

a slight depression in uptake by the shoulder-blades and incisors could be found (Fig. 1). Statistical evaluation is given in Table 1.

In animals with ultrasonically pulsed teeth, uptake differences could be seen not only in the incisors but even in the tibia (Fig. 2). The depression of uptake in the tibia was steadily seen from day 8 ($P < 0.01$) to days 42 ($P < 0.01$) and 62 ($P < 0.001$). In pulsed teeth only the terminal decrease on day 84 was statistically significant ($P < 0.05$).

Thus, the specific activity was altered not only in pulsed but also in non-pulsed bones or teeth; but this generalized metabolic result was found to be more significant in the skeleton than in the teeth, due to their higher sensitivity to injurious influences. This finding is in good agreement with the aforementioned authors illustrating the possibility of bone damage histologically and radiographically and with our observations of generalized reaction of mineral metabolism in the skeleton following a local injury⁴⁻⁷. Because of this, unfavourable metabolic consequences can be expected in growing bones of young individuals with possible influence on their general health and adaptability, following improper ultrasonic treatment.

JAROMÍR KOLÁŘ
ARNOŠT BABICKÝ
JIŘINA KÁČLOVÁ
JAROMÍR KÁČL

Radiological Clinic,
Charles University,
Prague, Czechoslovakia.

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BIOLOGY

Chemical Evolution and the Origin of Life

In a recent article¹, Dr. Ponnampereuma arrives at the conclusion that "life is only a special and complicated property of matter and *au fond* there is no difference between a living organism and lifeless matter". For many years the evidence has been strongly in favour of this view and, in any event, experience in every field of science suggests powerfully that Nature is a unity which can be divided into categories for human convenience, but that we must never lose sight of the fact that the boundaries so introduced are man-made and possess no counterparts in reality; it was to be expected, therefore, that the division of matter into living and dead forms would ultimately be revealed as an artificial one, convenient for distinguishing extreme cases such as man and rock, but quite inappropriate when consideration is being given to intermediate forms such as the virus and the newly dead. Nature appears to satisfy a principle of continuity, so that the marking of dividing lines on her fabric may throw into relief some features of the pattern, but it inevitably distorts the reality.

This principle of continuity is exemplified by the smooth gradation of forms from the fundamental particles to ourselves, thus constituting a hierarchy at no level of which can a clear dividing line between the living and dead be distinguished. The implication that the behaviour of a human being can be given an adequate explanation in terms of the laws of physics is so strong that few will now be prepared to argue the contrary view,

namely, that some special vital principle is involved. However, although the implications of the smooth transition from the fundamental particles to ourselves are widely appreciated, those which arise from a consideration of the transition in the reverse sense are less frequently emphasized. Now, the most certain feature of the matter complex, which is my brain, is that it is conscious. Even the spatial structure of that brain as revealed by surgery is only inferred. But, if consciousness is a characteristic of this matter aggregate, by the principle of continuity it must also be a feature of every aggregate and ultimately of the fundamental particles. If this were not the case, at some level in the hierarchy mentioned earlier, consciousness would arise discontinuously and it would be possible to draw a sharp dividing line separating conscious from non-conscious matter forms. This would only be a disguised form of the line earlier assumed to separate living from non-living forms. Undoubtedly, such mental characteristics as are possessed by the fundamental particles must be of poor quality and weak intensity, but unless some such features are postulated, I fail to understand how consciousness could ever arise in any matter system, however complex. A system of particles, each of which possesses the known physical characteristics of electric charge, spin, etc., might very well be designed to behave like a human being, but not to experience consciousness as human beings undoubtedly do. The conscious state each of us experiences must surely be generated by some form of interaction between the mental attributes of the particles comprising our brains.

It may well be, of course, that the electric and gravitational characteristics of a fundamental particle are simply those aspects of its mental qualities which it presents to an external observer and that the particle, in its real essence, is a continuing mental experience of an extremely primitive nature. De Chardin² has developed a view of the universe which is in sympathy with this idea. It seems to me that, unless it is allowed that such particles possess characteristics which are of the same nature as our own mental experiences, we may perhaps hope to explain human behaviour, but our experience of this behaviour will remain unaccounted for.

D. F. LAWDEN

University of Canterbury,
Christchurch,
New Zealand.

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Dark Pigment Formation in *Verticillium albo-atrum*

THE structural changes occurring during the production of resting bodies in *Verticillium* species are accompanied by the deposition of dark pigment in the cell wall. In *V. albo-atrum* this pigment has been described as a 'melanin'^{1,2} and its colour varies with the age of the culture; initially it is yellow/green, then dark green and finally brown/black.

In the strict sense, naturally occurring melanins can be defined as "dark polymeric indole derivatives of high molecular weight which are produced by a series of reactions involving tyrosinase (polyphenol oxidase), oxygen and as organic substrates, either tyrosine (hydroxyphenylalanine) or 'DOPA' (dihydroxyphenylalanine)"³. The preliminary results reported here were obtained in an investigation designed to investigate whether the pigment concerned is a melanin as so defined.

Tests with possible substrates showed that if either catechol (200 mg/l.) or 'DOPA' (500 mg/l.) was added to the medium (Dox's), the fungus produced an intense dark pigmentation in the agar immediately surrounding the growing edge of the culture, whereas the addition of tyrosine (500 mg/l.) induced only very slight pigmentation.