank? Would the cost be prohibitive?

The above items were selected from *QIP*, a thrice-yearly broadsheet edited by Mr W H Jarvis. It is available on subscription at a rate of £1.65 per annum from Mr W H Jarvis, Salewheel House, Ribchester, Preston PR3 3XU.

that with monocular vision one may *deduce* the distance of an image, whereas with binocular vision one intuitively *perceives* it. In using a telescope or monocular microscope one is directly aware of the angle subtended by the image at the eye, but one has no awareness of distance—which may however be determined or inferred.

I doubt whether the change in effort required to keep the bottom of a pond in focus whilst it was being filled with water would be perceptible. When I look vertically downwards into the pond in my garden with one eye closed I am unaware of its depth, but when I open both eyes this awareness is immediate and vivid. I suggest that Dr Warren tries this simple experiment.

USING THE HERTZ

The introduction of the hertz as the SI unit of frequency provides a way of giving more meaning to Planck's constant. The constant is usually expressed as 6.6×10^{-34} Js, but the unit Js has little meaning in itself. If expressed as 6.6×10^{-34} J Hz⁻¹, the unit means that for every hertz of frequency of a photon, the photon possesses 6.6×10^{-34} joules of wave energy.

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Science in schools and industry

The Association for Science Education is holding a one-day conference for science teachers and people from industry on Friday 21 October 1977 at the Royal Society, London. The aim of the conference is to provide an opportunity for an exchange of views about the place of science in schools and in industry. It will be chaired jointly by Professor P J Black from the Centre for Science Education at Chelsea College and Mr H S Mullaly, who is executive chairman of Understanding British Industry.

There will be short contributions from people working in industry, from science teachers and from students in schools, and there will also be opportunities for discussion. Participants will be given a view of the kinds of science that are taught in schools, of the conditions under which they are taught and of the reactions of those teaching and being taught. This view will be set against the needs of industry and considered in the context of the present demand for a greater awareness of industry in schools.

Application forms and further information can be obtained from the secretary of the organizing committee, Mrs J Brophy, 9A Ardwick Road, London NW2 2BX.