Letters

Migrating Medics

Science has taken note of the British Minister of Health's recent wailing over the "brain drain" of his country's physicians ("The new emigrés (II): British doctors head for U.S. in large numbers," 28 Oct., p. 494). Since he is a member of the Labour party, one might excuse his lack of concern for English tradition in the sense of noblesse, but this political orientation is hardly an acceptable excuse for his continuing the old imperialistic and colonial attitudes which proved the undoing of the British Empire.

He doesn't seem to realize that most of these men go to former colonies, and in so doing, each makes amends for England's failure as a colonial power to provide adequate medical manpower for those not fortunate enough to be born in the U.K. The situation is scandalous enough when one considers the needs of Canada, New Zealand, Australia, and the United States. It becomes incomprehensible and reprehensible in the case of India and Pakistan, the former "white man's burden." Not only are there no English physicians going there, but Indian and Pakistani doctors are migrating to England!

The problem is a larger one. All the European countries should supply doctors to their former colonies. If one considers the chief ethnic origins in the United States, it is obvious that the medical schools of Ireland, England, Germany, France, Israel, and Italy, at the very least, are duty bound to force a certain number of their graduates to practice here and help alleviate our medical shortage. The brain drain is actually much less than the body drain of the past 200 years. No doubt someone in the U.N. could figure out a "fair share" equation based on immigration figures, dates of mass migrations, and fertility characteristics.

Other examples come quickly to mind. Spain and Portugal have their Central and South American obligations to fulfill. Russia, Mongolia, and China should decide who is to relieve our Public Health Service of the care of the so-called American Indians, who are actually Asiatic nomads. Having left Southeast Asia in such a mess, France should provide medical care to both sides in Viet Nam.

The current physician population of California provides the precedent for this assignment of medical responsibility. This state has been, is, and will be a debtor state from the standpoint of physician supply. Many of us have reluctantly left the East and Midwest, following the general westward migration, in recognition of our duty to supply medical care to these expatriates.

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Writing as a doctor who has practiced general medicine in England for 21 years, I would like to congratulate Walsh on his two articles (News and Comment, 21 Oct., p. 365, and 28 Oct., p. 494). He has written the best factual description of medicine in Britain today that I have so far read; this is in spite of the almost daily deluge on this subject in our papers and magazines.

I still believe in the basic right of every man to get adequate medical treatment irrespective of his financial situation, but, in common with the vast majority of British doctors, I no longer have faith in the ability of politicians (of any party) to provide such a service. Anyone got a vacancy for a disillusioned, overworked, overweight, frustrated, middle-aged doctor?

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Freight Train Award

Peoples' letter (29 July) called attention to the use of "freight trains" (seemingly endless insertion of noun-like attributive adjectives, usually unpunctuated, between the article and noun) by some of today's technical writers. *Science* could further a cognizance of these monstrosities and perhaps reduce their frequency (or at least further an interest in their proper punctuation) by offering an award for the discoverer (and where possible a different kind of recognition for the author) of the best freight train submitted each month. The award should of course be appropriately titled, something like: "The New Science Monthly Technical Writer Freight Train Award."

The following freight train, which appears in an unnumbered, unpaged record of an Aerojet-General Corporation presentation to the President's Scientific Advisory Committee on 22 September 1964, should be considered a standard for the first group of entries: "The heat rejection loop NaK pump motor assembly design margin . . ."

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Tornadoes: Puzzling Phenomena and Photographs

Different eyewitnesses seem to have given rather similar accounts of "Luminous phenomena in nocturnal tornadoes" (Vonnegut and Weyer, 9 Sept., p. 1213) and of certain types of so-called "unidentified flying objects." J. Vallee's book on "UFO's," *Anatomy of a Phenomenon* (Regnery, Chicago, 1965), for example, includes a number of reports of slow-moving or stationary, often "cigar-shaped," objects or "clouds" with some or all of the following characteristics: vertical orientation; surrounding smoke or luminous haze, or multicolored or rotating lights; smaller, brightly luminous balls or disk-shaped objects that typically emerge from the lower end of the larger object and then fall or drift toward the ground or veer away—sometimes apparently at great speed. Sometimes, but not always, such a phenomenon is described as making its initial appearance out of a bank of clouds. Similarly, in connection with tornadoes, Vonnegut and Weyer's witnesses speak of such things as a vertical luminous column, a blue halo or rotating lights, "orange balls of fire" issuing from the bottom or "cone point" of the elevated funnel, and even a bright white, blue and yellow basketball-sized object

floating along 5 feet (1.5 m) above the ground. Isn't it possible, then, that these phenomena associated with tornadoes, previously described instances of "ball lightning," and at least some sightings of alleged "UFO's" or "flying saucers," all reflect basically similar sorts of electrical disturbances in the atmosphere?

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Is it not possible that the luminosity (or at least a portion of it) of the twin pillars was caused by the reflection of the lights from the town? A similar luminous glow can often be seen coming from low-level clouds and fog banks that move in at night over brightly illuminated cities and towns.

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. . . In Weyer's photo of "unusual illuminated vertical pillars," the fact that the power and phone lines crossing the foreground also appear lighter in the area of the "pillars," plus the fact that he did not observe the pillars visually while making the exposure suggests that these streaks are due to nonuniform application of the developer, such as sometimes happens when single rolls are developed in small tanks, the developer being poured in after the film has been inserted.

To me, the pillars appear to extend down into the immediate foreground, but the perception is almost subliminal. If the film were mine, I would make a lighter print of much higher contrast. If this caused the extension of the pillars into the immediate foreground to become fully evident, I would conclude that the pillars were caused by developer and not by tornadoes. Many "flying saucers" originate in the darkroom as the result of such processing accidents. But sometimes foreground material is present which also shows a change in gamma where it crosses the light blob that has been identified as a flying saucer, and so identifies the blob as a processing fault.

Nonetheless, this was a fascinating article!

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Our initial reaction, upon being shown a photographic print of the illuminated vertical pillars by Edmond Dewan, was probably that of most readers: that the effect could quite easily be an artifact either of exposure or processing. On reading of the guillotine method of exposure, a number of possibilities suggested themselves for the presence of an exposure artifact, such as, a background light passing through the gaps between the fingers, or reflected light from a ring on one of the fingers. This latter situation looked very possible in view of the stray illumination present from a window adjacent to the

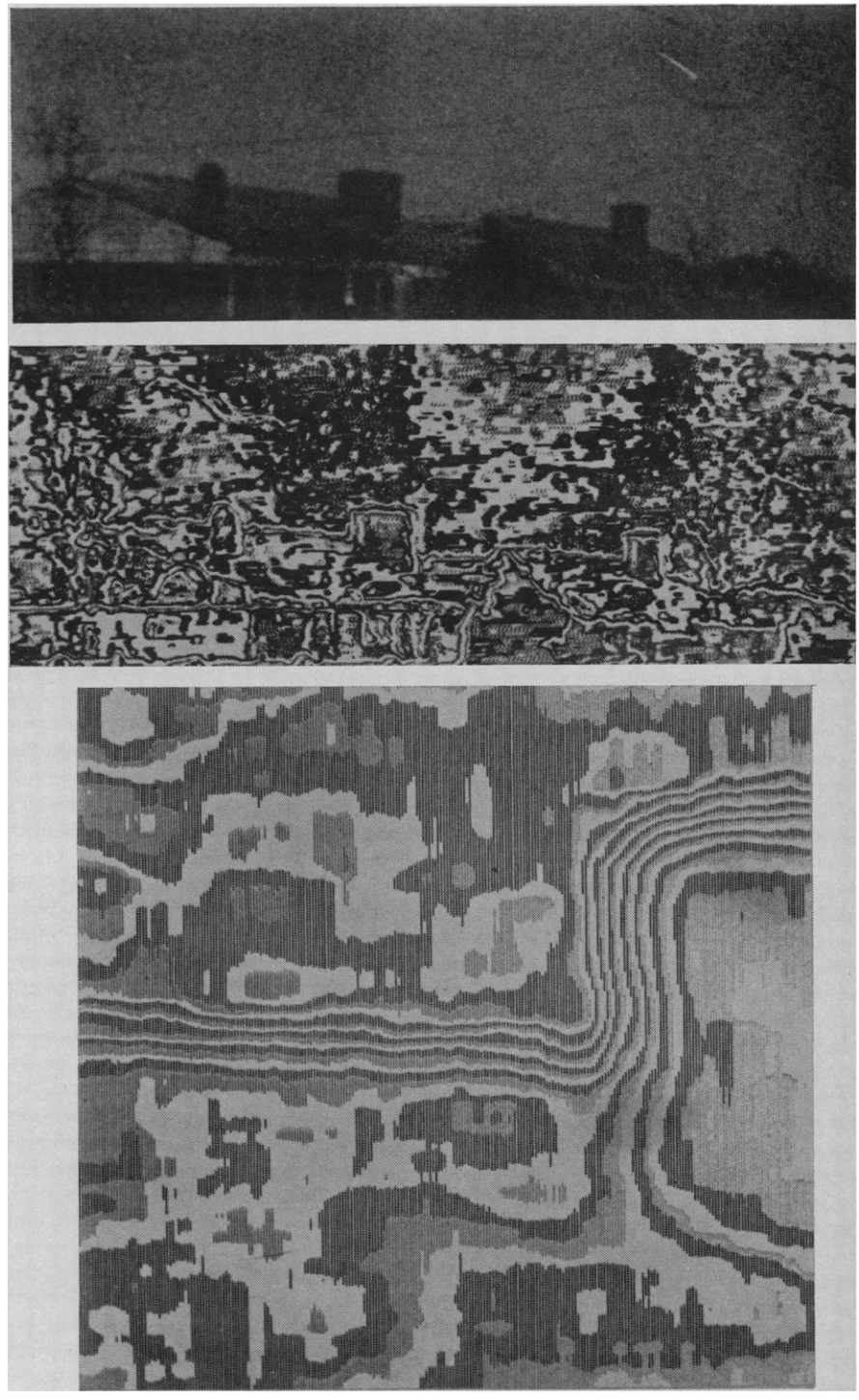


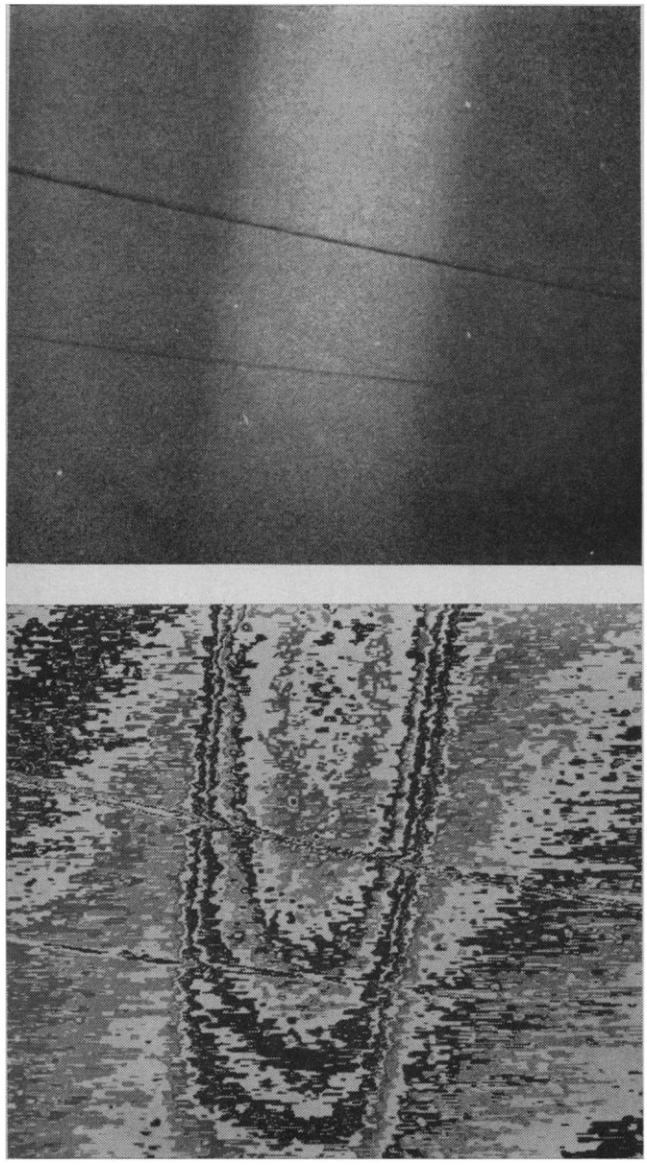
Fig. 1. Isodensitometric study of Vonnegut-Weyer photograph. (Top) A 20× enlargement of region studied; (center) trace at 20×; (bottom) trace of a small portion of region studied (top) at 200×.

one through which the exposures were made. Obviously studying the print could only lead to fairly empty speculation and any real conclusions could only be based on tests conducted on the original negative. Later Vonnegut made the original negative available to us for densitometric study and the results indicate that the luminous pillars are not an artifact but a real exposure. We can, of course, say nothing about the nature of the occurrence of the pillars.

A strip of film was loaned to us containing the interesting frame 11 plus frames on either side. The pillars existed only in the normal frame area of the film and did not extend outside this as they might have if caused by a light leak in the camera, or from certain types of faulty development techniques. No similar phenomena existed in any of the other frames.

The bright pillar on the left hand side of the photograph appears to cross the frame down to the region of the houses. We conducted a densitometric study, using an isodensitracer [see C. S. Miller, F. G. Parsons, I. L. Kofsky, *Nature* **202**, 1196 (1964)], of this and other regions of the negative. In the isodensitracer the quantized output of the microdensitometer is coded into a repeating series of symbols. The three-symbol cyclic code consists of a segment of a line, a series of closely spaced dots, and a blank space. Hence the direction of the change in density can be determined unambiguously. Once the scan is completed, the instrument automatically steps over a predetermined distance and rescans along a line parallel to the first scan. This process is repeated over the area of interest. When the set of scans is completed, the contours of equal density in the negative are readily recognizable. The interpretation can be greatly assisted if the dash-dot-space code is repeated in four different colors.

Figure 1 (top) shows the area that was traced and (center) shows the resultant plot. Both the photograph and the trace are 20× enlargement. The pillar of light reaches down to the roof line but does not depress the contours of the roof as it would if the



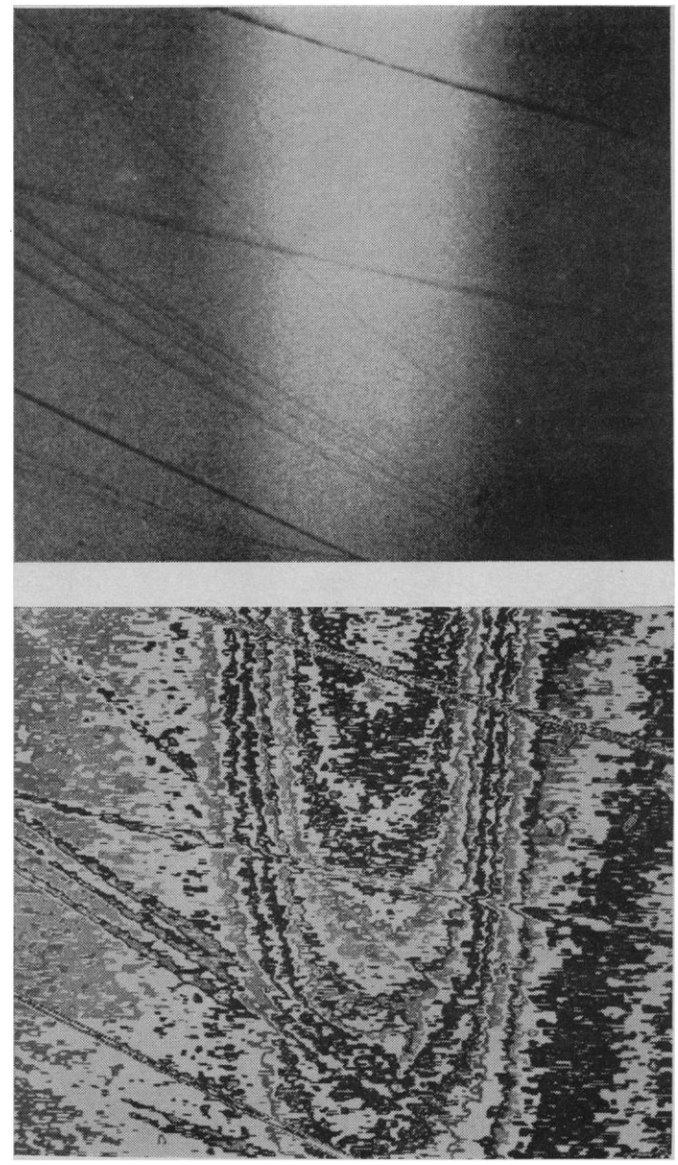


Fig. 2 (left). Isodensitrace (bottom) of a portion (top) of the left-hand pillar at 20×. Fig. 3 (right). Isodensitrace (bottom) of the right-hand pillar at 20×.

pillar extended in front of the houses. Figure 1 (bottom) shows a 200× trace of the region including the roof and chimney. Again the flatness of the roof contours is apparent. The intersymbol density difference is 0.01 density units and the scanning aperture is 100 μ^2. Apparently the pillar goes behind the house or stops suddenly at the roof line. The latter explanation is just too unlikely especially since the roof line is not flat. Any faulty exposure or development technique would not give this result.

A further detailed study was made of the structure of the two luminous pillars. Figure 2 shows the trace at 20× with a density increment of 0.012 and with a 100-μ^2 aperture. The appropriate portion of the photograph at the same magnification is shown for comparison. The wires do cross the pillars but are not resolved at this scanning aperture size. Structure is apparent in the pillar with a maximum high up. A similar result is apparent in the other pillar of light on the right hand side of the photograph as indicated in Fig. 3.

The indications are that the luminous pillars constitute a genuine exposure and are not an artifact of either exposure or development. Unfortunately no information was available concerning the characteristic curve of the film so that the brightness distribution of the pillars cannot be determined quantitatively. However, qualitatively the information in Figs. 2 and 3 is meaningful. Could the luminous pillars be caused by reflected ground-based lights? The maximum in each pillar looks too high up for that. This short note indicates the validity of the pictures and shows the usefulness of this particular densitometric technique in quantizing photographic density for the study and evaluation of photographic results. Of course, this work can give no indication of the nature or cause of the pillars.

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The intermittent luminosity occurred after the tornado had developed; therefore, it seems to be a side effect rather than a cause. The partial vacuum in the eye of a tornado (which is capable of lifting an automobile) provides the path of least resistance for electricity between the overhead storm clouds and the earth. It might act as an enormous vacuum tube, somewhat similar to a geissler, neon, or fluorescent light tube, conducting very low density electric current wherever there is a sufficient accumulation of electricity in the clouds to make the jump to earth. The discharge is reported to last only a few seconds; also, some observers were within the luminous area with no ill effects.

The partial vacuum in the tornado, together with the difference in potential between the earth and clouds, appears to be the direct cause of this illuminated path of the discharge. It is conceivable that spiraling supersonic winds in the eye of the tornado actually throw the air from the center toward the wall of the core so hard that additional vacuum is produced in the center. This augments the partial vacuum produced by the thermodynamic process at work in the system.

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Early ideas similar to Roberts' were advanced by Robert Hare in 1840 when he was professor of chemistry at the University of Pennsylvania. In discussing the tornado problem, he offered a translation of suggestions made by Peltier, the French physicist [*Amer. J. Sci. and the Arts* **38**, 73 (1840)]:

> . . . Flashes and fiery balls of sparks accompanying the tornado, a smell of sulfur remains for several days in the houses, in which the curtains are found discolored. Everything proves that the tornado is nothing else than a conductor formed of the clouds which serves as a passage for a continual discharge of electricity from above.

While we hope that eyewitnesses will continue to report in as great detail as possible what they see at the time of a tornado, we think it is clear that the most important thing that needs to be done is to obtain good photographic evidence of what is going on. It is our own opinion that we have certainly not established that the photograph indeed represents the two tornadoes, but it seems that an atmospheric phenomenon of some kind is probably present and that further studies are desirable.

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