

hydroxide was definitely a better flocculant than sodium chloride, while with the chloride-hydroxide mixture, this effect started at a concentration of 0.5 normal.

A preliminary experiment with a 0.1 per cent. suspension of highly purified amorphous silica gave the following results:

	Concentration required to flocculate in 1 hour.	
	Sodium.	Calcium.
Chloride	No flocculation in 10 hr. in 1 N solution	No flocculation in 10 hr. in 1 N solution
Hydroxide	0.13 N.	0.0015 N.

Thus both sodium and calcium hydroxides were far better flocculants than the corresponding chlorides. The writer suggests that if the term 'anomalous' must be used, it should be applied to the coagulation of silica by electrolytes rather than to the coagulating powers of calcium and sodium salts.

H. B. OAKLEY.

Wellcome Tropical Research Laboratories,  
Khartoum, September 20.

#### The Anomalous Dilatation of Invar.

IN *Arkiv f. Mat., Astron. o. Fysik*, vol. 19 B (1925), Messrs. C. Benedicks and P. Sederholm gave a short account of dilatation measurements of invar in which they claim to have found a new property of this well-known material. Raising the temperature of an invar wire quickly by 50°, they find the coefficient of expansion has sensibly the normal value, *i.e.*  $13 \times 10^{-6}$ , at the first moment of heating. After 3 minutes a contraction sets in, a steady state being reached after 12 minutes.

In order to repeat their experiment, I cut a strip  $120 \times 1.5 \times 1$  mm. from an old piece of invar forged out to 1 mm. thickness, and drew this into a wire of diameter 0.5 mm., 60 cm. long. This was clamped at one end, stretched with a force of 1 kgm. or less by a spiral spring at the other end, and heated to 50° C. by passing a current through it. A micrometer microscope focussed on a scratch near the free end enabled changes of length to be measured to within  $1\mu$ .

*No trace of the new effect was found.* The wire took its final length in any case 10 sec. after starting the current, as well as after cutting it off. The cold drawn wire contracted  $10\mu$  on heating; after annealing at a red heat it expanded  $6\mu$  (coefficients approximately  $-0.5 \times 10^{-6}$  resp.  $+0.3 \times 10^{-6}$ ), which shows that the wire was indeed the best quality of invar.

The above-mentioned authors detected by metallographic methods the existence of a second phase in invar, and then looked for an effect of a possible heterogeneous transformation on the thermal expansion. May I suggest that such an effect was found long ago by the exhaustive researches of M. Guillaume, in the form of a small thermal hysteresis which lasts for half an hour at 100° and a few days at 40°? These times would seem more probable for a transformation in the solid state than 12 min. at room temperature.

As Mr. Benedicks used a wire only 8 cm. long, it may well be that a lag of some kind in his measuring arrangement—about which he gave no details—is responsible for his result.

F. ZERNIKE.

Physical Laboratory,  
The University,  
Groningen.

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#### Biological Research in the Tropics.

DURING the months July to September this year I was enabled to do some research work on protozoan parasites at the Imperial College of Tropical Agriculture in Trinidad, B.W.I., thanks to the generosity of the governing body in granting me free facilities there.

As I feel that the possibilities of the College as a centre for tropical research are not sufficiently known to biological workers at home, I venture to direct attention to the fact that for research workers in almost any branch of tropical biology, there is no more convenient place for headquarters than the College. Though, of course, its teaching activities deal more exclusively with agriculture, the governing body and the Principal, Dr. Leake, were most generous in allowing me facilities for prosecuting my research, which was not connected directly with agriculture.

At the present time the only tropical research laboratory easily accessible to British workers is the one at Kartabo, British Guiana, run by Mr. Beebe under the auspices of the New York Zoological Society. Trinidad has the advantage of involving a shorter journey, and the biological worker will find large laboratories, which will soon be very well equipped, thanks to the new government grant. But, of course, the main point of importance to the biologist in the tropics would be the abundance of tropical forms, and here Trinidad compares favourably with other West Indian islands, as it is the most tropical of them all, and the flora and fauna are more South American than West Indian in affinities. There are large tracts of primitive forest which are under government control and form wonderful collecting grounds.

To a worker who can spend only a short time in the tropics, the presence of an expert staff such as that at the Imperial College of Tropical Agriculture can be invaluable, especially when backed by the valuable entomological, etc., collections which the College possesses. The College works in happy unison also with the Department of Agriculture, where again one found the most able and ready assistance on the part of the local experts, including my friend Mr. Ulrich, who possesses an unrivalled knowledge of the island fauna.

On these grounds, and on others which are too numerous to enumerate here, I wish strongly to urge that biologists who desire to do tropical research could not do better than obtain permission to work at this College, permission which, I have no doubt, will be granted in all suitable cases. J. S. DUNKERLY.

The University, Manchester.

#### Magnetic Storms and Wireless Communication.

It was reported a few days ago that communication with Canada, by the new beam system of rays of short wave-length, had been completely blocked by a magnetic storm. Why should this be? The fluctuations of magnetic force are but slight, and one might expect the rays to arrive by an altered path. May we assign a deeper and more fundamental cause? That the magnetic storm is itself due to an incursion of free electrons into the upper atmosphere, in such numbers as to upset all the ray-paths and twist them out of regularity. The number of foreign electrons need not be very great. The only alternative seems to be oscillation of the magnetic field, so rapid as to be comparable with the time of transit of the ray: which is very unlikely.

JOSEPH LARMOR.

Cambridge, October 26.