the red end of the spectrum at 655 m μ , the part in which differences due to varying melanin content are not obscured by variations in the other components of skin pigmentation, and it is well established that upon the amount of melanin present in the skin depends the penetration of ultraviolet radiation through it.

It would be worth examining the skin colour of the subjects on whom Dr. Ford and his colleagues report and, indeed extending their study to other more deeply pigmented groups in Britain such as immigrants from the West Indies and Africa. Apart from the public health interest here it might prove possible to quantify the evolutionary significance of skin colour differences.—I am, etc.,

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¹ Correnti, V., *Rivista di Antropologia*, 1962, 49, 135.

Pulsed Electrical Energy for Soft-tissue Injuries

SIR,—I wish to comment on the preliminary communication by Mr. D. H. Wilson (29 April, p. 269).

A number of reports have appeared recently pointing to the beneficial effects of pulsed, non-thermal, high peak power electromagnetic fields at 27.12 MHz/s (Diapulse). Such fields have been successful therapeutically in intermittent claudication,¹ in the experimental acceleration of wound healing in dogs,² following a variety of foot operations,³ in a number of oral surgical conditions,⁴ and in experimental haematomas.⁵

In view of the increasing importance of these fields in reparative bodily processes, work was very recently started here with a unit employing a coiled antenna and operating at 14.20 MHz/s (under special licence), since a Diapulse machine was not available. Pulsed non-thermal energy was tentatively used to study the resolution of experimental haematomas in rabbit ears.⁵ It would appear from these limited experiments that a fairly significant acceleration was possible in test as opposed to control haematomas.

A rapid decrease in power absorption by tissues takes place with increasing distance of the antenna from the traumatic site.⁶ Although speculation on the mode of action of such non-thermal pulsed radio frequency energy continues, brief mention should be made of the theory advanced by Wallis⁷ to explain certain effects at cellular and molecular levels. He points out that alternating high frequency fields tend to induce a repetitive deformation force (torque force) and polarization effects in the variable dielectric of the various constituents of cells and on macromolecular dipoles. Owing to the extreme rapidity of the oscillating field, the dipoles attempt to follow these oscillations and exhibit a type of continuous activity akin to electrotonus. However, if this alternating high frequency field is periodically interrupted (that is, pulsed several times a second), during the pulse intervals a relaxation time will be imparted to the dipoles, temporarily releasing them from the imposed torque force.

In Diapulse not only is the alternating high frequency field pulsed 80 to 600 times a second, but each pulse lasts for 65 micro-

seconds only. Therefore a relaxation period is imparted to the oscillating dipoles, and also sufficient time is allowed for heat dissipation. In other words, at 600 pulses per second, the interval between each 65 microsecond pulse will be one six hundredth of a second (that is, 1,666 microseconds), which is approximately 25 times greater. That is the reason why, despite a peak power output of 975 watts, exposed tissues only receive an average power of 38 watts.⁸

It has been shown that collagen exhibits piezoelectric properties,⁹ and it is possible therefore that the repetitively interrupted torque force exerted by such pulsed fields on macromolecular dipoles induces a secondary displacement current in connective tissue, of which collagen is a major component. This type of current in turn seems to accelerate healing and reparative processes in the body, by some as yet unelucidated method.—I am, etc.,

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- ⁶ Li, J., and Neurath, P. W., *The Institute of Electrical and Electronic Engineers, Transactions on Bio Medical Engineering*, 1969, 16, 96.
- ⁷ Wallis, R., *87th Annual Meeting of the American Public Health Association*, Atlantic City, October, 1959.
- ⁸ Ross, J., personal communication.
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Diagnostic Problems and Hypothermia

SIR,—Accidental hypothermia in the elderly is relatively common and frequently fatal.¹⁻⁴

Death, however, is usually certified as being due to other causes, with hypothermia as an associated factor.⁵ Active surface rewarming is dangerous in elderly hypothermic patients, but two cases are described where active rewarming was carried out by ventilation with heated gases^{6,7} resulting in a temperature rise of 1°C/hour and profound changes in the physical findings.

A 75-year-old woman was admitted to hospital cyanosed and unconscious. There were crepitations in all lung areas and chest x-ray showed opacification of most of the right lung and left basal changes. Blood pressure 90-100 mm Hg on admission gradually became unrecordable. Her temperature was 32.5°C. During rewarming, consciousness returned, the blood pressure became recordable again, and when the temperature had returned to normal the chest x-ray was clear.

An 86-year-old woman was admitted to hospital semi-conscious. She had a fracture of the tibia and fibula. There was gross abdominal distension with absent bowel sounds and her pulse was 20-30/min and irregular. The skin felt cold and rectal temperature was 24.3°C. On rewarming the pulse rate improved and the E.C.G. showed complete disappearance of J waves and ventricular and supraventricular extrasystoles while the temperature was still 27°C. Passage of a nasogastric tube resulted in the

release of large volumes of gas, and when the body temperature had reached normal levels the abdominal distension had disappeared and bowel sounds were again audible.

These two cases illustrate some diagnostic problems associated with hypothermia in the elderly. If the patients had died, the certified cause of death might have been cerebrovascular accident and pneumonia in the first patient and myocardial infarction and intestinal obstruction in the second. Since abnormal findings present on admission had disappeared after rewarming to normothermia, the hypothermia per se had probably been the only cause of these abnormalities. It would therefore seem that, while a patient is hypothermic, any diagnosis must be provisional. If the skin feels cold in any patient admitted to hospital, the core temperature should be measured by low reading thermometer and hypothermia treated before any firm diagnosis or prognosis is reached.

I would like to thank Dr. N. W. Horne and Dr. A. C. Milne, City Hospital, Edinburgh for permission to report details of the first case, and Mr. B. Nolan and Dr. F. Holmes, Royal Infirmary, Edinburgh, for permission to treat the second patient. I am, etc.,

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General Medical Council

SIR,—The General Medical Council has announced that it is about to erase the names of those who have not paid their retention fee. As I am one of the 4,000 or more doctors who may find themselves debarred from their chosen vocation of serving the sick will you allow me to put forward a few thoughts?

First: the historical origins of the G.M.C. are immaterial. It does not matter now why it was set up, who did so, nor who asked for it to be done. Times have changed. Either the G.M.C. is a statutory body for the protection of the public, in which case the public should pay for it, or it is a professional body, in which case it should represent the views of democratically elected members of the profession. At present it is a chimera, *pace* the letter circulated to us last April by its president.

Second: even if the G.M.C. is now legally entitled to repudiate its past implicit promise and not only to charge a retention fee but also arbitrarily to increase it whenever its archaic financial structure needs propping up, nevertheless the dictatorial manner in which it has asserted its new powers has offended many responsible members of an ancient and honourable profession. The support given to the G.M.C. by the Privy Council shows how out of touch that august body is with the realities of the situation. It