Aphodius are capable of passing through a screen that will keep out flies. A complete account of the experiment will be published elsewhere.

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THE WORD CARIBOU

WITH respect to the etymology of the word *caribou* as given by Professor L. B. Walton in SCIENCE of October 12, it may be well to show the aboriginal origin of the term by quoting the late Dr. A. F. Chamberlain's brief article on the subject in the "Handbook of American Indians."[1]

> The word came into English from the French of Canada, in which it is old, Sagard-Théodat using it in 1632. Josselyn has the Quinnipiac form *macoarib* and the synonym *pohano*. The origin of the word is seen in the cognate Micmac *χalibu* and the Passamaquoddy *megal'ip*, the name of this animal in these eastern Algonquian dialects. According to Gatschet (Bull. Free Mus. Sci. and Art, Phila., II, 191, 1900) these words signify "pawer" or "scratcher," the animal being so called from its habit of shoveling the snow with its forelegs to find the food covered by snow. In Micmac *χalibu' mul-χadēget* means "the caribou is scratching or shoveling."

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[1] *Bulletin 30, Bureau of American Ethnology*, pt. 1, p. 206, Washington, 1907.

QUOTATIONS

AWARD OF THE NOBEL PRIZE TO DR. CHARLES NICOLLE

THE recent announcement in the daily press that Dr. Charles Nicolle, director of the Pasteur Institute of Tunis, has been awarded the Nobel prize for medicine for 1928 in recognition of his work on typhus fever will be a source of gratification to all interested in the progress of medicine and to epidemiologists in particular. Dr. Nicolle's researches on the causation and prophylaxis of typhus, which have been carried on for nearly a quarter of a century, were first undertaken in connection with an epidemic which occurred in Tunisia in 1906–9, when he was able to show that the chimpanzee could be infected with the typhus virus by the injection of a small amount of blood from a patient in the acute stage of the disease. Subsequently he found that the lower apes could be similarly infected by inoculation of the blood of the chimpanzee, and that the infection could be transmitted from monkey to monkey by the bites of infected body lice. The demonstration of the louse as the agent in transmitting the disease was of far-reaching importance, and, like Dr. Nicolle's other investigations, it was confirmed by workers in the United States and in other countries. Dr. Nicolle also found that the guinea-pig could be successfully inoculated by injection of typhus blood. Although this animal showed no sign of disease as the result of inoculation except by a rise of temperature, it served a useful purpose in forming a storehouse of the virus for laboratory purposes. Of greater practical importance was Dr. Nicolle's discovery that injection of the serum of patients convalescent from typhus was able to confer an immediate though transient immunity to the disease. A similar protective quality in the serum of convalescents he also showed to be present in the case of undulant fever and also in that of measles some years before Degkwitz made the method popular throughout Germany. One of his latest contributions indicates that Dr. Nicolle, in collaboration with Drs. Sparrow and E. Conseil, is conducting experiments on active immunization against typhus whereby a more permanent immunity can be conferred. In addition to his article on typhus written in conjunction with Dr. E. Conseil in the "Nouveau Traité de Médecine" of Roger, Widal and Teissier, Dr. Nicolle is the author of numerous contributions on infectious diseases, including measles, influenza, chancroid and undulant fever.—*The British Medical Journal.*

SCIENTIFIC BOOKS

Astronomy and Cosmogony. By SIR J. H. JEANS. Cambridge University Press, 1928.

THERE are some chapters in modern astrophysics which can hardly be easily digested by a mind trained in a rigorous spirit of classical astronomy and celestial mechanics. It is quite evident that in order to throw light on the enormous amount of astrophysical data accumulated within the last twenty years we have to penetrate mentally into the interiors of the stars and to draw a picture of stellar material, *i.e.*, matter in conditions of enormously high pressure and temperature. In applying here the physical laws and principles deduced and checked in the conditions of our "low pressure and temperature" environment we are certainly using a very dangerous extrapolation, thus violating the policy of the exact sciences. We use mathematical physics—that miraculous star boring and drilling machine—under the tacit assumption that this extrapolation is allowed by the general principle of uniformity and continuity of physical laws in space and time; this principle has never failed; on the contrary it has proved exceedingly useful in all branches of cosmical physics.

On the other hand, in several instances the results of our analysis of stellar interiors can be checked by observing phenomena on the surfaces of the stars, and whenever this possibility is available it has always brought the verification of the theoretical results (at least in general terms). We remember, for example, the beautiful discovery of the relativity shift in the spectrum of the companion of Sirius, which confirmed one of the strangest conclusions of theoretical astrophysics—the possibility of matter in stellar interiors having a fantastically high density and still preserving its gaseous properties.

These two lines of argument—the principle of uniformity and continuity of the most important laws of nature and some data of observation—seem to show that in our study of the stellar interior we are, generally speaking, following the right way of reasoning, however dangerous it is from the standpoint of the exact sciences. This path is a very narrow one, and a student of theoretical astrophysics is always on the verge of disaster—with one incautious movement the scientific work turns out to be an unfruitful speculation and the investigator himself is hopelessly lost pursuing the ghosts created by his own imagination; and mathematics, no matter how perfect it is, can not help him—it is only the intuition of a physical truth which may get him on the right path.

Sir J. H. Jeans, one of the leading scientists of our times, has recently published a new voluminous book on theoretical astrophysics, embodying in a full and systematic manner his long and varied researches in this field. Sir J. H. Jeans is one of the founders of theoretical astrophysics, and has contributed many fertile ideas and theories to the new science. His new book is therefore of unusual interest to every student of astronomy. Some chapters of the book under review, dealing with the figures of equilibrium of rotating liquid and gaseous masses, are merely the revised reprints from his first book, "Problems of Cosmogony and Stellar Dynamics," published in 1919, but others deal with more modern problems: the sources of stellar energy, liquid stars, variable stars, stellar evolution and extragalactic nebulae. Every student of astrophysics who has followed astronomical journals during the last few years is of course more or less familiar with Jeans's theories, his polemics with Eddington, and the rapid—sometimes unexpectedly rapid—development of his ideas. But even for such a reader it is of considerable interest to see those theories expounded anew in a corrected, improved and (so to speak) codified form. Some of the new chapters are especially attractive and stimulating, for instance, Chapter X dealing with Jeans's beautiful discovery of radiative viscosity and his work on the rotation of stellar interiors, which gives seemingly a final and very simple explanation of the equatorial acceleration of the sun—a puzzling problem, which for many years did not yield to the most refined methods of modern hydrodynamics. This chapter certainly opens a new field for theoretical research and appears to be one of the most important and lasting of Jeans's contributions to exact science.

Reading thoroughly the numerous masterly pages we can hardly avoid the conclusion that Jeans's book depicts a system of astronomy and cosmogony which (as it has been in the case of all great philosophical systems) lives, stands or falls with one central idea—the real soul of most of his investigations. This is an idea of super-radioactivity of stellar matter creating energy, independently of the temperature and pressure, by the annihilation of protons and bound electrons. If stellar matter really has this fundamental property, we have to choose a stellar model which will allow of a high atomic weight. For any adopted value of the effective molecular weight μ of stellar matter, Jeans's theory affords a possibility of computing the value N^2/A (N = atomic number, A = atomic weight) for different stars built according to his model. Operating with $\mu = 2.5$ he shows (p. 98) that the mean of N^2/A for nine selected stars is equal to 300, which gives an extremely high value for the atomic weight A. On account of this we have to change the initial value of μ; then as a second approximation we get another still higher value of A, which demands a new increase in μ and so forth, and "it is impossible to say whether this race will stop or not." It is evident therefore that the solution is divergent—badly divergent—and that under such circumstances no result can be reached until we try initial values of μ, or other models, or finally change the coefficient for the opacity law. (It might be of interest to note that for dwarf stars we can get a convergent solution, even using Jeans's numerical data and star model. For example, the two components of Krueger 60 give for $\mu = 2.0$ a convergent value $N^2/A = 10_{02}11$ and pure calcium appears to be quite a suitable building material for these dwarfs.) Anyhow it is hard for a mathematician as well as for a physicist to accept Jeans's high values of the atomic weight of stellar matter.

Another point of extreme importance in Jeans's investigations is his theory of the stability of the stellar structure (Chapter IV). If his deductions are correct a star built up of any material that is not super-radioactive will necessarily be very fragile; even small perturbation is sufficient to crush such a star out of existence; it is condemned to death from the first day of its life. The question seems to be one of extreme difficulty—a simple and beautiful theory of stability of mechanical systems is no longer sufficient; we have to investigate the thermodynamic stability by considering various physical factors affecting it. Jeans was the first who investigated this question mathematically, but it seems to me that here as in the former case he took a *regia via*. For instance he did not take into account the ionization energy of a star and the effect of viscosity in the more general case of vibration. Now it is evident that inside an atom and outside the nucleus we have (taken for the whole star) an enormous amount of stored energy—the energy of bound electrons—which is very easily tapped and locked by an ordinary mechanism of ionizations and captures. This storage of energy might be fatal for stability, but in some cases it may save a star from death, as everything depends upon the atomic properties of the stellar material. We may expect that in such a manner not only dwarfs but also ordinary giants may be rescued, while the question of the abnormally massive star still remains open.

These critical notes certainly can not diminish the value of Jeans's well-known contributions to astronomy: his general theory of the stellar interior, the theory of double stars, moving clusters, etc., have to be considered as the most important starting-points for future investigators. It is a real pleasure to look over again and again these masterly pages, to enjoy their mathematical elegance, forgetting for a moment that for their author they are merely subordinate parts of his "system."

Of prime importance are the pages (323–352) dealing with extragalactic (formerly "spiral") nebulae, where Jeans applies his old theory of gravitational instability to Hubble's new data on these "island universes." For Jeans the central "unresolved" parts of the spirals are something like white dwarfs of enormous size, where the atoms are as closely packed as in the interior of the companion to Sirius. The motions in spiral arms still remain unexplained on the basis of Newton's law.

Certainly "Astronomy and Cosmogony" is one of the most "personal" books on astronomy ever written. Theories and data, no matter how important, are not even mentioned if they are for one reason or another not interesting to the author. In the chapter on the Galactic system, the new and very conclusive results on the Galactic rotation are simply neglected, and the reader will be unable to find any reference to Lindblad's or Oort's work. It might be curious to note the character of data as quoted by Jeans in his book; he uses, for example, the very old data of Kepler on the velocity of planetaries (p. 27); statistical data on all kind of binaries are taken from a book published in 1918 (p. 282, etc.), and accordingly Polaris still is supposed to have a long spectroscopic period of twenty years (p. 305).

We may get great pleasure and benefit from studying a scientific book without being convinced by its author. We can not agree with Jeans's opinion on the structure of the stars, but we are delighted by the vigor and freshness of his ideas as well as by the elegance of his mathematics and his arguments. He takes the reader to the top of a high mountain and shows him an enormous perspective of the universe in space and time. The reader may doubt whether the distant objects he sees from above are really what his guide represents them to be, but he is indebted to him for an unusual and stimulating feeling of grandeur and exhilaration.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

THE USE OF FRESH PIG OVARIES IN THE EMBRYOLOGICAL COURSE

BECAUSE of the abridgment of the anatomical discipline growing out of the prevailing reorganization of the medical curriculum, and the consequent abandoning of certain laboratory exercises that had well-nigh become traditional, their place to be taken by more concise methods, the following brief suggestion relative to an introductory experiment in the course in human or mammalian embryology may be permitted. For a long time the simplicity of the idea underlying it deterred the writer from making formal allusion to it, but a trial of several years has proved its fitness to be brought to the attention of instructors elsewhere who might wish to utilize it—if they have not already done so—in the student's initial experience in that work.

It was while the members of a class were led to observe the several morphological phases of the corpus luteum in fresh pig ovaries, secured in considerable number from the abattoir, that the thought naturally presented itself of directing them also to open the larger unruptured follicles, to search for the cumulus with the aid of hand lens, and then to remove it for the microscopic examination of the egg and the adherent follicle cells. By carefully excising the large intact follicle and suddenly puncturing it on the slide, the egg cell may in many instances be easily dislodged and extruded. Operations and observa-