have been made by M. H. Becquerel in the direction of polarisation; but I have already kept you too long. He had more particularly studied a very remarkable phenomenon, viz. that certain phosphorescent bodies—such as sulphide of calcium, for instance, and salts of uranium—on exposure to ordinary sunlight give out rays of some kind which pass through bodies opaque to light, and are able to affect a photographic plate beneath them. So far these agree in their properties with the X rays which are obtained from a Crookes tube, which they far more closely resemble than they do rays of ordinary light; but the rays thus obtained were found by Becquerel to admit of polarisation by means of tourmalines in a manner altogether unmistakable. I think, therefore, that we may take it as established that the Röntgen rays are due to some kind of transversal disturbance propagated in the ether.

The non-exhibition of the ordinary phenomena of diffraction and interference is explicable on the supposition that the vibrations in the X rays are of an excessively high order of frequency. I am not sure that a different sort of explanation might not, perhaps, be possible which I have in my mind, though I have not matured it; but, save the possibility of that, one is led to regard them as consisting of transverse vibrations of excessively high frequency. This opens out some points of considerable interest in the theory of light; but I am afraid it would keep you too long if I were to attempt to go further into this matter. I will merely remark that, taking the way in which these rays are most commonly produced, viz. as coming from a point where the kathodic discharge in the Crookes tube falls on the opposite wall, we may understand how it is that vibrations of excessively unusual frequency may be produced. These highly charged molecules, charged with electricity, coming suddenly against the wall, may produce vibrations of a degree of frequency which we are not at all prepared for; but I see by the clock that I must not detain you any longer on speculations.

*Postscript.*—This "different sort of explanation" is one between which and the supposition of periodic vibrations of excessively high frequency my mind has for a long time oscillated. In the above lecture I gave the preference to the latter; but subsequent reflection leads me strongly to incline to the former. I hope before long to develop fully these views elsewhere; meanwhile, suffice it to say that I am disposed to regard the disturbance as non-periodic, though having certain features in common with a periodic disturbance of excessively high frequency.

## *THE ICE VOYAGE OF THE "FRAM."*

DR. NANSEN has communicated to the *Daily Chronicle*, by telegraph from Tromsö, some interesting details given by Captain Sverdrup, with reference to his voyage in the *Fram*. The marvellous way in which the *Fram* withstood the ice-pressure, and the methods employed to free the ship from the ice, is an object-lesson for future Arctic explorers. The telegram is abridged below.

On March 14, 1895, Nansen and Johansen left us. During the first month after their departure, the ice was very quiet and the drift inconsiderable. Towards the end of April the drift, however, improved, and we were carried westwards. On July 26 the *Fram* was in 84° 50′ N., and 73° E. long. There was during this time much ice-pressure, but it never reached the ship. Then we had winds from south-west and west, which during the summer drifted the *Fram* backwards towards the east and north-east. It was not before October that the favourable drift recommenced, and during the autumn and winter, and especially during January and the first part of February 1896, our drift was better than ever.

On October 16, 1895, the *Fram* had reached the highest latitude observed, viz. 85° 57′ N., and 66° E. long. In the middle of February we were on 84° 20′ N., and 23° E., but here the drift closed until May, when we were again carried southwards. On July 19 we had reached 83° 14′ N., and 14° E. long.

There we got the *Fram* out of the grasp of the ice by blasting with gun-cotton and powder, and began to force our way southwards. During the whole drift in the ice the *Fram* was exposed to constant and violent pressures. None of these were, however, so dangerous as that which we had at New Year before Nansen left us. Immediately after his departure we were occupied in removing the huge mass of ice which on that occasion was pressed against the *Fram's* sides. At the end of March, just as the last portion of this ice was being removed, the ice suddenly cracked in all directions round the ship, and a broad water-lane was formed, which came within a few feet of the *Fram's* stern. Strong pressure very soon began along this crack, and the ice was so much broken up that the *Fram* at the end of July lay close to open water. A single mine was sufficient to free the ship from the ice.

As this mine was exploded, the *Fram* glided from the ice into the water like a ship being launched from her ways, but with a noise like thunder, the crew cheering loudly as she struck the water. Having been brought into a safe harbour by warping and sawing the ice, she was again, in August, frozen in. The ice-pressures were, during this year, of no great importance in comparison with the pressures this last summer.

During one week in June this summer (1896), at the height of the spring tides, the *Fram* was regularly exposed to violent pressures caused by the changing tide-currents. She was then once or twice a day lifted 6 to 9 feet, and her bottom could be seen resting on the ice. On all these occasions the *Fram* proved to be the very ship for ice. She was quietly lifted, and not a noise or a crack was heard from her timbers. The men on board were not disturbed in their slumber, even when the pressure was at its highest, and we awoke in the morning in ignorance of what had happened during the night. It was not before we came on deck that we observed how high we were lifted above the ice.

The temperature of the air was pretty even during our whole voyage, and did not fall lower than during the first winter. The depth of the sea was during our drift about the same as we had found before Nansen's departure, viz. 1800 to 1900 fathoms. In the temperature of the sea there was also little change, but the warm layer of Gulf Stream water under the cold surface-water increased a little in body as we came westwards. Depôts of provisions, boats, kayaks, and all necessary equipment were during our whole drift kept in readiness on the ice in the neighbourhood of the *Fram*, in case of fire or other accidents.

The time passed comfortably and peacefully, much in the same way as during the first winters. An easier expedition can hardly be imagined. Our principal work was to take the regular observations, sleep, eat, and drink. Our health was perfect the whole time, and we had no sign of scurvy. When the ice began to slack a little this summer, we worked hard to loosen the *Fram* from the ice—a difficult task, owing to the huge ice, piled up by pressures, in which our ship was frozen. We succeeded, after some days' hard work, by blasting, using mines of up to 100 lb. of powder. Guncotton proved the best.

From July 19 to August 13 we forced our way southwards through 150 miles of close ice. The ice was, as a rule, very high, and the floes were so extensive that we could not see all of them, even with telescopes. It often seemed to be hopeless, and if the *Fram* had not been such a superior ship for ice-navigation it would have been quite useless to try to force our way through ice-masses of such a description. It was by steam and warping that we broke our way through foot by foot, and where the ice was too bad for this it was forced by blasting.

We came out of the ice on August 13—the same day on which Nansen and Johansen arrived at Vardö in Norway.

## *UNIVERSITY AND EDUCATIONAL INTELLIGENCE.*

THE Lords of the Committee of Council on Education have appointed Mr. A. J. R. Trendell, C.M.G., to be Assistant-Secretary of the Department of Science and Art, in succession to Mr. G. F. Duncombe, retired. Mr. Edward Belshaw succeeds Mr. Trendell as the Chief Clerk.

THE retirement of Prof. Erismann from the chair of Hygiene in the University of Moscow, is announced.

COLONEL PENNYCUICK, late R.E., has been appointed President of the Engineering College, Cooper's Hill, in the place of General Sir Alexander Taylor, retired.

THE following announcements have been recently made:—Dr. Burney Yeo, to be Professor of Medicine, and Dr. Curnow, to be Professor of Clinical Medicine at King's College, London.

A SCHEME for a Central Technical College in Liverpool, for which the plans have already been accepted, now awaits the