

Four possible logical approaches to the problem of explaining human behavior were outlined by Dr. Hull:

1. You can accept the concepts of the physical sciences as the primary or undefined notions on which your system rests, and consider such mental states as anger or perception as coming between a physical event such as a rock dropping on your toe and the very easily observed and measured result, a cuss-word. These objectively observable facts would have to be linked, for logical understanding, with the intervening mental states by equations that would express their observed relationships.

2. You could build a system in which all forms of behavior, such as speaking or kicking or even changing temperature, might be logically deduced directly from the concepts of the physical sciences without assuming any intervening mental state. In other words, such a theory would be to the effect that the rock itself, in hitting the toe, produces the outburst of language—it is not necessary to assume that you became angry first. This is behaviorism.

3. You can use, as your initial or undefined notions, subjective concepts such as those found in the reports made by an individual of his strictly private observations of himself. This tends to be the program of the Gestalt school, Dr. Hull said.

4. You can take as the primary notions the goals or aims of behavior, and reason that specific actions are determined by these ends. This is the program of teleology and vitalism with which Prof. Edward C. Tolman and the Gestalters have an affinity.

"Each of these approaches," said Dr. Hull, "represents a program of research. It is conceivable that all four might be successfully attained. My personal favorite is, of course, the second or behavioristic program."

The first approach, Dr. Hull considers feasible, he said, although it is doubtful whether it is worth bothering about the subjective. The Gestalt approach is a legitimate scientific venture, but "a rather poor gamble." The fourth is inherent in the molar or macroscopic approach into which all behavior theorists at present must be forced. But this handling of behavior in large units has distinct limitations, Dr. Hull said, and should be minimized to the last degree possible.

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BIOLOGY

## Natural Growth Hormone Found in Ripening Pollen

### U. S. Department of Agriculture Scientists Obtained Their Material By Ripening Corn Pollen in Ether

**A** GROWTH-PROMOTING hormone, more powerful than any of the synthetic chemicals now in use for speeding root formation, inducing growth of seedless fruits and other recently discovered "plant magics," has been found in pollen by two research workers of the U. S. Department of Agriculture, Dr. John W. Mitchell and Miss Muriel Whitehead.

They obtained their material by extracting ripening corn pollen in ether and then evaporating off the ether. A fatty substance is left, which is mixed with lanolin in one-to-ten ratio. This paste or ointment is then spread on the plant part where growth-stimulating effects are desired. A ring of it around the stem of a seedling bean plant caused an elongation between 1.5 and 2.5 times greater than that obtained by treatment of comparison plants with any of the synthetic growth regulators.

It is not unlikely that the pure substance itself, when it has finally been isolated, will have even more powerful effects, for the crude ether extract of pollen is very likely a mixture of several substances, not all of which have growth-stimulating properties.

Chemical analyses of the ether extract will be actively pushed, for if the active principle can be isolated and its chemical structure determined, it may be possible to make it artificially.

The effectiveness of the newly-discovered substance in making plant stems grow longer may be put to practical use by florists in getting longer-stemmed flowers or in producing longer-fibered stems in such textile plants as flax, hemp and ramie. Such large-scale uses will depend, of course, on working out large supplies of the chemical at low cost.

Another use that has been discovered for growth hormones recently has been in producing seedless fruits from unpollinated flowers. A large range of plants, from holly berries to tomatoes, have been thus treated with good results. Spraying orchard trees with the hormones has had the effect of restraining flower buds from opening until

danger from late frost is past, of inducing apple and other trees to hang onto their fruit instead of dropping much of it prematurely, and of hastening the ripening of oranges.

To obtain a supply of pollen for their researches, Dr. Mitchell and Miss Whitehead exploit bees bringing the yellow dust back to the hive. The bees are compelled to pass through a narrow, screen-lined pollen trap, which scrapes off their loads of pollen.

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#### CONSERVATION

*Transparent plastic as a substitute for suddenly-scarce aluminum in the casings of radiosondes (high-flying robot weather observatories) will release six tons of the white metal for defense purposes on a recent order for 31,200 of the balloon-borne instruments placed by the U. S. Weather Bureau with the Washington Institute of Technology. Laura Young, holding the radiosonde on her lap to show how transparent its casing really is, points to the part of the instrument where those now-famous long blond human hairs are used as the essential driving mechanism of the hygograph, or humidity indicator.*