

Similar results were obtained with exposures on other regions, and in all cases the nebulosity shown on the plates taken with the reflector was denser than that registered by the portrait lenses in the approximate ratio of the relative numbers of faint stars shown on plates exposed simultaneously. Figures are also given which demonstrate the superiority of the reflector over the Willard lens, with which Prof. Barnard has obtained such striking photographs.

The experiments seem to point to a practical limit of about 1 to 5 for the ratio of aperture to focus in the construction of instruments for celestial photography. Dr. Roberts further concludes that it is not possible, as is often stated, that a photographic instrument of the portrait lens form can imprint images of nebulae that are fainter than the faintest star-images imprinted at the same time and under exactly similar conditions.

SOLAR PHOTOGRAPHY AT MEUDON.—In his recent presidential address to the Astronomical Society of France, Dr. Janssen gave a few particulars as to the progress of solar photography at Meudon. The well-known photographs taken some years ago revealed much that was new in regard to the granulation of the photosphere, and as the work has been continued, it has been found that the faculae, and even the striae in the penumbra of a sun-spot, have a granular structure like the rest of the solar surface. One can look upon the granule, or small photospheric cloud, as an element of the photosphere just as the cell is that of organic tissues. These granular elements are very small, sometimes being only one or two-tenths of a second in diameter; and exceptionally favourable atmospheric conditions appear to be necessary for their proper investigation.

UNIVERSITY OBSERVATORIES IN AMERICA.—We learn from *Science* that at the last session of the Illinois Legislature an appropriation was made for the erection and equipment of an observatory for the State University at Champaign. The designs for the building were made, under direction of Prof. Ira O. Baker, by the Architectural Department of the University. The instrumental equipment, consisting of a 12-inch equatorial, a 3-inch combined transit and zenith telescope and a chronograph, will be made by Warner and Swasey, the optical parts being made by Brashear. This makes four universities which have established observatories within the past year, all of which have ordered telescopes from Warner and Swasey, with optical parts by Brashear. The list is as follows: University of Pennsylvania, Philadelphia (18-inch aperture); University of Ohio, Columbus (12-inch aperture); University of Minnesota, Minneapolis (10½-inch aperture); University of Illinois, Champaign (12-inch aperture).

INTERNATIONAL CATALOGUE OF SCIENCE.

WE have been requested to print the following circular, which the Royal Society has recently issued to the foreign and other delegates of various nations, now numbering about thirty, whose appointment has been already notified:—

"In anticipation of the forthcoming International Conference to consider the preparation of a catalogue of scientific literature by international co-operation, we are directed to address to you the following:—

"It is proposed that the Conference shall be held at the rooms of the Royal Society, Burlington House, London, *beginning on Tuesday, July 14, 1896, at 11 a.m.*

"One of the earliest acts of this first meeting will be to appoint an organising committee to determine the mode of procedure (including the language or languages to be used at the Conference), the course of business, and the way in which votes shall be recorded on occasions when it will be necessary to have recourse to formal voting.

"The Committee of the Royal Society hopes to be in a position to bring definite proposals before the Conference with regard to its main work. Meanwhile, we are directed to submit to your consideration the following provisional suggestions, and to invite remarks from you upon them:—

"I. That the proposed International Authors and Subject Catalogue of Scientific Literature shall be restricted, in the first instance, to branches of pure science, such as mathematics, astronomy, physics, chemistry, geology, zoology, botany, physiology, and anthropology, to the exclusion of applied sciences, such as engineering, medicine, and the like: the determination of the distinction between pure and applied science being left to the Conference.

"II. That in such an International Catalogue of Science all definite contributions to pure science shall be thoroughly indexed, whether occurring in books, memoirs, &c., treating of pure science, or in those devoted to applied or practical science—in other words, that the catalogue shall not be confined to papers published in certain periodicals, or to books of a certain category.

"III. That with regard to the form of the said Catalogue:—

"(a) There shall be a first issue of authors' titles, subject-matter, &c., in the form of *slips or cards*, which shall be distributed as speedily and as frequently as possible to subscribers generally.

"(b) That a further issue in book form, in a state for use as a permanent work of reference, shall take place at such intervals as may be determined on, parts corresponding to the several sciences being, if found desirable, published separately.

"IV. That, in order to secure the preparation and publication of such an International Catalogue, a Central Bureau shall be established under the control of an International Council.

"V. That the whole of the Catalogue shall be prepared and issued subject to the authority of the International Council, and that any particular undertakings which may be allotted to particular countries, institutions, or persons, shall be subsidiary to the work of the Central Bureau and subject to its control.

"VI. That the cost of preparing and publishing the said Slip- and Book-Catalogues at the Central Bureau during the years 1900–1904, in so far as these are not met by sales, shall be provided for by means of a guarantee fund, and that application be made to governments, learned societies, institutions, and individuals throughout the world, to assist in establishing such a fund.

"The Conference will also have to take into consideration the following matters, among others:—

"(a) Supposing that the plan of a Central Bureau is adopted, where shall the Bureau be placed?

"(b) The mode of appointment and organisation of the International Council in charge of the Bureau.

"(c) The language or languages to be adopted for the Catalogue.

"(d) The system of classification to be adopted in the subject index. It is suggested that the decimal system of Dewey may be so amended as to be worthy of adoption.

"There is necessarily the greatest difficulty in estimating the cost of the work in advance, or in forming an opinion as to the extent to which such an enterprise will be self-supporting. It will probably, therefore, be best to raise a guarantee fund covering a period of not less than five years, within which period it will undoubtedly be possible to determine the cost of the enterprise. The annual sum to be thus secured may be approximately estimated at ten thousand pounds.

"We are, your obedient servants,

"M. FOSTER, Secretary, R.S.

"RAYLEIGH, Secretary, R.S.

"E. FRANKLAND, Foreign Secretary, R.S."

THE FRENCH UNIVERSITIES.¹

ON March 5 the Chamber of Deputies voted unanimously for a reconstitution of the French universities. In order to understand the object of this important law, it is necessary to recall the circumstances and the legislative proceedings which brought about its adoption.

Until 1875 the faculties of literature, science, law, and medicine existed separately in France, without being united by a single tie, even when four of them (a university, in the acknowledged sense of the word) existed in the same town. In 1875 the National Assembly announced the liberty of higher instruction, permitted the installation of free faculties, and accorded to the group of three faculties (refused to similar groups of the faculties of the State) the title of University. This vote increased at once, by reaction, the force of the movement, which, since the fall of the Empire, claimed unsuccessfully, by means of such men as Guizot, Cousin, Duruy, and Renan, the constitution of State universities. In 1877 a first scheme of law was handed over to M. Waddington, then Minister of Public Instruction, by a Committee of eminent men

¹ Condensed from an article in the *Revue de l'Université de Bruxelles*, February 1896.

and jurists, amongst whom were Renan, Taine, Berthelot, and others.

This led to the creation of seven complete universities, to which the nearest separate faculties attached themselves. M. Waddington, after having looked over the scheme, did not ask for a discussion. He thought that universities could not be established before university life had been founded, before the material, scientific, and moral situation of the faculties had been ameliorated. It is in this direction that the reforms were directed.

In 1885, the localities of the faculties having been changed, their scientific instruments being complete, their courses extended, at the cost of great pecuniary sacrifices, the question of universities was again renewed. The Minister of Public Instruction, at this time M. R. Goblet, signed two important resolutions. For each group of faculties there was instituted a general Council composed of two delegates of each faculty, with extended functions for academic, scientific, administrative, financial and disciplinary matters. The Rector of the Academy received the presidency. The ordinary life of the faculties of the same town was thus created. Each one of the faculties received, besides, confirmation of the right that they possessed since their creation, but which was repealed in deed to receive endowments, legacies and relief.

The faculties became therefore civil persons, but their grouping remained extra-legal, and had no judicial unity. It is in a scheme of law presented to the Senate in 1890 by M. Bourgeois, then Minister of Public Instruction, that the proposition is first made to confer the civil personality and the name of University on the groups, comprising at least the four faculties of law, literature, science and medicine, and to give to the universities the autonomy of their budget, by abandoning to them all the receipts which they effected (right of inscription, of study, revenues) for covering their expenses, with the help of a State subsidy. This project, rather badly received by the Senate, was sent back to a Commission, which very soon gave up its examination. It met with the strong opposition of the senators who represented the towns of the little groups of two or three faculties, which could not, by the terms of the project, pretend to the rank of University.

In spite of this repulse, the Minister of Public Instruction, and especially M. Liard, the eminent Director of Higher Instruction, were not discouraged. They succeeded in having inserted in the Finance Law of April 28, 1893, an article (No. 72) which conferred civil personality on the faculties in the same academic resort. The Senate, averse to the project of 1890, accepted the provision of 1893 by 212 votes against 56. Thus new progress was made.

Nevertheless, as it became more evident that the Senate would never consent to sacrifice the little groups of faculties, the partisans of the universities had to content themselves, in order to obtain anything, with demanding less.

In 1895, M. R. Poincaré presented the proposition which has just been voted for by the Chamber, and which he defended as Reporter, at the side of his successor in Public Instruction, M. Combes.

Briefly, in the terms of the project, the bodies of faculties, instituted in 1893, take the name of University; the general councils of the faculties, created in 1885, become councils of the university. In 1898 each faculty will have a budget of its own.

This arrangement has its importance, for it confers on certain groups of the university considerable receipts—646,000 francs at Paris, 105,000 at Bordeaux, 128,000 at Lyons, 83,000 at Lille.

By the vote of the Chamber, and that of the Senate, the universities, suppressed by the Revolution, will be reconstituted in France and endowed with civil personification. The new law is, on the other hand, but the result of the long evolution commenced twenty years ago. It perpetuates results already attained, and so little contested, that in 1889 M. Gréard, in his inaugural discourse at the Sorbonne, talked of the University of Paris, and the new buildings of the Faculties of Lille bear the inscription "University of Lille."

It is certainly to be regretted that the proposal of 1890 was not adopted. Real universities must include four faculties. And, as the Rector of the Catholic Institute of Paris, M. d'Hulst, has said at the Chamber, it is a delusion to call the union of only two or three faculties a university. It may be presumed that the incomplete groups, in order to maintain their new name and the concurrence of the complete groups, will try to give themselves the faculties which are wanting. If they do

not succeed, they will remain, of necessity, in the shade; and it is better, in short, to see the faculties of Paris become a university, even if those of Clermont-Ferrand receive the same title, than to see the ambiguous situation, created in 1885, continued.

There are fifteen groups of faculties in France; there would, therefore, be fifteen universities, of which seven are complete: Paris, Lyons, Bordeaux, Toulouse, Montpellier, Lille, and Nancy. It is to be remarked that the southern half of the country will possess four of the seven universities. The incomplete universities are Aix-Marseilles, Rennes, Caen, Poitiers, Grenoble, Dijon (law, science, and literature), Clermont, and Besançon (science and literature).

The above-mentioned towns, Clermont and Besançon excepted, contain a preparatory school of medicine. Many of these schools will probably be turned into faculties.

NATIONAL ACADEMY OF SCIENCES.— WASHINGTON MEETING.

THE recent annual meeting of the National Academy of Sciences in Washington brought together an unusual number of members; and the papers read during the first three days of the meeting included several of special interest and value.

Naturally the Röntgen rays have been the prominent topic, and it is fortunate that most of the successful investigators have attended and read papers, or participated in the discussions. Some errors which have gained credence and wide publication have been corrected, and perhaps the most satisfactory feature of the discussion has been the elimination of these errors, and the correction of too hasty generalisation from experiments conducted without sufficient care.

What the rays are Prof. Rowland frankly admits we do not know, nor are we perceptibly nearer a solution of the problem than when Röntgen first launched his epoch-making essay.

Prof. Rowland presented to the Academy some notes on the rays, in which he said in part that investigators of the source of these rays generally overlook the fact that electrical currents are almost invariably accompanied by oscillations, so that each pole is alternately anode and kathode, thus vitiating any generalisations as to the anode or the kathode being the source of the rays. He mentioned that the rays are developed to the greatest extent when the kathode rays fall on the anode, and hence a kathode ground to a reflecting surface focused on the anode gives the best results. This fact is utilised in the construction of the "focus-tubes" now largely used in Röntgen photography.

Prof. Rowland has obtained good results by using perfect vacuum tubes in which the electrodes are brought within one millimetre of each other. The source of rays here is less than 1/1000 of an inch in diameter. This throws a shadow with remarkably sharp outline, being less than 1/1000 inch. The width of the image gives the limit of wave-length—if it is indeed an undulation, and not the projection of material particles—not greater than 1/8 the length of waves of yellow light.

A paper on the source of the Röntgen rays was read by Prof. A. A. Michelson and S. W. Stratton. Prof. Michelson maintains that these rays are not essentially different from those of Lenard. The latter produce their effect mostly within the tube, the former without; but Lenard also found an actinic effect outside the tube. He also brought forward evidence to show that Röntgen rays radiate in all directions from the surface first encountered by the kathode rays, and do not start from the anode.

Prof. A. M. Mayer read several papers. He showed that investigations of polarisation of these rays must be made with some very thin substance of low density, herapathite being the best; but this substance, which is an iodo-sulphate of quinine, is difficult to obtain. He described the process, already communicated by him to NATURE (April 2). On using plates of herapathite with three different exposures of half-hour, one hour, and three and a half hours, no polarising effect was produced. He remarked that calc-spar was utterly unavailable as a test of polarisation of these rays, because it could not be procured of sufficient thinness for the rays to penetrate. Hence the researches of some experimenters, though widely published, were of no value whatever. He has determined the density of herapathite with great accuracy and by repeated