for an undertaking of this character, since he combines several abilities which especially fit him for such a task. He is undoubtedly the most skilled artist who devotes his artistic abilities to insect morphology. He has had wide experience in morphological investigations and possesses a broad knowledge of the comparative anatomy of insects, and as an insect morphologist has no superior. He also possesses a rare ability to write in an attractive style, one which holds his readers to an unusual degree. To possess artistic skill, knowledge of comparative anatomy and a facility in the use of one's own language is indeed a rare combination, and because of these qualifications the author has presented a book which no student of insects can neglect and one which raises the standards of work in insect morphology and physiology.

To those especially interested in the honeybee, this book is a treasure, for it will serve as a starting point for much future work in bee behavior and physiology, as well as in practical beekeeping. It gives under one cover a fund of scientific knowledge of this most interesting but too often misrepresented insect and will help to dim the luster of the pseudo-scientists who have so long encumbered bee literature with their speculations. From all these different points of view, this is a notable book which deserves hearty commendation.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN INEXPENSIVE AIR PRESSURE INJECTION APPARATUS

Air pressure apparatus for embalming and injecting has many advantages over that depending on gravity, but most biological laboratories are not equipped with compressed air and electrically operated systems are expensive to install. The equipment described here is only a simple adaptation of a contrivance common in chemical laboratories, but several months' use in preparing a wide variety of dissection material has convinced the writer of its utility. Furthermore, it is very inexpensive.

The air pump is a common filter pump, *g*, fig. 1, whose outlet is passed through the stopper of an aspirator bottle, *A*, of four liters capacity or greater. Air and water are discharged together into the bottle. The water escapes through the lower outlet, while the air is led through bottle *B* to *C*, which contains the liquid to be injected.

To operate: Open pinchcocks *a*, *c* and *d* and close

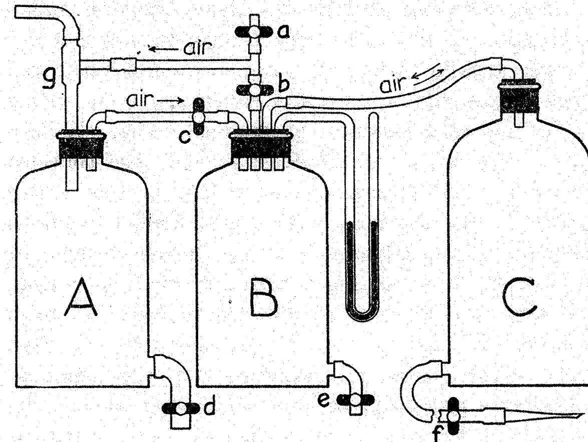

Fig. 1

b, *e* and *f*. Turn on the water. Partially close *d* and so adjust it that the desired pressure is maintained, with air and water escaping through *d*. The flow of liquid through the canula is then controlled at *f*. Always open *d* to release the pressure before turning off the water.

To fill *C* with injection fluid: Close *a* and *c*, open *b* and turn on the water. This will reduce the pressure in *C* and it can then be filled through the tube which holds the canula without the necessity of moving the bottle or of pouring the liquid through a funnel.

The bottle, *B*, is necessary unless *A* is quite large, because *A* will sometimes fill up with water and *B* then helps to keep it out of the air tubes and out of *C*. If *A* is large, *B* can be replaced by a T-tube and the manometer inserted at any convenient point. The manometer is necessary in order that the operator may always know and control the pressure with which he is working. The type shown, with the outer end sealed, will give the least trouble. Stoppers must be wired in and the ends of glass tubing should be beaded to hold the rubber tubing securely.

The apparatus as shown should not cost over fifteen dollars. If aspirator bottles are not available, a tube inserted through the stopper nearly to the bottom will serve for the lower outlet. Some manufacturers supply as a unit, made of metal, the equivalent of the filter pump and bottle *A* with the inlets and outlets fitted with stopcocks. This is listed as *blast apparatus* or *filter pump apparatus, Muesche.*

The outfit used by the writer consists of one of these units, a one liter wide-mouth bottle (*B*), and (*C*) two carboys and two four-liter bottles. The carboys were set outside the window in the light well and are never touched since they can be filled from the work table. The two bottles have long air tubes and can be moved about. They are used for small quantities of fluid and for starch mass which must be prevented from setting. This equipment, with the moderate water pressure available, will develop an air pressure of ten pounds, though two to five are all that are usually needed. It will deliver one liter of air per minute at five pounds pressure and over four liters at atmospheric pressure. It will maintain an even pressure without attention unless the air is suddenly released or the water pressure varies. This apparatus, in comparison with the gravity apparatus formerly used, saves time and necessitates less handling of unpleasant fluids and less moving of heavy bottles.

The same equipment can also be used for operating a small blast burner, for stirring with air, for aerating aquaria, etc. It is especially useful for salt water aquaria where running sea water is not available. Fresh air may be secured from out of doors by running a tube to the pump from any desired point, and the air delivered to the aquarium is washed, cooled and moistened. The writer has aerated fourteen aquaria at one time with one pump. The tube to each aquarium must be provided with a clamp to regulate the flow of air and to maintain some pressure in the system. Especial care must be taken that water from the pump does not get through the air line into the aquaria.

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SPECIAL ARTICLES

CERTAIN OXIDES OF IRON IN SOME NEW CATALYTIC ACTIONS[1]

IN current numbers of the *Philosophical Magazine* and the *Journal of Biological Chemistry* detailed accounts of our work with synthetic iron oxides and their use in catalyzing certain reactions of biological interest will be presented. The results appear to be of sufficient general interest to justify a brief description in this journal.

The oxide with which we start is the magnetite which is formed when a solution containing one mol of ferrous sulphate and two mols of ferric sulphate is poured into a boiling solution of sodium hydroxide of sufficient strength to remain alkaline after the addition of the sulphates. The black, micro-crystalline precipitate is washed to remove the sulphate, and it is then filtered off and dried. Two distinct ferric oxides can be derived from this magnetite. One, which we call "oxidized magnetite," is obtained by oxidation of the magnetite in a stream of oxygen at a low temperature of say, 300° C. The oxidized magnetite is ferric oxide of the composition Fe_2O_3 but it retains the ferro-magnetic properties of the magnetite Fe_3O_4, with which we started, and it retains also the original cubic crystal structure. If, now, the oxidized magnetite, which is completely oxidized to Fe_2O_3, is heated to 550° C. or more, it loses its ferro-magnetic properties, and the crystal unit takes on the rhombohedral form usually found in hematite, Fe_2O_3. This transformation of oxidized magnetite into hematite is non-reversible, for the oxide remains permanently non-magnetic and the structure does not change back to cubic when the oxide cools. These physical properties of the magnetite with which we begin, of the oxidized magnetite, and of the hematite are compared in the first three rows of Table I.

TABLE I

	Fe_3O_4 (Magnetite)	Active Fe_2O_3. Fe_3O_4 oxidized at 330° C. (Oxidized magnetite)	Inactive Fe_2O_3. Fe_3O_4 oxidized at 330° C., then heated to 550° C. (Hematite)
Prussian blue test for ferrous iron	+	—	—
Maximum magnetic susceptibility, k.	0.152	0.182	0.0036
Crystal unit	cubic	cubic	rhombohedral
Absorption of water, average per cent.	27	27	21
Blood test. Oxidation of benzidine by H_2O_2 in presence of —	good	good	none
Growth of *B. lepisepticum* in broth and in presence of —	good	good	none
Absorption of oxygen, average initial rate, $\frac{Cm^3}{gr.\ hr.}$	0.0044	0.0080	0

The table brings out the marked tendency to absorb water which is characteristic of the oxides if prepared in the way we have described. The table shows, too, that the appearance of ferro-magnetism in an oxide

[1] From the Laboratories of the Rockefeller Institute for Medical Research, New York.