of tumour frequency. Tumours are most frequently in the tissue influenced by sexual hormones or by the phenanthrene substances similar to tar (1–2 benzopyrene). The sexual hormones are necessary for the above-mentioned divisions. We must also consider the thyroid, the antagonistic parathyroid glands, which must play a part in the fat metabolism of an organism (cholesterol contained in fats and lipoids has a phenanthrenous basic group).

I suggest, therefore, that the tumours can be exogenous in origin, that is, evoked by such factors as irradiation or chemical substances (penanthrenous derivatives and so on). On the other hand, the tumours can be of endogenous origin, being produced by the efficiency of the so-called 'segregators' (in the sense of Demerec's assumption) or genes inducing the somatic segregations of chromosomes.

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Double Stars and the Cosmogonic Time-Scale

IN a recent note[1] Sir James Jeans has brought forward arguments in favour of the equipartition of energy in the orbital motion of double stars. As he has pointed out, the existence of equipartition would be opposed to the 'short time-scale' of the universe. Some remarks on this interesting subject are perhaps not superfluous :

(1) The argument that the number of orbits whose eccentricity is less than e will be proportional simply to e^2 holds, not only in the case of the equipartition of energy, but also in a more general case, when the density in the phase space is an arbitrary function of the whole energy of the binary system.

(2) If the perturbations from passages of other stars are responsible for the distribution of eccentricities of binaries with known orbits, they would be also sufficient for the production of equipartition between the double stars with the more distant components ($r_{AB} > 100$ astron. units). It is easy to see that in this case the Boltzmann's factor $e^{-u/\theta}$ is nearly equal to unity and the relative number of the double stars with the distances between companions confined within the limits r and $r + dr$ will be simply proportional to $r^2 dr$. However, Öpik[2] in his valuable work has shown that this number is proportional to dr/r. Therefore, the distribution of the distant companions is not in accord with the long time-scale hypothesis.

(3) In the case of the long time-scale, we should expect the existence of some sort of dissociative equilibrium between double stars of large separation and single stars. It is easy to compute that the theoretical ratio of the number of distant pairs and single stars in the dissociative equilibrium is many thousand times smaller than the observed ratio. Therefore the dissociative equilibrium for the distant companions is not yet achieved.

We may conclude that the observational data of double-star astronomy do not support the long time-scale hypothesis.

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[1] NATURE, **136**, 432 (1935).
[2] Tartu Observatory Publications, **25** (1924).

PROF. AMBARZUMIAN seems to have misunderstood my main point. I did not intend to claim that equipartition actually exists—Prof. Ambarzumian's arguments (2) and (3) are sufficient to disprove this—but that *in certain respects* there is a tolerably good approximation to equipartition. To obtain perfect equipartition would, of course, require an infinity of time ; to obtain the observed approximation requires time of the order of 10^{13} years. I cannot see that Prof. Ambarzumian's remarks in any way challenge this position, so that it seems to me that the observational data he mentions are not opposed to the long time-scale of 10^{13} years, but only to an infinitely long time-scale.

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Losses in Electrical Machinery due to Open Slots

ONE of the difficulties in design and manufacture of electrical machines is the separation of the true iron loss from the loss due to open slots.

In all the experimental investigations so far published, the apparatus used has included both these losses. The true iron loss could only be measured separately by making substantial changes in the building and arrangement of the apparatus, which introduces changed conditions and some degree of uncertainty.

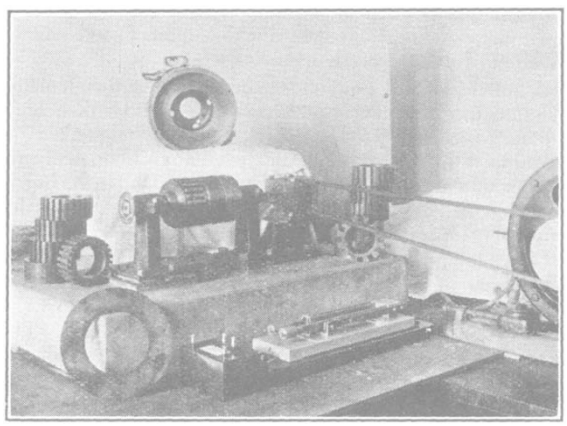

FIG. 1.

In the present method, the true iron loss is avoided by the use of a homopolar machine, details of which are shown in Fig. 1. The rotor and the stator are each cut out of solid steel, and each is mounted on its own ball bearings ; the rotor has a critical speed of more than 20,000 r.p.m. The loss in the machine is measured by the torque exerted on the stator, while the speed is determined very accurately by a tuning fork operated stroboscope.

Investigations have been completed in regard to flux density, linear speed and slot opening relative to gap length ; while effects of variations in slot pitch, ratio of slot opening to slot pitch and the nature of the material opposite the teeth are now being examined.

It is hoped to use speeds, in the case of turbo-alternator materials, up to 18,000 ft. per min.

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