ment and arrangements for scientific work were equally satisfactory, but the canned provisions either from character or from quality were unsuited to prevent scurvy. Nine of the twenty-nine members of the personnel were polar veterans, whose services were entirely satisfactory—producing a maximum of possible results.

Leaving Havre, August 15, 1908, the *Why Not?* sailed *via* Rio and Buenos Aires—in which cities great interest was shown and material aid given—to Punta Arenas, whence she departed on December 16. At Port Deception, South Shetlands, was found a steam-fleet—engaged in the renewed whaling enterprizes—from which Charcot obtained his last coal.

Favored by fine weather the *Why Not?* skirted the west coasts of Palmer and Graham Lands, making many discoveries and reaching Alexander Land. Obliged to return for winter quarters to Peterman Island, the ship grounded en route and barely escaped destruction.

After eight months in winter-quarters Charcot was able to break out, and obtaining coal at South Shetlands—to renew his explorations to the south in the summer of 1909–1910, when his success was phenomenal.

In the two summer voyages he extended this part of the continent of Antarctica from the Antarctic circle to 70° S., surveying Loubet coast, discovering and mapping Fallières Land, extending Adelaide Island from an islet to a land seventy miles long, opening Marguerite Bay, surveying Alexander I. Land, and finally discovering Charcot Land in 77° W., 70° S., a mountainous, almost ice-covered region—doubtless a part of the continent.

Keeping to the west the *Why Not?* traversed unknown areas, along the parallel of 70° S., from 103° W. to 124° W. (except on the 107th meridian where Cook passed); in latitudes from two to three hundred miles to the south of Charcot's predecessors—he sounding as he sailed.

The second voyage was made under conditions of great peril, for a survey of the *Why Not?* by a diver at South Shetlands disclosed that "The whole stem below water-line was torn away, as well as several meters of the keel: the slightest shock might send the ship to the bottom." The diver remonstrated, yet Charcot sailed.

This being a popular volume, it does not give the results of the immense amount of scientific work done, including observations on gravity, seismology, meteorology, geology, tides, magnetism, zoology and oceanography. Many attractive sidelights are, however, thrown on these subjects by the notes made from day to day. A spirit of French gaiety and good humor pervades the book, and these qualities were evidently characteristic of the party as a whole.

The generous spirit shown by Dr. Charcot in giving due credit to his predecessors adds much to the enjoyment of his narrative. Such action is in striking contrast to the unfortunate tendency of some explorers of smaller mind to mar the value of their own exploits through neglect or by disparagement of the work of others, whether associates or rivals. Especially grateful to Americans are the credits given and justice done to Palmer and Pendleton.

The volume is most creditable to the publishers, and the translation good. The illustrations are excellent, but the south-polar chart should have been on a larger scale, with side maps, and its text should have been in English. The volume will interest all readers fond of travel and exploration.

A. W. GREELY

Stereoscopisches Sehen und Messen. By von CARL PULLFRICH. Jena: Gustav Fischer. 1911. Pp. 40.

This useful pamphlet, so far as the text is concerned, is available in English as the article on the "Stereoscope" in the eleventh edition of the Encyclopedia Britannica. The pamphlet contains some supplementary statements; but its notable addition is a bibliography of 276 numbers covering the period 1900–1911. This in turn supplements the bibliography available in M. von Rohr: "Die binokenlaren Instrumente." Both text and bibliography are concerned predominantly and designedly with the physical problems of stereoscopy, though the discussion of the resulting refinements and variations of the stereoscopic effect reflects indirectly upon the psychological problems. While involving at each step questions of psychological analysis and theory, the essential advances in stereoscopy have been physical in nature. In part they constitute the physical solutions of problems raised by the study of depth-perception; and in yet larger measure they constitute original physical problems of application, extension, and quantitative refinement of the stereoscopic principle. However, the existence of an adequate psychological study contributes to the physical problems a very different status than attached to them fifty years ago, when it was difficult to convince the scientific public that psychology had any logical right or proprietary interest in an instrument made of prisms, or lenses, or mirrors.

The renascence of interest in stereoscopic problems is abundantly evidenced by the extent of the literature, and further by the great variety of publications in physiological, psychological, ophthalmological and general scientific journals, together with applications of stereoscopic presentations to scientific, educational and technical procedure. While the expository article of Dr. Pullfrich touches upon but few of these phases of the subject, it is written with a background reference to them, as a support of the interest in the problems considered. It seems the irony of fate that the man who by construction and analysis had done so much to make possible the refinements of stereoscopic vision, is himself deprived of their enjoyment. Having lost the use of one eye, Dr. Pullfrich records that to him the beauties of stereoscopic effects are a matter of remembrance only.

Pullfrich's exposition is itself so condensed that this notice may be confined to an account of its method and procedure. The fundamental condition of stereoscopic vision is the separation and position of the eyes in the head, the variations of which in different animals offer suggestive and as yet incompletely interpreted potentialities of depth-perception. The part of the visual field in which stereoscopic vision operates is limited, and makes the reports of space-relations from those portions of the visible world which the right eye and the left eye respectively but exclusively survey, a special problem of *indirect* stereoscopy. Obviously such report is momentary and shifting, since a turn of the eyes brings the outlying object into the binocularly policed territory. As to the physiological or psychological basis of the team-work which the two eyes so marvelously perform, we are reduced to ingenious hypotheses. The principles of stereoscopic vision express merely the conditions of conformity necessary to the production of the depth-effect, and the corollaries of variation in effect resulting from shifting values of the many variable contributors. It has become clear that the presumable alternative of the earlier discussions between the part played by "retinal dissimilarity" and by "convergence shiftings," is not an exclusive one; the two jointly contribute to the effect in practise, and this circumstance reflects back upon the theory, by suggesting that tentative motor initiatives may even fuse with seemingly instantaneous retinal impressions.

The physical problems are, in a sense, conditioned by the marvelous precision of the psychological depth-perceiving mechanism; for were not the optical instrument supported by the visual fineness of distinction, there would be no possibility of the utilization by the eyes of the extensions and controls of its verdicts which the inventions of Dr. Pullfrich and the constructions of the firm of Zeiss have added to the triumphs of science. The problems arising from the reconstruction of a natural depth-effect from the combination of two photographic (or diagrammatic) views—the divergence of which reproduces the difference resulting from the base line of the interocular distance —are naturally distinct from those growing out of the project of extending the range or degree of depth-perception of an actual and extensive three-dimensional world. The former problem was in principle solved by Wheatstone, and its perfection in securing an orthostereoscopic effect—apart from convenience and refinement—follows upon the analyses and elimination of the incidental and unintentional deviations between the optical system of the photographic reproduction, and that of the original visual experience. Invention has been fertile, especially in devices for presenting to the eyes the two divergent views, leading to such diverse pieces of viewing apparatus as the reflecting stereoscope of Wheatstone, the refracting one of Brewster, the lenticular of Helmholtz, the complementary chromatic effect of Rollman-d'Almeida, the Ives parallax stereogram, the unilateral reflecting stereoscope of Pigeon, and in another direction, to the invention of the Verant lenses; in yet another, to the devices for stereoscopic projection, and again to the study of pseudostereoscopy. The enlargement and precision of stereoscopic vision has led to the stereotelemeter, in which the projection of a scale incorporated in the optical system of the instrument (by engraved lines on the objective, or equivalent device) over the distant landscape gives accurate stereoscopic judgments at a telescopic range. Conversely the stereo-comparator provides the means of restoring to space-relations of the third dimension, the minute transverse deviations of the two divergent representations resulting from any given real (or calculated) base line. From this, in turn, other problems diverge, such as that of constructing an equally precise photographic stereo-camera, and again of restoring from the stereograms thus resulting, the actual object—say, a statue—in its three dimensional reality. No less accurately than a phonographic disc preserves a voice for posterity may a solid reproduction of our actual bodily self in length, breadth, thickness of build and feature, be embodied on the twin record of a true stereoscopic print. Finally, of applications of stereoscopic principles there are many and varied examples, from the detection of forgeries to that of the variability of stars, or examination of microscopic specimens.

Pullfrich's article is devoted not to the description or analytic aspects of the problems of which these several inventions form the solutions, but to the clear and concise statement of the physical (and mathematical) aspects of the constructions involved, with due reference to the functional service sought. For this specific purpose, as well as for a general survey of the recent advances in stereoscopy, the pamphlet may be unreservedly recommended.

JOSEPH JASTROW

De Fabricatie van Suiker uit Suikerriet op Java. By H. C. PRINSEN GEERLIGS. Amsterdam, J. H. De Bussy. 1911. Second edition. Pp. xxiv + 500 + xx.

Desire to keep pace with the rapid advances which the art of sugar-making is constantly experiencing has induced Prinsen Geerligs, the well-known Dutch sugar-expert and author, to prepare this new edition of his book, which was originally published in 1907.

The work is divided into three sections. The first of these is given over to a consideration of the raw material and discusses the occurrence and distribution of the various constituents of the sugar-cane—sucrose, dextrose, lævulose, invert-sugar, fiber, the pectins, organic acids, cane-wax, coloring matters, nitrogenous bodies and mineral matters.

The second section is concerned with the technology of sugar-making. Attention is first given to the extraction of the juice from the cane and in this connection there are considered, sugar-mills, processes of diffusion, the treatment of bagasse and determination of its fuel-value. Then follows an exhaustive discussion of various processes of defecation and carbonatation, having for their object the clarifying of the crude cane-juice, and a detailed review of various reagents employed for the purpose.

Under the caption "Concentration of the Juice," the author deals with the preliminary concentration of sugar solutions, vacuum-pans and their accessories, and the working up of by-products.