Physiology. — *"On the Influence of the Season on Laboratory Animals"*. By Prof. H. ZWAARDEMAKER.

(Communicated at the meeting of January 29, 1921).

This technical subject appears to be of general application. In previous publications the present writer and his co-workers have superadded to J. LOEB's balancing of ions of the circulating fluids, expressed in the equation $\frac{Na + K}{Mg + Ca}$ = constant, the balancing formula $\frac{K + (UO)_2 + Th}{Ca + Sr + Ba}$ = constant. In the latter formula the radio-physiological antagonism between K and $(UO)_2 + Th$. need not be taken into account [1]).

Moreover, in earlier discourses the replacement of potassium by the other radio-active elements Rb, $(UO)_2$, U, Th, Io, Ra, Em, has been repeatedly discussed [2]).

Now the present writer wishes to point out that the dosages in which these elements are to be administered must be much smaller in summer than in winter. Of course, this difference is not brought about by the radio-active elements as such, but by the fact that in summer the organs are more sensitized by certain substances [3]).

These substances can be washed out, so that in the transition periods the functionating of a summer-organ during some hours' perfusion with an artificial but nonetheless efficient circulating fluid, suffices to transform a summer-organ into a winter-organ.

As regards sensitizing power, that of the washed-out substances is analogous to that of adrenalin.

The organs operated upon were the hearts of frogs and of eels. A detailed publication will appear elsewhere.

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1) C. R. des Séances de la Soc. de Biologie 7 Juin 1919.
2) Journal of Physiology Vol. 53 p. 273 1920.
3) Proceedings of this Acad. 25 Sept. 1920.

Physics. — *"On the principles of the theory of quanta*. By PAUL S. EPSTEIN. (Communicated by Prof. P. EHRENFEST).

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1. *Introduction*. The quantum-theory in the form, which in 1911 PLANCK [1]) has given it, depends on the application of statistical mechanics in the so-called "phase-space" of the canonical position- and impulse-coordinates $q_1\, q_2 \ldots q_f;\ p_1\, p_2 \ldots p_f$, and consists in dividing this space into elementary regions of probability. The method obtains a considerable simplification for the soluble mechanical systems, since for them each impulse-coordinate $p_i = p_i(q_i)$. Instead of the $2f$-dimensional phase-space (f being the number of degrees of freedom of the system) it is then sufficient to consider the f "phase-planes" (p_i, q_i), which, as the author showed a few years ago [2]), gives great advantages in the treatment of these systems. In each of these planes the successive conditions of the system are represented by a curve. For the class of the "conditioned-periodic motions", the only ones for which so far quantum-conditions have been established, the curves in question are as a rule closed. The only exception is formed by the "cyclic coordinates" which bear the character of a plane angle; a cyclic coordinate varies from 0 to 2π and the corresponding impulse is constant; hence the representive curve becomes a segment of a straight line parallel to the axis of abscissae. [3])

PLANCK's hypothesis, as extended by SOMMERFELD and the author, consists in the assumption of the existence among the states of the system of certain preferential or "stationary" motions, which are represented by discrete curves in the diagram, the area of the phase-plane between two successive stationary curves being equal to the universal constant h

$$\iint dp\, dq = h. \quad \ldots \ldots \ldots \quad (1)$$

If the area of the narrowest of these curves (or for cyclic coor-

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1) M. PLANCK. Verhandelingen van het Solvay-congres.
2) P. S. EPSTEIN. Ann. d. Phys. **50**, p. 489; **51**, p. 168, 1916.
3) This case was discussed for the first time by P. EHRENFEST. Verh. d. D. phys. Ges. **15**, p. 451. 1913.