

## CORRESPONDENCE

### Effect of Humming on Vision

SIR,—I have read with interest the paper by W. A. H. Rushton on "Effect of Humming on Vision" (*Nature*, 216, 1173; 1967). The description of his experiments was most interesting, but I am still at a loss to discern his exact conclusions. Nevertheless, I would like to bring to his attention another use of the stroboscopic technique, which we employed about 1950.

At that time, the sky contained large numbers of aeroplanes, both civil and military, which were powered by piston engines and airscrews. While many of these engines rotated clockwise when viewed from the front, there were several—mainly American—which had anti-clockwise rotation. As members of the Air Training Corps we were keenly interested in aircraft recognition and this often led to arguments concerning the direction of engine rotation. Some of us hit on a reliable method of determining this, which was particularly suited for aircraft in flight.

The technique was similar to that described by Professor Rushton, that is, to vibrate the head at a slowly increasing frequency until the propellers "stopped". A slight decrease in vibration frequency then allowed the propellers to advance in phase, thus showing the true direction of rotation. The vibration was produced in a different way from that described. The method was to curve the tongue against the roof of the mouth and exhale gently. This produced controllable "purring" due to the vibration of the end of the tongue as it fluttered, driven by the air stream over the palate. The vibrations so produced influenced the eyes in exactly the same way as in Professor Rushton's descriptions.

Yours faithfully,

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### Biosatellites are a Waste of Money

SIR,—“Biosatellites are a Waste of Money” (*Nature*, 217, 899; 1968) cannot be considered as a responsible and balanced view of the NASA bioscience programme.

The clear implication of its lead paragraph is that the Biosatellite II mission would have justified its cost had the results been "exciting". To suggest that "exciting" results are the normal expectation and that all other outcomes are a waste is to express a total and arbitrary misconception of what research is all about. It also does a grave injustice to the dedicated biologists, engineers and NASA administrators who accepted an unequal challenge for several difficult years and succeeded in their endeavour.

The very conclusion that studies on orientation and morphogenesis did not reveal unexpected effects is of great importance for future work, and sufficient of itself to justify the effort and cost.

There is, however, an even more important contribution to biology being made by the Biosatellite project: it represents the first formal achievement of a combined major effort of the biologist with the engineer. The biologist has had to convert a working hypothesis into a very complex and reliable piece of hardware, and to make it work in a very harsh environment with extremely severe temporal limitations. Biological knowledge is being recognized as an increasingly important component for the survival of our society saturated as it is by the bitter fruits of tech-

nology, and the integration of biology with engineering is of the greatest possible significance.

To suggest that the money might have been better spent for other purposes is probably true, but in this context it is a *non sequitur*. Such a choice does not actually exist. An excellent and well publicized rebuttal to this argument was made in the columns of the *New York Times* by Professor Harold Urey a few years ago.

A far better case might have been made by suggesting that less than a half a day of the Vietnam war would have easily paid for the Biosatellites.

There are sound arguments to be made against the concept and the execution of Biosatellites, and few responsible biologists and engineers would dispute them. There always is criticism against projects of this magnitude, but the following quote is pertinent in this respect: "... I wish to emphasize that our ignorance of living organization—of how living matter works—is in general so profound, and our lack of any real theory (in the sense that the physicist uses that term) so complete, that we cannot afford the luxury, or rather the scientific arrogance, of insisting that we know the space environment will bring us no surprises. In short, we cannot afford an arrogance that may cause us to lose the possibility of major discovery" (C. S. Pittendrigh, *Scientists' Testimony on Space Goals*, hearing before the Committee on Aeronautical and Space Science, USS 88th Congress, June 10–11, 1963 (USGPO).)

Yours sincerely,

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### 'Memo' Functions and Machine Learning

SIR,—I have just noticed two howlers in my paper which you published on April 6 (*Nature*, 218, 19; 1968). The passage "'Factorial' (of a natural number) is a function; so is 'highest common factor' (of a pair of real numbers)"; should, of course, read "'Factorial' (of an integer) is a function; so is 'highest common factor' (of a pair of integers)".

These errors occurred in the course of a redrafting: I changed the example functions and forgot to change the argument types accordingly.

Yours faithfully,

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**ERRATUM.** The following corrections should be made to the article "Possible Model for a Rapidly Pulsating Radio Source" by Jeremiah Ostriker (*Nature*, 217, 1227; 1968): in the inequality on page 1227, 17s should read 1.7s; on page 1228,  $J = 3.46 \times 10^5 \text{ g cm}^2 \text{ s}^{-1}$  should read  $J = 3.46 \times 10^{50} \text{ g cm}^2 \text{ s}^{-1}$ ; in Table 1,  $1.35 \times 10^{18} \text{ cm}$  should read  $1.35 \times 10^8 \text{ cm}$ ; and in the inequality on page 1228,  $7 \times 10^{-5} \text{ day}^{-1}$  should read  $2 \times 10^{-3} \text{ day}^{-1}$ .

**ERRATUM.** In the article "Intellectual Style and High School Science" by A. J. Cropley and T. W. Field (*Nature*, 217, 1211; 1968) the incorrect insertion of a footnote in the text obscured the fact that the AL-AQ tests of intelligence are published by the Australian Council for Education Research (ACER) and are specifically designed for use with above average groups.