IN THE LABORATORY

Apparatus for Studying Crystal Formation

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In an attempt to develop methods for studying some of the problems of mineral deposition, we have designed a simple apparatus which promises to be very useful in many different kinds of studies of crystal growth. Most recorded laboratory experiments on crystallization have made no attempt to simulate the conditions under which many crystals are formed in fissures and cavities in the earth. One of the most common mechanisms under natural conditions is precipitation by slow cooling from moving solutions. The apparatus is a first attempt to design an approximate earth model in which the effect of variables can be studied accurately.

The essential features of the apparatus are shown in Fig. 1. The material to be precipitated is ground, sized, dried, and weighed, then put in the pervious basket in the left arm above

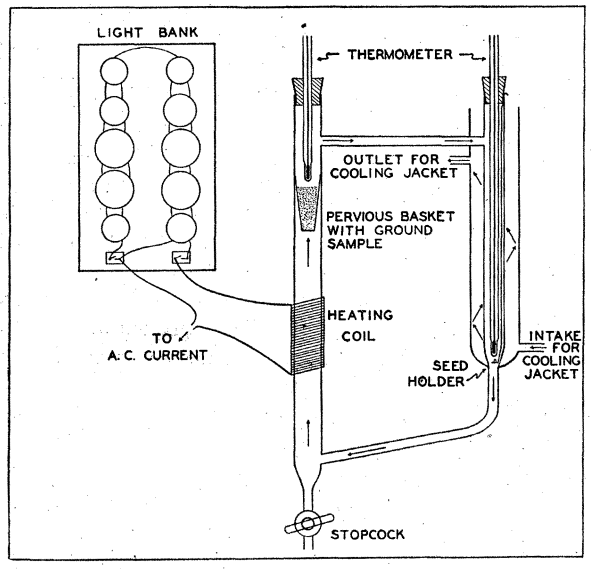

FIG. 1

the heating coil. The heating coil is connected, and convectional circulation established as shown. The temperatures of the two arms can be controlled by adjusting the amount of heat by using various bulb combinations in the lamp bank and by adjusting the rate of flow of cooling water in the jacket surrounding the right arm. After a constant temperature gradient has been established and the solution is saturated at the lower temperature, a seed crystal is introduced at the coldest point of the right arm, and growth on the seed begins.

Many different kinds of studies can be made with the unit. Some of the obvious advantages over ordinary static precipitations might be mentioned. Operation is continuous, and the system is so stable that little adjustment is necessary after an original temperature setting. The apparatus is especially suited for studies of slightly soluble materials, since thousands of liters of solution can be passed through the sample. Preliminary work indicates also that many slightly soluble substances, which precipitate colloidally when formed by the mixing of ionic solutions, will crystallize fairly readily down a gentle temperature gradient such as that provided in the apparatus.

The device is now being used to study the effect of flow on crystal orientation and growth, the use of inclusions in crystals as a criterion of temperature of formation, and the rates of leaching of very slightly soluble minerals as a function of temperature. Many other possibilities suggest themselves, such as the response of crystal habit to different temperature gradients and the nature of replacement processes. A second model has been designed with adaptations to fit our specific purposes. This new model will have a plane-sided chamber at the point of crystal formation, so that the crystals can be photographed during growth and the prints pieced into a motion-picture film. In the first design, rate of flow and temperature differential of the two arms are interdependent, and the rate of flow changes with the grain size and total amount of material introduced for leaching. In the new design, rate of flow will be controlled by a diaphragm with adjustable permeability, so that flow and temperature differential can be kept constant, even though the permeability of the sample changes during the leaching process.

Antigenic Carbohydrate-Lipid Isolated From Paraffin-Oil Extract of Dead Tubercle Bacilli[1]

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A carbohydrate-lipid complex isolated from tubercle bacilli has been found to induce antibodies when injected into normal animals.

The experiments have been carried out, using as tools the two fractions of biological significance which were obtained from a paraffin-oil extract of dead tubercle bacilli (*1*). One fraction is called the "toxic" fraction, since as small an amount as 2 γ is sufficient to produce lesions in the lung of normal guinea pigs when injected intraperitoneally in paraffin oil. The other is called the "sensitizing" fraction, as it gives to normal animals definite hypersensitivity to old tuberculin (and also to the whole bacterial cells) when injected intraperitoneally, in oil, in amounts as small as 0.1 mg. Both fractions were found in the oil extract. This oil extract was made in an attempt to elucidate the mechanism by which paraffin oil enhances the ability of dead bacilli to produce

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