the radiation responsible for the single tracks has a range of 200 gm./cm.[2] in ice, thus confirming Perkins's earlier conclusions that the stars and single tracks are in equilibrium. This work is being reported fully elsewhere[3].

We should like to express our indebtedness to Prof. A. von Muralt and Dr. R. Stämpfli for providing facilities at the Jungfraujoch Scientific Station during the course of this experiment.

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Adenosine Triphosphate and Muscular Contraction

It is commonly stated, on evidence obtained with muscle extracts, that the energy of muscular contraction is derived in the first instance from the breaking of the terminal energy-rich phosphate bond of adenosine triphosphate. Why not try to find out whether it really is, not in muscle extracts which cannot contract but in muscles which can ?

The total energy obtainable from this source, from the whole of the adenosine triphosphate present in muscle, is calculated to be about 0·05 calorie per gm. In the maximal contraction of a frog's muscle at 20° C., this would last only about 0·5 sec. Before then, however, according to current hypothesis, the restoration of the adenosine triphosphate at the expense of the energy of creatine phosphate breakdown (the 'Lohmann reaction') is well under way; the difficulty of resolving chemical events occurring so rapidly might very well be regarded as insuperable. But there are two easy ways around this obstacle: (i) to use a slower muscle; and (ii) to work at a lower temperature. The liberation of energy in toad's muscle during maintained contraction is only half as rapid as in frog's, in tortoise's only 1/10 to 1/20 as rapid; and its rate can be diminished about nine times by lowering the temperature to 0° C.

One cannot be sure how fast the adenosine triphosphate (if it *is* broken down in contraction) would be restored by the Lohmann reaction at 0° C. during maintained activity. Apart from such restoration, its breakdown in toad's muscle would be complete in 10 sec., in tortoise's in 50–100 sec. Probably in times of this order a balance would be reached between breakdown and restoration, at a level substantially different from that at rest. The slowness of the processes involved, particularly in tortoise's muscle at 0° C., should allow ample time for the necessary treatment preliminary to chemical analysis, and good resolution in time could probably be obtained. The experiment might allow a clear decision to be reached as to whether adenosine triphosphate is really concerned with the contractile process as such, or whether —like every other chemical change known to occur in muscle—it is part of the mechanism of recovery.

Prof. T. B. L. Webster recently provided an epigram to be posted in my laboratory: 'Υπόθεσις ἔλεγχους μὴ ἀποδεχομένη οὐκ ἐξοιστέα, which means that hypotheses should not be put forward that do not admit of test. The hypothesis that adenosine triphosphate breaks down during the contraction of a living muscle ought not to be left in that category, but only biochemists can remove it.

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Meson Masses and the Principle of Reciprocity

In two previous letters, M. Born and H. S. Green have proposed a new theory of elementary particles and quantized fields and applied it to the case of mesons. We shall give some numerical results which follow from the theory.

There is an infinite number of particles predicted by this theory, the rest-masses of which are the square roots of the solutions of certain transcendental equations, namely,

$$L_n^{(1)}(x) = 0, \quad (1)$$

where $L_n^{(1)}(x)$ are the Laguerre polynomials of the first kind. The first of these were given in the first paper, and it is easy to calculate the following ones with the help of a well-known recurrence formula. We have solved the equations (1) and found the following values for their roots:

n	x				
1	2				
2	1·26	4·73			
3	0·93	3·31	7·75		
4	0·74	2·57	5·73	10·9	
5	0·53	2·11	4·61	8·40	14·26

These figures are connected with the masses in the following way: let a and b be the absolute length and momentum such that $ab = \hbar$. Then the wave equation for particles belonging to a given value x is

$$(p^2 - E^2 - xb^2)\,\psi = 0. \quad (2)$$

Hence one has for the mass

$$m = b\sqrt{x}/c. \quad (3)$$

Consider the first particle corresponding to $n = 1$ and replace b by $a/\hbar$, then

$$m = \hbar\sqrt{2}/ac. \quad (4)$$

Now we make the assumption which at the present state of the investigation cannot be justified from theoretical arguments but seems rather plausible, namely, that a is the classical radius of the electron, given by

$$a = e^2/\mu c^2, \quad (5)$$

where μ is the mass of the electron. If this is substituted in (4) one obtains

$$\frac{m}{\mu} = \frac{\hbar c}{e^2}\sqrt{2} = 137 \,.\, \sqrt{2} \simeq 194. \quad (6)$$

We venture the suggestion that this value of m is the mass of the most stable meson. Indeed, the experimental determinations of the mass of the mesons which are observed at sea-level, and are therefore presumably the most stable ones, is given by the Bristol workers as about $200\,\mu$, in good agreement with our calculated value. (According to the