tions of the observatory located at Cambridge, at Mandeville, Jamaica, and at Arequipa, Peru.

For more than thirty years Harvard has maintained a southern station in order that its series of celestial photographs might cover the whole sky. After the investigation in 1889 of various sites in Peru and Chile, the branch observatory was located in the Andes Mountains near Arequipa, at an altitude of eight thousand feet. Throughout a large part of the year the astronomical conditions in this high altitude are excellent, and the astronomers working at Arequipa have secured more than a hundred thousand photographs of southern stars. During the Peruvian summer, however, in the months from December to March, a heavily clouded season prevails. The continuity of the photographic record is then so badly interrupted that it has now been decided to test other sites in the hope of finding a favorable place that may be occupied during the cloudy season at Arequipa.

A southern station of the Astrophysical Observatory of the Smithsonian Institution has been located for a few years on a mountain near Calama, Chile. The climatic conditions there have proved to be exceptionally favorable for work on the sun. The new Harvard Observatory has been located at Chuquicamata, Chile, about twenty miles from the Smithsonian station, and at an altitude of between seven and eight thousand feet. The region is practically rainless, and the available records indicate long seasons of cloudless skies.

A ten-inch photographic telescope is being used for the study of variable stars in the southern Milky Way, and in the Magellanic Clouds. A special telescope with wide-angle lens carries on the photographic patrol of the whole southern sky—an investigation long maintained by Harvard in order to have a continuous record of the variations or of any unusual behavior of the brighter stars.

## ASTRONOMICAL LECTURES AT THE UNIVERSITY OF TORONTO

ON the invitation of the Board of Governors of the University of Toronto, Henry Norris Russell, Ph.D., professor of astronomy in Princeton University, will deliver a special course of lectures during the month of February. The subject will be "Applications of Modern Physics to Astronomy." The course will probably begin on Tuesday, February 12, and will last until the end of the month. The lectures will be given in the Physics Building daily (except on Saturday and Sunday) at 5 p. m. or in the evening. The subject will be presented in a simple manner so as to be followed by the amateur as well as by the professional scientist. Admission will be free, and visitors are invited. Subjects of these lectures are as follows:

I. *The extent of the universe:* Distances and motions of the stars; Motion of the sun; Its use for measuring greater distances; The brightness of the stars; Apparent and absolute magnitudes; Star colors and their measurement; Variable stars, and their use in determining great distances; Distances of star clusters and the Milky Way.

II. *The sizes and masses of the stars:* Stellar diameters; Eclipsing variables; Interferometer measures; Stellar masses; Binary stars; Slow-moving pairs; Relation of mass to brightness; Similarity of masses; Dynamical parallaxes; Stellar densities; Giant and dwarf stars.

III. *The analysis of light:* The observation of spectra; The origin of spectra; Modern atomic theory; Excitation and ionization of atoms; The interpretation of complex spectra; Black-body radiation.

IV. *The analysis of stellar atmospheres:* The sequence of stellar spectra—its dependence on temperature; Temperatures found from color-index or heat-index; Stellar diameters; The effects of density; Spectroscopic parallaxes; Saha's theory of ionization; Pressure in stars; Electron haze; Problem of the photosphere.

V. *The constitution and evolution of the stars:* The interior of a star; Radiation pressure; Eddington's theory; What determines stellar masses; Relation between stars and atoms; Stellar evolution; Giant and dwarf stars; Influence of mass; The B-stars; The time scale; Age of the earth and sun; Probable origin of the solar system; Sources of stellar energy; Special problems; Cepheid variables; Long-period variables; Novae.

VI. *The nebulae:* Dark nebulae—their abundance, size and probable nature; Galactic nebulae—gaseous and otherwise; Appearance; Spectra; Relation to stars; Source of luminosity; Probable nature; Non-galactic nebulae—spiral and globular forms; Spectra motion; Probable size and distance; Jeans's theory of their nature.

## EXPLORATION OF DARIEN

A SCIENTIFIC expedition to Darien (eastern Panama) sailed January 16 on the steamer *Carillo*. The party is directed by Richard O. Marsh, of Brockport, N. Y., and includes John L. Baer, representing the Smithsonian Institution; Charles B. Breder, Jr., representing the American Museum of Natural History, and Herman L. Fairchild, of the University of Rochester. Beside the general natural history of the region a special subject of study is a tribe or group of blonde Indians in the Chucunague Valley, which have been reported by several observers, but of whom nothing definite is known. The only anticipated difficulty in the trip is establishing friendly relations with these Indians which are probably in a state of primitive savagery. A record of the expedition in moving pictures will be made by the Pathé Company, and Paul Benton, of the *Rochester Times-Union*, is special correspondent for the North American Newspaper Alliance.