

the not rigorously plane surface of the photographic film, would be unsuitable; and the plan, which Lord Rayleigh described in the discussion, of forming the film on a solid metallic mirror, might be substituted for it.

All things considered, it seems not improbable that Lippmann's process may be applied successfully to X-rays at nearly grazing incidences on metallic mirrors, and possibly even on non-metallic mirrors.

Suppose now, for instance, the directions of the incident and reflected rays to be inclined to the mirror at angles of $\cdot 1$ of a radian ($5^{\circ} \cdot 7$). The distance between the planes of stratification in the photograph would be ten times that which would be produced by the same light at normal incidence. Thus if, for example, the wave-length of the particular X-light used is 5×10^{-6} cms. (or one-tenth of that of green light), the photograph would show tints of from green to violet when viewed normally, or at less or more oblique angles, by Lippmann's ordinary arrangements.

It is quite possible, however, that when we know something of the composition of Röntgen light, we may find such great differences of wave-lengths¹ in it, and so much difficulty to obtain approximately homogeneous X-light by sifting through metal plates (as we sift ordinary visible light by coloured glasses), or by other

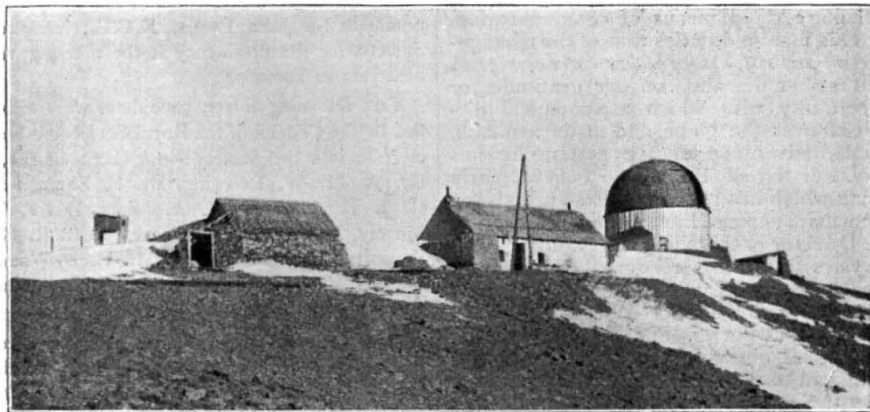
may be normally, according to Prof. Lippmann's ordinary procedure, will be seen as a complete spectrum in concentric circles, with violet in the centre, and red, of wave-length $7 \cdot 15 \times 10^{-6}$, at the circle of 56° incidence; but, if viewed by an eye placed at the position of the source of the violet light which photographed it, it will, according to the principles explained by Dr. Lippmann in his paper, be seen of uniform violet light throughout its whole area.

KELVIN.

THE OBSERVATORY AT MONT MOUNIER.

THERE is no end to the generosity of M. Bischoffsheim. Not so very many years ago he endowed science with an observatory at Nice, and now again he has presented another, and this one is at the high altitude of over 8900 feet. The observatory is situated on the summit of Mont Mounier, one of the peaks in the Maritime Alps. The advisability of having it at this spot was suggested by M. Bischoffsheim himself.

It was not till early in 1893 that the plans were worked out, but the observatory was sufficiently finished in August of the same year, to allow observations of Venus to be made before the planet passed into its inferior conjunction.



Mont Mounier Observatory (altitude over 8900 feet).

means if other means can be found, that the experiment which I have suggested may fail on account of want of homogeneity of the incident light.

But here, suggested to me by thinking of oblique incidence for the photographic light, is an illustrative experiment which (with variations of detail to facilitate realisation) cannot fail if Prof. Lippmann will think it worth while to try it. Place a point source of homogeneous violet light (wave-length 4×10^{-5} cms.) so near to the centre of the mirror and sensitive film that rays shall be received at all angles of incidence from zero up to 56° (being the angle of which the secant is 1.788). The thickness of each stratum will vary in different parts of the photograph in simple proportion to the secant of the angle of incidence, and in the centre it will be equal to the half wave-length. It will therefore vary from 2×10^{-5} in the centre to $3 \cdot 6 \times 10^{-5}$ at the circle of 56° incidence. This photograph, viewed or thrown on a screen as nearly as

¹ It is to be hoped however that, very soon, we shall have definite knowledge of wave-lengths of Röntgen X-light by diffraction fringes actually seen instead of estimates of their smallness from diffraction fringes not seen. I should explain that I am writing on the supposition which seems to me, after much correspondence with Sir George Stokes, to be exceedingly probable that Röntgen light is merely ordinary transverse-vibrational light of very short period. That its period is less than one-fifth that of green light seems well proved by the skilful experiments described by Perrin in *Comptes rendus*, January 27, 1896, p. 187; and by Sagnac, *Comptes rendus*, March 30, p. 783.

The buildings consist of a house for the astronomer and his assistant, the actual observatory, which has a revolving metallic dome (26 feet in diameter), and a wooden hut, used as workshop or dépôt. The house and actual observatory are united by a passage, which is indeed a necessary arrangement, on account of the very severe weather, and the snow, which sometimes lies thickly on the ground.

The observatory is a branch of the one at Nice, and at the time that important observations were being made at Nice, for the purpose of verifying M. Schiaparelli's discoveries on the rotation of the planet Venus, they were simultaneously being carried on at Mont Mounier by M. Perrotin, and with most successful results.

M. Bischoffsheim suggested that the observatory should be a meteorological station; it has therefore been furnished with Richard's recorders, and instruments for ascertaining the temperature, pressure, and other conditions of the air.

Nor is the observatory now isolated. For some weeks the house has been connected by telephone to Beuil, the nearest village with a telegraph office, a distance of five miles. This was also done at the expense of M. Bischoffsheim. It will therefore be possible to send daily reports to the central meteorological office of the observations made on Mont Mounier.

There can be no doubt that the Mont Mounier observatory, started under such favourable conditions, and so well supplied with instruments, will considerably assist in the advance of science.

DR. ADALBERT KRÜGER.

ASTRONOMERS in all observatories and of all nationalities will have learned with regret the death of Dr. Krüger, the Director of the Kiel Observatory, but who, perhaps, will be more generally recalled as the editor of the *Astronomische Nachrichten*, and gratefully remembered for his services to that journal. From the time that Schumacher, under the auspices of the Danish Government, started the *Nachrichten*, no astronomical journal has proved itself so indispensable, both as a means for the publication of observations and the dissemination of astronomical knowledge, or contributed more to its advance and progress. For that large class of observations of which early publication is its greatest value, but the details of which are a weariness to most editors, the *Astr. Nach.* has stood unrivalled, and its general conduct has wisely preserved the broad lines on which it was originally established. And with the progress of time, as the eagerness of observers has increased with their numbers, Prof. Krüger has recognised the necessity of still more rapid means of communication, and by adding to his manifold duties that of the management of the *Bureau central des dépêches astronomiques*, he has made still further demands on our gratitude, for the ease and certainty with which astronomical discoveries are sent all over the globe, and made available to those who take advantage of the system he has elaborated. Prof. Förster, of Berlin, we believe, early advocated the plan which has proved itself so useful, but the details of the management have been wisely left in the hands of the Director of the Kiel Observatory.

But these services to science, rendered continuously from 1880, when the death of Dr. Peters made vacant both the positions which Dr. Krüger has since filled so admirably, should not put out of sight the fact that he has been both a skilled observer and an ardent astronomer. It is sufficient to recall here his more prominent services, such as the share he took with the late Dr. Schönfeld in the observation of the zones for the *Durchmusterung* at the Bonn Observatory: a work at first voluntarily undertaken on his part, but later in regular and active co-operation with Argelander and Schönfeld. Here, too, during an absence of Dr. Winnecke, which prevented the heliometer being used, he began and carried to a successful issue the determination of the parallax of 70 Ophiuchi, in two very accordant series.

In 1862 Dr. Krüger was appointed Director of the Helsingfors Observatory, in which the instrumental equipment was probably insufficient. There he busied himself with an inquiry into the orbit of Themis, with the view of obtaining a more accurate value of the mass of Jupiter, which the continued observation of that planet is likely to afford. The result, published in the *Proceedings* of the Finnish Society of Sciences, was to show that Bessel's value of the mass of Jupiter, the then received value, required to be increased by the 68/100,000 part, and to give a value intermediate between that of Airy and Bessel, as derived from the motions of the satellites.

From Helsingfors, Dr. Krüger went to the Observatory at Gotha, where he stayed five years, leaving that city to take up his final position at the well-equipped Kiel Observatory, in 1880. For after the termination of the Danish dominion in the Elbe Duchies, the observatory had been enriched by the instruments from the old observatory at Altona, and had been brought into closer relations with the university. This position naturally

carried with it the editorship of the *Nachrichten*, to which allusion has already been made. It is true that since the journal has been under his care, the words "Unter Mitwirkung des Vorstandes der Astronomischen Gesellschaft" have appeared on the title-page, but we imagine Dr. Krüger has enjoyed a free hand in its management, with beneficial results to the journal and to his own reputation. In his capacity as Director, he has published many observations of comets, and prepared, or had prepared under his own eye, the orbits and ephemerides of many of these bodies. These computations have been occasionally enriched by notices of a mathematical character, such as the effect of perturbations by planets near the sun. He has also occasionally given original observations of stars observed with comets, and in many useful, if not brilliant, ways, he has shown his capacity as a Director of an observatory. His career has been marked by an energy and industry, to which might be applied the words of Schiller, "Beschäftigung die nie ermattet, die langsam wirkt doch nie zerstört."

NOTES.

THE first of the two annual conversaciones of the Royal Society was held last night, as we went to press.

THE Council of the British Association have resolved to nominate Sir John Evans, K.C.B., Treasurer of the Royal Society, for the presidency at the meeting which will be held next year in Toronto.

THE following fifteen candidates were selected on Thursday last by the Council of the Royal Society, to be recommended for election into the Society:—Sir G. S. Clarke, Dr. J. N. Collie, Dr. A. M. W. Downing, Dr. F. Elgar, Prof. A. Gray, Dr. G. J. Hinde, Prof. H. A. Miers, Dr. F. W. Mott, Dr. J. Murray, Prof. K. Pearson, Rev. T. R. R. Stebbing, Prof. C. Stewart, Mr. W. E. Wilson, Mr. H. B. Woodward, Dr. W. P. Wynne. The qualifications of the candidates will be found in another part of this issue.

THE Surinam Toads (*Pipa americana*), at the Zoological Society's Gardens, have recommenced breeding this year, and two of the females may now be seen with their backs covered with cells, in each of which an egg is located. The hitherto unexplained mode in which the eggs are transferred into their cells has been discovered, and the secret was divulged at the last scientific meeting of the Society.

AN unnamed donor has given Harvard University 100,000 dols. to found a Chair of Comparative Pathology, the only one of the kind in any leading American University.

THE generous hospitality always dispensed to British men of science by continental Governments begs anything ever done officially in England to welcome foreign visitors distinguished in science. We have already notified that the summer meetings of the Institution of Naval Architects will be held this year in Hamburg on Monday, June 8, and the following day. On Wednesday, June 10, the meetings will be transferred to Berlin, on the invitation of the Imperial German Government, and will be continued there during the remainder of the week. With a public spirit which should put British steamboat companies to shame, the Hamburg-American Company have generously offered to take the members over in a body from Tilbury to Hamburg in their twin-screw Transatlantic liner the *Fürst Bismarck* free of charge. The steamer will start either late on Saturday night, June 6, or else early on Sunday morning, June 7, and will arrive in Hamburg in about twenty hours after its departure. The meetings are receiving the warmest support from the Imperial Government, and the arrangements in Berlin are being carried out by the Imperial