THE ORIGIN OF NOVÆ.—Prof. W. H. Pickering examines various theories of the origin of novæ in *Popular Astronomy* for November last. He rejects the theory of collision of star with star on the grounds that novæ are too numerous for this and that the period of brilliance is too short. The first difficulty, but not the second, is avoided by the theory of collision of star with nebula; it would probably require years, not days, for a star, even at the enormous speed indicated by the spectroscope, to traverse a nebula of average size. Prof. Pickering prefers the hypothesis of a body of small planetary dimensions falling into the star and penetrating the photosphere to some depth before it exploded. He pictures its conversion into gas as being so rapid and violent as to scatter the materials of the photosphere to a considerable distance all round, thus producing an immense, but short-lived, increase of light. He notes that he is drawing on the star's own energy for the outburst, the falling planet merely acting as the trigger. The dark and bright bands of the spectrum are explained (as on many other theories of novæ) by the outer shells of gas being cooler, and so absorbing light, while the light from the gases streaming out on the remote side of the star, having its wave-length altered by motion, is not arrested by the cool gas on the near side. Newcomb, in "The Stars: A Study of the Universe" (p. 138), suggested a similar explanation, treating the stars as hollow globes of highly heated and condensed gas; a foreign body, on falling, might break the shell, when the interior gases would burst forth. "What magnitude the outburst might assume it is impossible to say."

CELESTIAL SYSTEMS.—The Memoirs of the College of Science, Kyoto University (vol. iii., No. 7), contain a paper by Shinzo Shinjo and Yoshikatsu Watanabe on the angular momenta of celestial systems. The authors examine all the binary and multiple systems for which sufficiently accurate data are available (including eclipsing variables). They show that the resulting momenta are confined within tolerably narrow limits, and exceed several hundred-fold the angular momentum of the solar system. In studying the possible origin of angular momentum they examine the case of a spherical swarm of meteorites, and show that, for a given mass, the larger the individual meteorites the greater the probable momentum. To produce the momentum of the solar system they conclude that the individual meteorites must have been about 20 km. in diameter. The size would require to be much larger to satisfy the conditions of the binary systems. It is conjectured that swarms with the largest meteorites would condense into two or more nuclei, those with medium-sized meteorites into single orbs which would afterwards divide into two, those with meteorites 20 km. in diameter into planetary systems. In the case of dust-swarms or gaseous nebulæ, the number of constituents is so immense that the resulting angular momentum is infinitesimal. While the paper does not give a complete system of cosmogony, it sheds fresh light on some of the stages of the process.

COTTON-SEED BY-PRODUCTS.

ON February 5, at the Royal Society of Arts, Mr. Ed. C. de Segundo read a very interesting and suggestive paper on "The Removal of the Residual Fibres from Cotton-seed and their Value for Non-textile Purposes." Mr. de Segundo explained that there are two main classes of cotton-seed, viz. the bald, black, or clean seeds, such as Egyptian, Sea Island, Brazilian, etc., of which practically the whole "lint" is removed by the process of "ginning," or separating the lint or textile fibre from the seed; and the white, woolly, or fuzzy seeds such as American, which are still covered with a short white "fuzz" or lint after ginning. Indian cotton-seed is really of the latter class, though the fuzz remaining on the seed is much shorter than in the case of the American.

To deal with these two classes of seed, two different methods have been adopted. The black seeds are crushed whole, and the residue after extraction of the oil is pressed into cattle-cake. The white seeds are first "delinted," which removes part of the short fuzz left on the seed after ginning, the machine used being practically the same as the saw-gin used for the ginning itself. The short fuzz or "linters" thus removed is used for guncotton, blotting-paper, waste, etc. The seed is then "decorticated," a process of separating the hull, with the fuzz still remaining on it, from the kernels or meats. The latter are then crushed alone, and the oil is taken out in a much purer form than is possible under the whole crushing process, because the presence of the hull or shell gives a darker colour to the oil. Incidentally, the process afterwards required to remove this dark colour gives the oil a slightly bitter taste, which made the value of such oils distinctly lower than those got by the decorticating process. The crushed kernels give a very fine residual product known as cotton-seed meal, which has recently been attracting particular attention because it has been shown to possess very high qualities as human food. Its protein and fat contents are very high, and mixed with potato- or wheat-flour it produces a most valuable form of food.

As it happens, the two processes above described have come to be known as the British and American processes respectively, because the British crushers have only had the opportunity of handling the Egyptian and Indian cotton-seed products in large quantities. The bulk of the American crop has, naturally, always been handled in the States. The Indian crop known as Bombay seed has always been imported into this country and crushed whole without previous delinting, because its seed-lint was scarcely long enough to be worth removing, and its presence in the cake (though it took long to convince the users of it that this was true) did no material harm if properly handled, while it gave a much bulkier, and therefore cheaper, cake.

The two improvements with which Mr. de Segundo has been connected are, first, the production of a machine which, after ginning and delinting in the ordinary way, takes a further quantity of "seed-lint" from the seed. This seed-lint is of considerable commercial value for many non-textile purposes, such as paper-making, artificial silk, explosives, and cellulose acetate, the peculiarity of the process being the very clean and pure condition in which it delivers the lint. Its removal also adds to the value of the seed for crushing purposes, saves freight by reducing its bulk, and minimises the danger of heating, and hence the risk of fire by spontaneous combustion. The second improvement is a process of removing the last vestige of fibre from the hulls after decortication, thus taking two further by-products out of the last residue of the former process. It was the first of these improvements that was mainly dealt with in the lecture.

The importance of these processes to the cotton industry is certain to be very considerable. There are many new areas in the British Empire where cotton is being developed, such as Uganda, Nigeria, and parts of the Sudan, where the woolly seeded varieties have been found the most suitable, but the seed has never been fully utilised because the crops were comparatively small, and the cost of handling them under the disadvantageous conditions found in these areas was scarcely covered by the value of the by-products. But by increasing the value of these products the scale may be turned, and such a system rendered profitable, and it would certainly be an advantage to these areas to have such a supply of oil and cattle and other foods as these by-products would yield. Again, there are other areas where cotton is struggling against the rivalry of other competing crops, and where the scale might just be turned in its favour by the increased value of its by-products. Reference was made to the position of India, where the seed-crushing industry has never been properly developed, and it was agreed that such a process as the seed-lint removal might make all the difference.

A seed-lint defibrating machine was shown working at the lecture, and samples of all the by-products were exhibited, including bread, scones, and cakes made with a proportion of cotton-seed flour. There was a very useful discussion after the lecture by a number of experts representing different sections of the trades affected.

A BRITISH GEODETIC AND GEODYNAMIC INSTITUTE.

A COMMITTEE, consisting of Dr. Shipley (the Vice-Chancellor), Dr. H. K. Anderson, Col. Sir C. F. Close, Sir Horace Darwin, Sir F. W. Dyson, Dr. E. H. Griffiths, Sir T. H. Holdich, Sir Joseph Larmor, Col. H. G. Lyons, Prof. Newall, Sir Charles Parsons, Sir Napier Shaw, Sir J. J. Thomson, and Prof. H. H. Turner, has been formed for the purpose of making an appeal for the creation and endowment of a geophysical institute at Cambridge. The question of the establishment of an institute of this character has been under consideration by the British Association for the last three years. A large and representative committee reported unanimously in favour of the project, which was then considered by the Conjoint Board of Scientific Societies. This Board also reported that there was a real need for such an institute. The chief reasons which have been put forward on behalf of the scheme are:—(1) Geodetic work must form the basis and control of all the State surveys of the Empire, on which about a million sterling was spent annually before the war. (2) A geophysical institute could render great assistance in connection with the particular group of geodetic problems now of most practical interest in the United Kingdom, namely, those associated with levelling, mean sea-level, and vertical movements of the crust of the earth. (3) Such an institute is greatly needed to assist in the study of the tides and in attacking the great problems which must be solved if tidal prediction is to advance beyond its present elementary and fragmentary state. (4) There is at present no provision for the collection and critical discussion of the geodetic work which is being done within the Empire, or for its comparison with the work of other countries. There is no institution available for research work or higher training in geodesy. There is no British institution which can be referred to for the latest technical data and methods, and until the outbreak of war it was the custom of many British surveys (notably the Survey of India), when confronted with geodetic problems, to refer to the Geodetic Institute at Potsdam. This was not even then a very satisfactory arrangement, and now a radical change is inevitable.

Discussion as to where the institute could most suitably be established has led to the selection of Cambridge, for it is essential that an institute of geodesy and geodynamics should be closely associated with a great school of mathematics and physics, and it is only in connection with a great Imperial university that that width and freshness of outlook are to be sought which are essential to a progressive and practical science. The committee has evidence that an institute at Cambridge would be cordially welcomed by the national Survey Departments, both terrestrial and oceanographic.

It is estimated that an endowment of 50,000*l.* will be necessary if the proposed institute is satisfactorily to perform the double task of research and education, but it is hoped that if half that sum were contributed by private benefactions the remainder would be forthcoming from national funds. An essential part of the scheme would be the foundation of a university professorship of geodynamics to be held by the director of the institute. To place this professorship in line with other chairs recently endowed by private benefactions, and usually associated with the names of the donors or founded as memorials of national sacrifice in the great war, a sum of 20,000*l.* (which is included in the 50,000*l.* mentioned above) would be required. It is certain that all who have to do with our shipping interests or with aerial navigation would ultimately profit from the establishment of such an institute.

RESPONSIBILITIES OF BOTANICAL SCIENCE.

"SOME Responsibilities of Botanical Science" is the subject of Prof. B. E. Livingston's address to the Botany Section of the American Association for the Advancement of Science meeting at Baltimore last December (*Science,* February 28, 1919). The work of botanical science is at present carried on by a sort of guerrilla warfare, each man for himself; for a planned and productive campaign co-operation is necessary. The objects to be attained are twofold. The first is the conservation of knowledge already attained. The existing means for presenting botanical abstracts and *résumés* are merely makeshifts; there is need for a national or international institute for the furnishing of bibliographical information on request. Such an institute would be a great undertaking, with a permanent staff of departmental heads and a corps of bibliographical assistants; but it would seek the co-operation of all men of science. It would avoid enormous waste of time and energy on the part of scientific workers and research institutions, and give congenial employment to many who wish to serve in scientific work, but may not find their best places as teachers or research workers.

The second object is botanical research, which is considered under three heads: the planning of research, the procuring of data, and the interpretation and presentation of results. Prof. Livingston emphasises the absence of any recognition of the investigator as such, and the striking characteristic that most of the published work appears to be done by apprentices. The planning of scientific investigation deserves much more attention than it generally receives, and our selection of problems and planning of projected investigations would be greatly improved if co-operation between competent thinkers were more in vogue. The securing of the requisite observational or experimental data is the easiest part of investigation, but comparatively few writers trouble to interpret their results in a logically complete manner. A discussion is written from the point of view of one out of several or many logically possible hypotheses, and one of the greatest wastes in biological research lies in the publication of so many uninterpreted observations. Finally, there are the responsibilities towards applied botanical science, not only the practical applications in the arts, but also the philosophical applications to other branches of science.