Letters

Environment Planning: The Role of Engineers

It is a function of engineers to apply science to human problems involving human situations. The Report of the Environmental Pollution Panel of the President's Science Advisory Committee [see News and Comment, 19 Nov., p. 1006] impels me to call attention to the recent contributions made by the engineering profession to an attack on the environmental-pollution problem.

In 1962, a report of the Committee on Engineering Research Needs stressed the importance of considering the total physical environment in relation to human well-being.

In a report in 1964 on Urban Planning Definitions, a committee of the American Society of Civil Engineers stipulated as one of the principal groups of operations in urban planning the consideration of the effect on health of physical-environmental factors as a whole. It defined these factors as including both natural and man-made conditions affecting physical and mental health, as well as safety. In this report and in an explanatory note by the chairman of the committee, a number of means of dealing with environmental conditions are indicated. In general, they comprise public education, special measures, physical improvements, and regulations. The very essence of environmental planning as part of urban planning is in evolving a balanced use of all these means to deal with the combined effects of various environmental conditions upon health.

It is understandable that, without a rational engineering planning system, and without enough competent engineers in environment planning, these means have not been effectively utilized. The way is now open to correcting these deficiencies. The recently established National Academy of Engineering is closely related to the National Academy of Sciences. Both are serviced by the National Research Council. This arrangement encourages collaboration between scientists and engineers while recognizing the differences in their functions. It is hoped that it will enable the nation and its leadership to see more clearly the role of engineers in bringing about practical, scientific solutions to our environmental problems.

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Attribution of Error

Ti Li Loo (Letters, 15 Oct., p. 292) writes that a statement I made in my article "Cell division and cancer" (2 July, p. 34) is "unfortunately erroneous." My statement referred to findings of Freedlander and French [*Cancer Res.* **18**, 1286 (1958)]. On rechecking I find that I quoted them correctly. What Ti Li Loo probably meant is that his findings differed from those of Freedlander and French.

I think that open letters should be worded carefully so as not to cast unwarranted doubt on the reliability of other researchers.

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Frequency Scale for Spectra

Wald's plea (Letters, 3 Dec., p. 1239) for plotting spectra as a function of frequency rather than wavelength deserves support on pragmatic grounds, and because when radiation traverses media of different kinds it is indeed frequency rather than wavelength which is invariant and may therefore properly be considered the more fundamental quantity. However, it must be remembered that in the optical region wavelength is as yet the only measurable quantity and that frequency must be computed. This is not "a curious historical mischance" but an experimental reality.

Wald speaks of ways of plotting spectra as being "rational" or "irrational." There seems also to be a need to distinguish between a "normal" spectrum and a "rational" one. The diffraction grating provides a rational but not a normal spectrum; the latter must be computed. The problem of what constitutes a "true" representation of a spectral distribution is a very old one—Rayleigh treated it in 1883 (*Nature* **27**, 559)—and to say that "things that are the same look the same on a frequency scale" seems to me to involve prejudgment. For instance, is the ultraviolet region more or less extensive than the infrared region?

In arguing the merits of the "Fresnel unit" for a frequency scale, Wald says that "a wavelength scale from 400 to 750 $m\mu$ becomes a scale of 750 to 400 Fresnel units." This is a bit misleading, for it would seem to imply that 575 $m\mu$ equals 575 Fresnel units, which is not the case. The Fresnel unit, by the way, is the same as the terahertz, established in 1960 as a part of the *Système International d'Unités*.

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. . . With the main burden of Wald's argument I agree, but I think that expressing frequency in Fresnel units would represent an unnecessary departure from conventional terminology. The established unit of frequency is the cycle-per-second; the alternative name "hertz" was adopted for this unit by the General Conference on Weights and Measures, which also adopted a set of metric prefixes that includes "tera-" to indicate multiplication by 10^{12}. Accordingly, "teracycle per second" and "terahertz" are already well established in the literature (on lasers, for example), and there is no need for a third name for the same unit.

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. . . In addition to the advantages Wald outlines, the use of frequencies rather than wavelengths provides yet another important advantage. Because frequencies are directly proportional to energies, significant relations between fundamental, overtone, and combination vibrational bands are immediately apparent from spectra linear in frequency units but are obscured by wavelength presentation.