we must look for the true facts. If orthogenesis is real, it will be found here. But the evidence is all to the contrary. I am well aware that this may seem to be a very cavalier treatment of a large subject, but it is my purpose only to present the conclusions which are authorized and justified by the results of the present investigation. And this summary statement must suffice.

And now, by way of conclusion, I may outline what I believe to be the full and correct statement regarding the history of organic differentiation among the Partulae, as it has gone forward in the past and as it is proceeding to-day. The efficient causes of evolution are congenital, and their work is manifested by the continuance of some among the parental qualities; but these are never repeated faithfully, for the hereditary chromosomal machinery is such that exact similarity is impossible. The individual differences may be small or larger, but the degree is unimportant—it is congenital causation that is the essential element. The variants then exercise their hereditary endowments as they may, with success or failure as the outcome of their accord with the whole complex of surrounding circumstances. They must not be unadapted—this is the true biological categorical imperative. Nature makes a wide allowance in the matter of actual utilitarian values.

Variation and heredity, then, are the two aspects of the workings of the internal factorial machinery; natural selection, with which I include spatial and physiological isolation, does the rest. The whole complex of external conditions, whatever these may chance to be, does nothing in the way of originating variations; its effects are limited to an acceptance, a tolerance or a rejection of the varied aspirants for the career of a complete organic life.

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RESEARCH AND THE TRAINING OF THE RESEARCHER

I

RESEARCH is systematic and critical investigation into the sources of truth; it is a characteristic and proudly accepted function of the university. In the eyes of the world the university degree, the doctor's degree, stands for competency in scholarly pursuit of truth. In granting the degree the university acknowledges, tacitly at least, responsibility for *training in research* of potential researchers. Are the functions desirably to be differentiated?

(1) One policy, not uncommon, admits the candidate for the doctor's degree to a professorial undertaking in research. He may, at the discretion of the professor, take such part in the investigation as appears compatible with its validity and profit therefrom in "training" as he can. Responsibility, however, lies with the professor; the investigation is his investigation. Thus, properly, the candidate is follower and not director of inquiry; he pursues a technique chosen and directed by another; he is executor of a plan not his own. If he plays his part of technical assistant to the satisfaction of the professor, thereby, so far as research enters, he qualifies for the doctor's degree.

(2) A second policy does not admit the candidate to staff research; it assigns him to independent research. The candidate is not an assistant whom the professor may use at his discretion for the forwarding of his own researches; he is, rather, an initiate in self-directed inquiry, for whom the professor is a resource of advice and criticism. His independent research is both a medium for the development of research ability, and a test of that ability. By it he is judged to be competent or not competent in research.

(3) A third policy is intermediate. The policy admits the candidate to a part in execution of more than one professional inquiry, each designed, directed and controlled throughout by the responsible staff member. When the candidate by repeated practice under direction appears to have mastered the essentials of a variously flexible technique, he is released from his auxiliary status and assigned to independent research. Again by his independent work as researcher he manifests his competency or incompetency.

II

Now the end of research is truth discovered. To that end error, so far as is humanly possible, must be kept out of investigations. The obligation of the university in its research function is to maintain the highest quality of truth-seeking that the capacities of its membership and the extent of its material resources permit. Hence research must be directed and controlled by the select and the proven in research—namely, the experienced and competent staff membership.

(1) In the first policy described above, that principle is clearly accepted. There is no research other than staff research. The policy permits, if it does not ensure, the highest attainable quality in all research for which the university stands sponsor.

(2) The second policy segregates staff research from the research of candidates. The staff is in no wise hindered in the most effective use of its resources

for discovery of truth. But the policy does admit a second level of research. For it is neither assumed nor to be assumed that the norm of acceptability in student research shall equal the norm of staff production in research. The standard is, rather, the minimal level of acceptable staff research. Hence, if student research be placed in the same category with staff research, the level of quality in the total research product of the university is lower than it is under the first policy of strict staff responsibility.

(3) The third, or intermediate, policy protects staff research exactly as does the first policy. But, like the second policy, it admits a second level of research. The level of student product, however, is likely to be raised. For the policy involves training in the essentials of technical procedure preliminary to the undertaking of independent research. Hence, the level of total research under university auspices will, in quality, lie between the extremes.

III

The end of the training function is the competent researcher—a man able to locate and define a problem for investigation; able to plan and carry through a technique of inquiry appropriate to the solution of his problem; able to organize and interpret, in their immediate bearings at least, the findings to which his inquiry leads.

(1) The first policy, well designed to the maintenance of quality in research, is deficient as a means to the qualification of the researcher. The candidate is not the original and responsible agent in location and definition of the problem for investigation; nor is he selecter and organizer of the method of attack; nor, again, is he organizer and interpreter of findings. In all those phases of the investigation he is but observer, or, at best, "vicarious participant." He is responsibly active only in execution of technique. That is, his "training" is alongside of research rather than in it. If the candidate has originality he has not demonstrated it. He is trained only as a technical assistant, not as a researcher.

(2) Under the second policy the candidate is placed in the position of the researcher. He must find and define his problem, plan and execute his technique of inquiry, organize and interpret his findings. His participation in research is genuine and not vicarious. He is trained in research by performance of "a complete act" of research.

(3) The third policy, by keeping the candidate in contact with "a complete act" of a competent researcher, provides for him a pattern of research. By repeated practice in certain essentials of technique it trains him in elements of habit usable in research. By assignment to independent research it educates him in "a complete act" of research. The candidate learns both by imitation of research and by genuine research of his own.

IV

It appears, then, that an organization of university function to the end of highest quality in research is not an organization best adapted to the production of the competent researcher. On the other hand, an organization to the end of competency in the researcher is not best adapted to the highest product in research. The functions of research and of training in research are coordinate, but they are not coincident.

Can not the university best serve both ends by a frank recognition of distinction in functions? Let us have in one category research of the highest quality, performed by the experts in research—what I should like to call university research. In another let us have research of high quality, performed by initiates in research, undertaken by the university not for the sake of its value in contributing to the sum of known truth, but undertaken as a means to the development of competency in prospective researchers. This I have, without license, already called student research.

T. H. EATON

CORNELL UNIVERSITY

THE PROMOTION OF KNOWLEDGE OF PRECAMBRIAN LIFE

THE promotion of the knowledge of Precambrian life is the object of an award and medal founded by Mrs. Mary Vaux Walcott, in memory of her late husband, Dr. Charles Doolittle Walcott, internationally distinguished for his investigations of Cambrian life and preeminent in his explorations of Precambrian life. A trust fund providing for an honorarium and inexpensive medal has been established under the auspices of the National Academy of Sciences in accordance with Mrs. Walcott's letter as follows:

I inclose herewith the outline for a medal and honorarium, to be awarded every five years by the National Academy in memory of the work of my husband, Charles Doolittle Walcott. I hope this trust will be acceptable to the Academy and serve to stimulate investigation along the scientific lines which were of such great interest to Doctor Walcott.

The essential provisions governing the award are:

(1) The fund ($5,000) is to be known as the Charles Doolittle Walcott Fund.