pected if the short sections of chain or beaded particles were oriented or lined up by the magnetic field; the transverse waves of light vibrating in a plane intersecting the length of the chains would not be deflected on account of the extremely small diameter of the particles composing them, but waves vibrating in the plane of the length of the chains would be reflected to the side, and this would account for their plane of polarisation being what it is. Such waves would behave as if reflected from short rods in line with the plane of vibration, while the extremely small diameter of the rods would not sufficiently intercept the light vibrating in a plane transverse to their length.

The continuation of the investigation with artificial light and other varied conditions is anticipated.

ELIHU THOMSON.

Thomson Laboratory of General Electric Co., Lynn, Mass., May 23.

Geometrical Isomerism in Monomolecular Films.

IN the course of investigations on these films by a method differing only in details from that described by Langmuir (Journ. Amer. Chem. Soc., 1917, p. 1868) I have found striking differences between the properties of films formed from the "cis" and "trans" forms of some fatty acids containing an ethylenic linkage, which indicate that of the two pairs of acids, oleic and elaidic, erucic and brassidic, oleic and erucic are the "cis" forms and elaidic and brassidic the "trans." The results appear to be consistent with Langmuir's conception of the structure of the films, and this stereochemical configuration is that usually regarded as correct from chemical considerations.

According to the theory, the films are one molecule in thickness. With saturated acids, such as palmitic, the molecules are attracted to the water by the

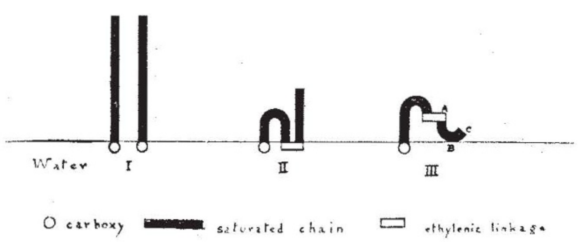

FIG. 1.

carboxyl groups, and are arranged as in Fig. 1, I. Unsaturated acids are also attracted by their ethylenic linkages, and when, as in the acids mentioned, these are approximately in the middle of the chains, the molecules in the film will take up the position in Fig. 1, II. or III. The attraction of the double bond for water is less powerful than that of the carboxyl, and when a lateral compression is applied to the film the area per molecule will diminish by some or all of the molecules straightening out to the position I.

Fig. 1 shows that a difference is to be expected between the "cis" and "trans" isomers. The double bond in the "cis" form can approach as closely as desired to the water, but in the "trans" form *the saturated portion of the chain ABC must be forced in among the water molecules.* Although it is known from stereochemical considerations that a hydrocarbon chain is flexible, yet its radius of curvature cannot be reduced below that of a ring of five carbon atoms without encountering resistance; there will, therefore, probably be a considerably greater resistance to the approach of the double bond to the water in the case of the "trans" form than in the case of the "cis."

The results obtained point clearly, I think, to a greater tendency to occupy the larger area with oleic than with elaidic acid, and a larger with erucic than with brassidic acid. Oleic acid, when first put on distilled water and a compression of about 1·4 dynes per cm. applied to the film, occupies about 40×10^{-16} sq. cm. per molecule; the area decreases steadily with time, however. Elaidic acid occupies about 30 units of area at the earliest moment when readings can be taken, and the area diminishes rapidly to about 22 units, when the film behaves like one of palmitic acid.

In the 22-carbon series there appears to be a smaller tendency than in the 18-carbon series for the double bond to approach the water. Erucic acid gives films rather similar to elaidic acid, but brassidic acid occupies the greater area for so short a time that the curves of compression of the films are not very different from those of a saturated acid such as palmitic.

It is hoped to amplify these experiments and publish full details later.

N. K. ADAM.

Trinity College, Cambridge, May 28.

Sources and Sinks.

LORD KELVIN in a paper "On the Forces Experienced by Solids Immersed in a Moving Liquid" (Proc. Roy. Soc. Edin., 1870) compared two tubes, with liquid flowing through each, with two hard steel magnets and stated that the forces are opposite in the two cases; unlike poles attracting and like poles repelling in the magnetic system, while in the hydrokinetic there is attraction between like ends and repulsion between unlike.

That two sources of like sign attract and two of unlike sign repel, as here stated, is generally accepted. An examination, however, of the case of a source and an equal sink appears to contradict this. When source and sink coincide the fluid medium is at rest, but when they are separated it is in motion and possesses kinetic energy. Work, therefore, must be done to effect the separation. This suggests that the force between source and sink is one of attraction. That this is actually the case is shown by the following experiment.

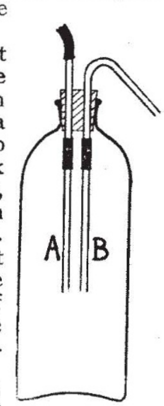

FIG. 1.

Two glass tubes A and B (Fig. 1) are connected by short lengths of rubber tubing to short tubes, which pass about 1 cm. apart through a cork in the neck of a Winchester bottle full of water. The tube A is connected to a water-supply and its open end constitutes an experimental source. The end of the tube B is an equal sink. The source and sink attract smartly and the ends of the tubes remain in contact so long as the water flows.

A. F. DUFTON.

The Royal School of Mines, South Kensington, May 25.

Polarisation Phenomena in an X-ray Bulb.

HITHERTO the potential difference required to produce a discharge through a well-exhausted vacuum tube has been considered to vary only with the pressure of the gas. In the course, however, of some experiments with an X-ray bulb (where the pressure