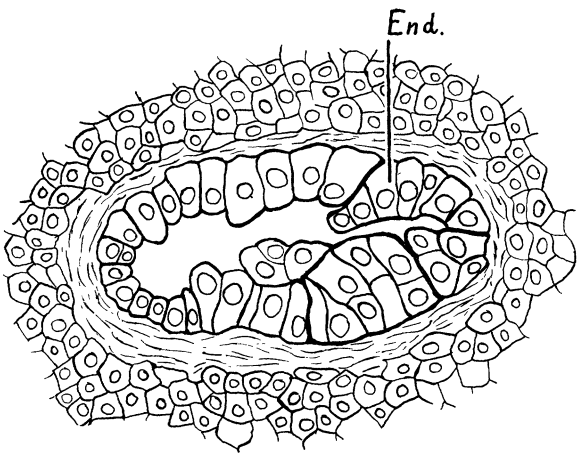

FIG. 3

pointed out that the stimulus to incompatibility and ovular-tumor formation is not confined to species crosses in which qualitative differences in the genes of the two parents might be supposed to be in some way responsible for the failure of embryo growth. Ovular tumors and incompatibility occur also in $4n \times 2n$ crosses within inbred lines of the same species.

Ovular tumors associated with embryo abortion in incompatible crosses of *Datura* have been found to contain a water-soluble thermostable substance unrelated to plant hormones, which is capable of inhibiting growth of embryos from selfed *D. stramonium* both *in vitro* and *in vivo*. The contents of such inhibited ovules contain a substance capable of inhibiting another set of capsules. This substance has been found effective in three successive passages, suggesting a self-duplication such as occurs in viruses or a new formation of inhibitor stimulated by the originally injected ovular-tumor extracts. Fig. 4 diagrams the effects of these injections.

In the upper part of the diagram is shown that one-fourth of the extract from a single inhibited ovule (a) will not inhibit ovules in another capsule, whereas the extract from a whole incompatible ovule (A) inhibits the

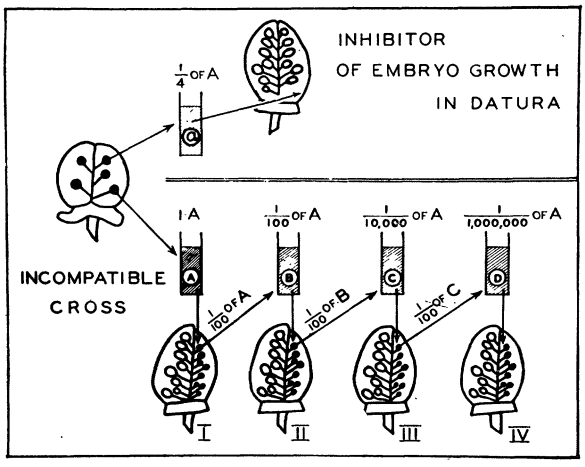

FIG. 4

± 100 ovules of the locule of the capsule into which it has been injected. The extract (B) from one of these ± 100 inhibited ovules will contain one-hundredth of the amount of inhibitor present in A. Since, however, it inhibits a second series of ± 100 ovules it is believed that the strength of the inhibitor had in some way been increased. The strength of the extract (D) which inhibits ovules in capsule IV must be only one-millionth of that in the original (A) if no such increase had taken place.

The basis of this increase in potency of the inhibiting substance, as well as the nature of the inhibition, is receiving further study.

Solution of this problem might well lead to methods whereby the postfertilization barriers to crossability could be removed, with a great increase resulting in the number of wide species hybrids possible. It might also throw new light on the broader problems of both normal and abnormal growth and differentiation in other forms.

Details of our studies on ovular tumors in *Datura*, together with literature citations, will be given in two papers now in press in the *American Journal of Botany*.

A Mechanical Heart with Coagulable Blood

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As far as we know, no artificial heart with coagulable blood has yet been devised. Our method, which will be described briefly, aims to take blood (arterial, venous, or mixed) without extravasation, from any part of the body, raise or lower its pressure to any wanted level, and perfuse any organ, organs, or part of the body with this blood, which is sent back to the right heart through a jugular vein.

This artificial heart is made from an aorta in which the blood is propelled by a roller-pulley. The peripheral resistance is provided, on the one hand, by the perfused organ or organs, and on the other, by a shunt such as we described previously (*1*), which is coated inside by a carotid. The air pressure exerted on this vessel regulates the arterial pressure.

The aorta of a dog of 15–30 kg is dissected from the heart up to and including the iliac division, and all branches carefully ligatured. It is cut 5 cm below the subclavian artery. The central end of the peripheral part is turned inside out over a Payr's cannula of 10–12 mm diam. The cannula is tied at its other end inside the end of a piece of rubber tubing of 12-mm diam and 80-mm length. The distal part of the vessel emerges from the rubber tube. The superior mesenteric branch is connected with the shunt, which is the pressure regulator. One of the renal arteries is connected with a manometer. One of the iliac arteries leads to the perfused organ or organs (i.e., kidneys); the other iliac artery, clamped, is used for rinsing the air out of the preparation.

The crook of the aorta, which has been separated, is tied at its peripheral end over the central end of the other part of the aorta, which is fixed on the Payr's cannula.

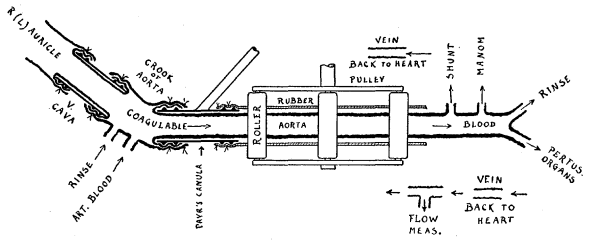

FIG. 1. Artificial heart with coagulable blood.

The subclavian artery is connected with a reservoir of saline or blood to rinse the air out of the preparation. The innominate is either tied or connected with an artery to introduce arterial blood into the preparation. Into the large end of the aorta, a Payr's cannula of 15-mm diam, coated with a vena cava, is introduced and tied. The other end of this cannula is introduced into the auricle, right or left, according to which sort of blood one wants to pump out of the heart.

The rubber tubing which protects the aorta rests by means of a layer of moss rubber on a flat groove. The roller-pulley can be raised or lowered by a screw so that the rollers as they rotate exert more or less pressure on the aorta (systolic output), and the speed of the pulley can be regulated to vary the number of beats. The diameter of the pulley is 65 mm and there are six rollers of 8-mm diam. In order that the aorta may not slip off, the cannula on which it is tied is itself fixed on the apparatus.

The output of such a heart can easily reach 700–1000 ml/min, against a pressure ranging from the normal level up to 300 mm. Up to the present it has been used to perfuse kidneys with arterial blood under varying pressures, or with venous blood at arterial pressure. Brief results of these experiments will be published at the International Congress of Physiology in 1950.

Reference

1. BRULL, L. *Arch. int. Physiol.*, 1936, **44**, 1.

Hollow Crystals of Nitroguanidine[1]

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The irregular formation and occurrence of voids and internal imperfections in crystals have been observed frequently. However, the consistent and reproducible formation of regular-shaped cavities along the entire length of a crystal has not been previously observed, to our best knowledge. We have found recently that under certain conditions nitroguanidine crystallizes from solution as

[1] Published with the approval of the Chief of the Bureau of Ordnance, U. S. Navy.

[2] The authors wish to acknowledge the assistance of Messrs. Don MacLaghlan and Al Uremovich, who prepared the thin sections and the photomicrographs.

FIG. 1. Photomicrograph of nitroguanidine.

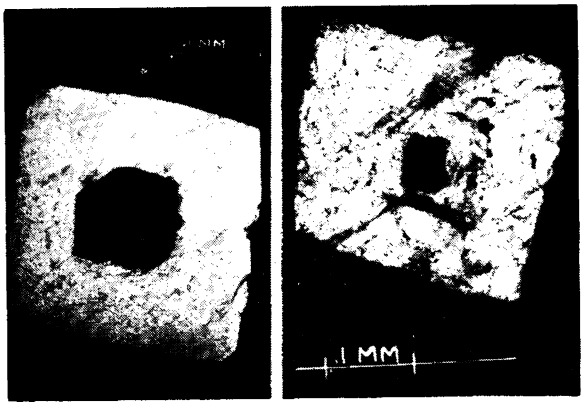

FIG. 2. Photomicrographs of thin cross sections of hollow nitroguanidine crystals.

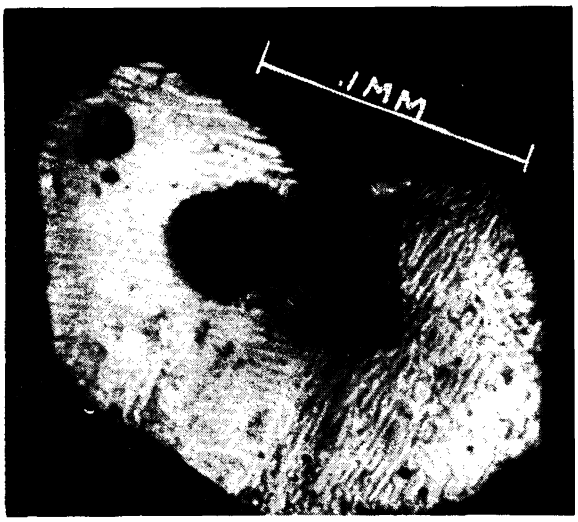

FIG. 3. Photomicrograph of a thin cross section of an incompletely formed hollow nitroguanidine crystal.