

submarine illumination. The new neon lamp method would be simpler, more portable, and much cheaper than this arrangement, and probably less liable to go out of order as it contains no moving parts. It remains to be seen, however, whether it can be made to give as good results.

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#### The Excitation of Spectra by High Frequency Oscillations.

WITH reference to M. Ponte's letter in NATURE of Feb. 18, p. 243, may I say that my letter in the issue of Nov. 19, 1927, p. 727, did not pretend to be a full account of the development of the spectrum of mercury by the method of the electrodeless discharge, nor was it my intention to give the impression that I thought the phenomena observed were necessarily dependent on the short wave-length of the exciting oscillations. It was stated in that letter that the spectrum of mercury was examined as a preliminary to work on other substances; one of the advantages of this procedure was that mercury had already been studied by MM. E. and L. Bloch, using a similar method.

My results, however, differ from those obtained by these investigators in what I regard as an important particular. Apparently all the spectra which they photographed consisted of a large number of lines; the 'arc' lines appeared first, then the 'first spark' lines, and so on. On the other hand, I was able to develop the 'arc' spectrum in stages, first the triplet series, then the singlet series. This may have been due to the better control over the exciting conditions which is given by the valve method of generating the oscillations in the exciting coil. MM. Bloch themselves point out, in the paper to which M. Ponte (*J. de Physique*, 4, 333; 1923) refers, that they could not keep the potential constant during an exposure. The method I used permits of this being done over a long period. This has the additional advantage that a steady temperature and pressure can be realised, with the coil activated, before an exposure is made.

The account which M. Balasse gives of his work with undamped oscillations is very brief; he says that he obtained the glow spectra of mercury, caesium, and potassium, "which only showed arc lines." He does not mention any stages in the development of these arc spectra, and I look forward to a fuller account of this work.

M. Ponte attributes the absence of the *p* series "to the kind of discharge employed"; I suggested that it might be due to insufficiently high potentials applied to the exciting coil. Perhaps we may mean the same thing, for I observe that many of the lines recorded by MM. Bloch as 'spark lines' are members of this series. These spark lines were excited by increasing the length of the spark used in the production of the condensed discharge passed through the coil, and this lengthening of the spark involves a higher initial discharge voltage.

I would assure Prof. Bloch and his colleagues that I know and value their work. Nevertheless, the possibility of developing spectra series by series, not merely by stages of arc, spark, and so on, was new to me. It is the use of undamped oscillations at constant voltage which renders this possible because it facilitates control of the discharge, and it is this series by series development which I regard as full of promise.

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#### The Exit of *Leishmania tropica* through the Proboscis of *Phlebotomus papatasi*.

It has been shown (*Ann. Trop. Med. and Parasitol.*, vol. 19, No. 3, and vol. 20, No. 2) that human beings can be infected with *Leishmania tropica* by inoculation with *Herpetomonas* from naturally infected sandflies. It has also been shown that sandflies (*P. papatasi*) both wild and laboratory bred can be infected with *L. tropica* by feeding on oriental sores, and further, that after a certain period of development the artificially infected sandflies contain flagellates which on inoculation into man produce cutaneous leishmaniasis. The development of *L. tropica* in *P. papatasi* suggests very strongly that infection in Nature is through the bite of a sandfly, but actual experimental proof of the exit of the flagellates via the proboscis of sandflies has been hitherto lacking.

The following experiment proves beyond all shadow of doubt that *L. tropica* can be expelled from the sandfly via the proboscis.

19/1/28.—Seven specimens of *P. papatasi* ♀♀ (hatched in laboratory 17-19/1/28) fed through a membrane of rabbit skin on an emulsion of culture of *L. tropica* in inactivated rabbit blood (3000 per c.mm.).

23/1/28.—All the sandflies re-fed on a human being.

27/1/28.—One sandfly died, and on dissection was found to be heavily infected with *L. tropica*.

27/1/28.—Three sandflies re-fed through a membrane on inactivated rabbit blood. The experiment was performed at 37° C.

After the sandflies had fed, some of the inactivated rabbit blood was sown on a tube of Shortt's N.N.N. The remainder was examined microscopically. In nine coverslip preparations not a single flagellate was found.

2/2/28.—The inoculated tube was examined and found positive, that is, *L. tropica* had passed via the proboscis into the fluid above the membrane. The number of flagellates which had passed through must have been very small, because no flagellates were found in the coverslip preparations.

Further, under the conditions of the experiment, all possibility of faecal contamination from the rectum of the sandflies was completely excluded.

The method of infecting sandflies by feeding through membranes has been described (*Ann. Trop. Med. and Parasitol.*, vol. 21, No. 2).

Further details will be given elsewhere.

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#### Segmental Interchange and Crossing-over.

IN October last I published a working hypothesis for segmental interchange between homologous chromosomes (*Proc. Nat. Acad. of Sciences*, U.S.A., vol. 13, pp. 717, 718). Since that date, further work with liliaceous plants has led to an addition to this hypothesis.

It is presumed that the two strands of each homologue have breaks in the chain of genes at the leptotene stage (leptophase). These breaks are presumed to be at random in each of the two strands making up each homologue. The breaks are supposed to be only in the chain of genes, and not in the visible thread itself. They are to be regarded as places where the genes have separated far enough to be out of the sphere of mutual attraction.

In this case, if  $1/x$  represents the probability of