money—if there is enough—to buy a marble tablet, a portrait, a bust, an autographed photograph, an album bound in gold of some of the letters you have dictated, plus your name in big letters over the door and on every article, reprint, letterhead, and word of wisdom that issues from this laboratory. Wherever the human being, his conditional reflexes, neuroses, psychoses, are being discussed, your name will inevitably be tagged on.

This offer has a certain time limit. As the advertisers say, we cannot guarantee acceptance of your money unless you act at once. Other donors are on the alert, they have been animated by the same fear that stirs you (they get up early in the morning looking for universities to endow), and I cannot urge you too strongly to act immediately, as we will be forced to take the first and biggest donor that accepts this offer to go down in fame. I am already making plans to replace the present wooden sign with an appropriate marble slab. Owing to the great demand, there are not enough good laboratories and universities to go around. In order not to be disappointed, please act quickly. Your offer, to be considered, must not be signed anonymously.

Assuring you of our speedy cooperation in your plight,

Faithfully yours,

W. Horsley Gantt

Pavlovian Laboratory of the Phipps Psychiatric Clinic
Johns Hopkins University School of Medicine

P. S. Please use the self-addressed envelope (which needs no postage) for reply.

Lascaux Charcoal

We have noticed with great interest the comment of Don Ritchie (*Science,* **113**, 531 [1951]) concerning the identification of charcoal fragments from the Lascaux Cave, near Montignac, Dordogne, listed as sample #406 in the paper by Arnold and Libby (*Science,* **113**, 111 [1951]) on radiocarbon dates, where it was stated that the charcoal was ". . . of conifer *Abies* or *Larix,* neither of which grows in a cold climate." As Dr. Ritchie points out, this statement was made in error; it should have read ". . . neither of which is necessarily indicative of arctic conditions."

Subsequent analysis of the Lascaux sample by one of us (ESB) reveals that there is no reason to doubt that the wood is that of the genus *Abies* (fir). In all its details of structure this charcoal can be matched with the wood of *Abies pectinata* DC., the European silver fir. Structure of the torus of the bordered pits and the form, size, and number of the pits between ray cells and tracheids are identical with those of this species. The specimen consists of a small branch or stem with exceptionally narrow growth rings, indicative of very slow growth. It is more likely a branch than a young stem, in view of the prevailing orientation of the rays to the tracheids, these not being at right angles as is normal in erect stems.

Whether the charcoal is from the wood of *Abies pectinata* or some other species of *Abies* is not possible to determine for certain. In fact, it is extremely difficult, if at all possible, to determine as to species the wood, much less charcoal, of the various species of *Abies*. In view, however, of the present range and occurrence of *A. pectinata,* and the fact that the charcoal wood differs in no detectable way from this species, it seems reasonable to conclude that it is *A. pectinata.*

A. pectinata is widespread in the forests of central Europe, where today it forms a major component in the montane forests of parts of Germany, Austria, France, and the Swiss mountains. It occurs as far south as Corsica and the Pyrenees. The presence of this form in the Vézère Valley at the time the Lascaux Cave was occupied by late Upper Palaeolithic man indicates that a slightly more rigorous climate obtained than that now characteristic of this area, since the flora then contained elements thriving at present in the adjacent truly alpine regions. In terms of climatic tolerance *A. pectinata* is stated to have nearly the same degree of cold tolerance as the common European beech *Fagus sylvatica.*

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Stability of Disodium Adenosine Triphosphate[1]

Recent reports on the stability of various preparations of ATP[2] have been conflicting. Bailey (*1*), using enzymatic methods of assay, found that metallic salts of ATP decompose on storage to AMP[1] and inorganic pyrophosphate, and to a lesser extent to ADP[2] and inorganic orthophosphate. Rowles and Stocken (*2*), who also employed enzymatic methods, found that a specimen of dibarium ATP stored at room temperature for over two years had formed inorganic pyrophosphate to the extent of 3%, as compared with a value of 41% for a comparable sample reported by Bailey.

A new approach to the analysis of adenosine polyphosphates has been developed by Cohn and Carter (*3*), who introduced the use of ion-exchange resins for this assay. In analyzing various commercial ATP preparations, these investigators noted that a tetrasodium salt, Na_4ATP, which had been stored at room temperature for six months, had decomposed practically completely to AMP, whereas a similar preparation, stored at $-35°$ C, retained a high ATP content. They state that the instability of the sodium salt of ATP has been noted by others and makes im-

[1] We wish to thank J. W. Williams, R. A. Alberty, and R. M. Bock, of the University of Wisconsin, for their cooperation in this work.

[2] ATP, adenosine triphosphate; ADP, adenosine diphosphate; AMP, adenosine monophosphate.

perative the analytical control of this compound before use.

A new form of ATP, the disodium salt $Na_2H_2ATP \cdot 4H_2O$, has recently been developed in these laboratories, and its stability has been under investigation for the past six months. We are reporting the preliminary results of this study, which will be of interest to the increasing number of research investigations being conducted with ATP.

As a method of analysis, the ion-exchange technique of Cohn and Carter (*3*) was employed. In order to check this method by a completely independent technique, a comparison with the moving boundary (electrophoresis) procedure of Bock and Alberty (*4*) was conducted. Both methods were found to agree to within ± 5%, the resin method tending to give slightly lower ATP values.

Samples of disodium and dibarium ATP were stored at 25° C, 4° C and − 20° C, and assayed for ATP content after various periods of time. At 25° C, a progressive decrease in ATP content, amounting to about 3% per month for both salts, was noted. This decomposition was found to be associated with the development of ADP, AMP, and inorganic orthophosphate (pyrophosphate was not investigated). At both 4° C and − 20° C, however, no significant changes in ATP content could be detected.

From the data thus far obtained, it is concluded that disodium and dibarium ATP are stable at temperatures of 4° C, or lower, but decompose at the rate of about 3% per month when stored at 25° C. There appears to be no difference in the stability of the disodium salt as compared with the dibarium salt. It is suggested that metallic salts of ATP be stored in a dry atmosphere at low temperature, under which conditions they appear to be perfectly stable.

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Book Reviews

Quantum Mechanics. Alfred Landé. New York: Pitman Pub., 1951. 307 pp. $5.50.

Perturbation Methods in the Quantum Mechanics of n-Electron Systems. E. M. Corson. New York: Hafner Pub., 1950. 308 pp. $11.00.

The development of quantum mechanics in the past half century has made it a firm foundation for the discussion of atomic, molecular, and even nuclear phenomena, whenever velocities can be regarded as small compared to the velocity of light and the constituent particles do not change in numbers. The frontiers of theoretical knowledge lie in the related problems of relativistic invariance, transformations of the ultimate particles, and the field theory of the forces between them. The practical application of the settled theory is limited by the complication of dealing with many body problems.

It is now customary to introduce students of physics to some quantum mechanics in their last undergraduate years and first graduate year, and several excellent textbooks for such courses are available. For an advanced course, however, it has, to a large extent, been necessary for the professor to bridge the gap between these elementary texts and the advanced monographs and original literature. The two books considered here seem to fill most of this gap very well.

Landé's book seeks to build up an approach to the understanding and solution of problems in the field from the physical picture. He adopts a historical arrangement, showing in his first 7 chapters how quantum mechanics develops from the equivalence of wave and particle descriptions—explaining approximate methods of solving the wave equation, and developing the technique of matrix mechanics in an intuitive manner. In the second half of the book he lays the groundwork for a large number of physical applications: elementary radiation theory, including photo-ionization and coherent and Raman scattering; atomic spectra, including the details of the helium spectrum and fine structure and Zeeman effect in general; molecular structure and molecular spectra, including the Heitler and London theory of the hydrogen molecule; an introduction to statistical methods, dealing with the Bose and Fermi gases and with fluctuations; the Dirac electron and relativity theory; the quantum theory of radiation; and the meson theory of nuclear forces. In all this the emphasis is on the physical picture behind the mathematical equations, which, in the frontier examples, we may hope will remain when the present mathematical difficulties have been overcome.

Corson's book will carry the student who already has an idea of the physical pictures involved over the whole range of exact and approximate mathematical solution of problems in the quantum mechanics of many particles. It is thus more advanced and more complete in itself, but a little more restricted in range than Landé's book. The author develops the general theory by the methods of Dirac, mathemati-