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FORMAL EDUCATION FROM THE STANDPOINT OF PHYSIOLOGICAL PSYCHOLOGY.

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Students of modern pedagogy are apt to be confused by the very different notions that exist as to the nature of the educational process. On the one hand are those who tell us that education means the development of mental power, and that subjects of instruction are of value chiefly in so far as they contribute to this end. On this theory the knowledge a subject supplies is a matter of very secondary importance, provided that it is capable of training or disciplining the so-called powers of the mind. It is desirable on this plan to study higher mathematics, not because the knowledge this subject supplies will have much value for the student in after years, but because it affords him a splendid mental training, enables him to think for himself, to grapple with the problems of life. In the same way the advocates of classical study base their arguments, in part at least, upon the discipline that this subject affords. The knowledge obtained in this study may be wholly forgotten, but the mental training secured by this means is a permanent possession. It is in this discipline or training that the value of education consists.

It is a natural result of this view of education that the method of study should be exalted above the subject matter. As President Eliot says, "The method of study and the aim in studying are the all-important things."¹ In harmony with this view the Committee of Ten practically assumed the equivalence of all subjects of instruction, provided that they are taught by equally good methods. Their value to the student is to be measured by the time he devotes to them, and the thoroughness with which they are pursued. If, for example, twice as much time is spent on Latin as on mathematics, it has twice the educational value.

In opposition to this emphasis of the disciplinary value of education, there has always been a strong tendency to make its value consist in the acquirement of knowledge. This opinion is especially prevalent among the great mass of people who do not profess to be experts in theoretical pedagogy, but who, looking at the subject from a common sense standpoint, are inclined to value an education in proportion to the amount of knowledge it supplies that is of practical value for every-day life. In its extreme form this view of education is apt to be narrowly utilitarian. Every educator knows the difficulty of having a subject introduced into the schools that does not minister directly to the material needs of the pupil, and every innovation that has not this bread-and-butter value, is apt to be resented and treated as a fad.

It is not, however, from this element of society alone that we find an emphatic protest against the over-emphasis of the formal value of studies. Evidence of this may be seen in President Baker's minority report to the Committee of Ten, and in President Schurman's criticism of the attitude of this committee in the *School Review*,² and in

¹ *The Forum*, December, 1892, p. 427.

² February, 1894, p. 93.

the growing emphasis that is being placed in the schools upon subjects that are of value for their content, as science, history and literature, as opposed to those that have chiefly a formal value. Between these opposing theories the educational novice has to choose his way or strike out a new path for himself, and any knowledge that can throw light upon this problem ought to be welcomed.

It is one of the merits of Herbartianism that it proposes to settle this question. From the high ground of philosophic principles, it professes to speak with the voice of authority, and gives its decision uncompromisingly in favor of the advocates of knowledge as opposed to those of discipline. This objection on the part of Herbartianism to formal education is so intimately related to the Herbartian philosophy of mind that it will be necessary to examine this briefly, in order to see the foundation on which this decision rests.

According to Herbart, the soul is a simple, indivisible substance which "has no innate natural talents nor faculties whatever, either for the purpose of receiving or for the purpose of producing. It is, therefore, no *tabula rasa* in the sense that impressions foreign to itself may be made upon it; moreover, in the sense indicated by Leibnitz, it is not a substance which includes in itself original activity. It has originally neither concepts, nor feelings, nor desires. It knows nothing of itself, and nothing of other things; also in it lie no forms of perception and thought, no laws of willing and action, and not even a remote disposition to any of these.¹ To this hypothetical soul there is attributed only one power, the ability to react against the pressure that is brought to bear upon it from without, and through this reaction upon its environment the soul becomes possessed of certain states or contents, as we may call them, its ideas. Once these ideas come into existence they are forever imperishable. They may, however, have a greater or a less degree of intensity, which is increased by the fusion of similar ideas and the combination of those less closely related. As ideas become stronger, they have a tendency to occupy the whole field of consciousness, and to force the other ideas to which they are not related into the background until we wholly cease to be aware of them. In Herbartian terms, they have reached the threshold of consciousness. They have not, however, ceased to exist; for under favorable circumstances these pale shades of ideas that in the meantime inhabit the nether world of consciousness may again rise to the surface, and enter the field of conscious life. Their return is brought about by means of the entrance into consciousness of ideas to which they are related, or by the removal of those opposed to them. In order to facilitate its stay in consciousness, each idea seizes upon all others that are of a similar character to it, and by this means it makes itself stronger, and increases its chances of occupying the chief place in consciousness, which is the dominant ambition of any half-respectable idea.

Now on this theory of mind it naturally follows that there can be no such thing as formal education, for apart from the ideas there is practically no mind to be trained. "The ideas really make up the mind. The soul is regarded as little else than the battleground of contending ideas."² Feeling and willing are dependent upon the ideas, and not independent mental activities. All, therefore, that can be done with a mind is to supply it with ideas. These can of course, be strengthened and reinforced by association with other ideas of like character, which will enable them more frequently to rise into consciousness and to exercise a greater

¹ *A Text-book in Psychology*. Int. Educ. Series, p. 120.

² J. Adams: *The Herbartian Psychology Applied to Education*, p. 49.

influence upon the life of the individual, but no general development of mental power is possible independent of the ideas. Hence for Herbart the chief thing in education is the cultivation of the circle of thought, for out of it all the other psychical activities arise. Knowledge, not discipline, is the end of education. The prominent leaders of the Herbartian movement at present are in agreement upon this point. Dr. DeGarmo assures us that the world at large regards formal education as a myth,¹ and Professor Rein says: "The fiction of formal education must be given up."²

However convincing the Herbartian philosophy of mind may be, we must remember it is only a theory. No one knows that ideas exist below the threshold of consciousness. No one knows that ideas fuse in consciousness. Like all theories, Herbartianism must prove its validity by its ability to explain the facts of experience to which it relates, and by its freedom from inherent contradictions in itself. When, however, we submit it to this test, it appears to be defective for the following among other reasons:

1. Because it denies what appears to be an obvious fact of mental life that the mind can be benefited, to some extent at least, by formal training, apart altogether from the value of the knowledge received. Take, for example, such a subject as geometry. Few students, I suppose, have any practical use for this subject that is at all commensurate with the time and energy that is devoted to it, and yet it appears as if the practice it affords the pupil of solving problems for himself, and a cultivation of a habit of clear, consecutive, reasoning, have no small value for the student, whether the knowledge he derives from the subject is ever called into play or not. The same thing is true, to a greater or less extent, of every other subject. It is not wholly the knowledge which an individual receives that makes an education have a value for him, but the power he acquires through the exercise of his mental activities. But we must either give up our belief in the possibility of the cultivation of mental power independent of the growth of knowledge, or reject Herbartianism; for between this ghost theory of ideas and formal education there can be no compromise. Of course we can say with the Herbartians that the latter is only a myth, but it is hard to believe that a so generally established opinion among educated men is wholly an illusion.

2. The existence of unconscious ideas appears to be an absurd and an unnecessary hypothesis.³ Surely the very essence of an idea is that it is an element of consciousness, and an unconscious idea is as much an impossibility as a square circle. Of course it may be said that the idea must exist in an unconscious state, for it can return to us after its departure from consciousness. But that an idea ever returns to us is an unwarranted assumption, as the so-called return or revival in consciousness of ideas can as easily be explained on other grounds.⁴

3. The supposition of a fusion of ideas that is implied in Herbartianism is open to serious objection. It is an attempt to think of mental states in terms of external matter. Chemical elements can unite so as to form a new body, but experience gives us no reason to believe that mental chemistry is possible, nor does reflection even show that such a notion is intelligible.⁵

4. The Herbartian doctrine of the dependence of feeling and volition upon ideas is not generally accepted by modern psychologists.

¹ *Herbart and the Herbartians*, p. 26.

² *Outlines of Pedagogics*, Van Liew's Trans., p. 61.

³ Cf. James: *The Principles of Psychology*, Vol. I, p. 162.

⁴ *Ibid.*, Vol. I, p. 655; Allin, *Ueber das Grundprincip der Association*.

⁵ Cf. James: *The Principles of Psychology*, Vol. I, p. 158.

In its practical application it is apt to overlook the immense importance for the pupil of the cultivation of right habits, the growth of which may be wholly independent of any ideas he may possess concerning them. As Aristotle long ago maintained in opposition to Socrates, the virtuous life does not altogether depend upon knowledge, but in a large degree upon habituation to right modes of life, which unconsciously leads to the development of moral character. This relation of the elements of the psychical life is also at variance with the generally accepted fact that men of thought are necessarily men of action, and that the exclusive cultivation of the intellect may lead to a paralysis of the will, as is illustrated in men of the Hamlet type. So, too, intellectual culture may produce an atrophy of the emotional life, as Darwin tells us was true in his case.

5. As a system of practical philosophy for the teacher, Herbartianism does not sufficiently take into account the importance of the physiological conditions of mental growth, nor help us to understand the different stages through which the child passes in the course of his development. According to Herbartian principles, the ideal education is that in which the knowledge acquired is properly related to that already possessed. But it is not easy to see why, according to this plan, an individual might not be taken at any time of life, and by means of a properly adjusted course of instruction be developed in any direction the teacher might choose. If all development depends upon the reception and assimilation of ideas, there would seem to be no limit to the power of education, and the process might take place at any age. But this is not the case. Physiological conditions may offer an insuperable objection at one time of life to an education that would have been a comparatively simple matter at another. A course of instruction has to be adapted not only to the knowledge of the pupil, but also to his stage of mental and physical development. As Dr. Lukens says: "Each subject has a more or less pronounced 'nascent period,' when interest in and physical ability to learn it culminate. The periods of maximal physical growth are not periods for severe mental discipline. The mind and the body both grow by fits and starts."¹ Hence the advantage of a genetic view of the mind over one that simply affords a glimpse of a cross-section of the stream of mental life. The teacher needs to know something about the stages of mental growth. In this matter the philosophy of Herbart can give us little aid except in the principle of apperception.

If, then, our examination of the Herbartian psychology does not appear to warrant us to conclude that the impossibility of formal education has been established, how will this doctrine fare at the hands of physiological psychology, which is to a greater or less extent adopted by modern psychologists? Perhaps it is desirable to consider briefly in the first place what this science has to say upon the question of mental activities. According to its teachings we are at liberty to dispense with a belief in the existence of unconscious ideas. Each psychical process is occasioned by an excitation of some brain area. When this neural excitation ceases, its mental correlate also goes out of existence, but one similar to it can at any time be produced by a like excitation of the same brain cells. This excitation is all the more likely to occur again owing to the fact that any series of cells that have acted together on occasion have a tendency to repeat the same movement. Hence a psychical process may be occasioned not only by a stimulus from the sense organ as at first, but also by an internal stimulus from some other brain center. Therefore the more relations an idea has with other ideas, that is, in physical terms, the more con-

¹ *Educational Review*, p. 119.

nections the brain cells that are concerned with its production have with other brain cells, the more frequently will such an idea occur, and the more likely is it to form a stable part of the individual's thought. All that is explained, therefore, by the Herbartian principle of apperception, may as readily find its explanation in the nature of the physical basis of consciousness, without necessitating our acceptance of a belief in the impossibility of formal education.

What, then, will formal education mean from this latter standpoint? Perhaps it is necessary to analyze a little more closely the meaning of this term. While the expression has been used somewhat vaguely in pedagogical literature, I think it is generally assumed to imply the two following notions: first, that mental power can be developed by mental exercises irrespective of the knowledge that is obtained; and, secondly, that the power that is generated by means of these mental gymnastics may be used in any other sphere of intellectual labor. Now, as to the first point, since all mental states are conditioned by brain states, it seems to be evident that any increase of mental power that can be produced by discipline, will be due to the greater effectiveness of the brain and nervous system. That there is the possibility of development in this direction appears to be an established fact. Neurologists tell us that the brain and nervous system contain probably 3,000 million cells.¹ While the number of these is not increased after birth, investigations have shown that there is a development of the fibres up to 33 years of age; for a considerable part of the cells remain mere developed granules, apparently of no value to the individual, simply the latent possibilities of unrealized power. In this connection Professor Donaldson says: "For the cells continually appearing in the developing cortex no other source is known than the nuclei or granules found there in its earliest stages. These elements are metamorphosed neuroblasts which have shrunk to a volume less than that which they had at first, and which remain small until, in the subsequent process of enlargement necessary for their full development, they expand into well-marked cells. Elements intermediate between these granules and the fully developed cells are always found, even in mature brains, and, therefore, it is inferred that the latter are derived from the former. The appearances there also lead to the conclusions that many elements stop short of complete development, that the number of elements which might possibly develop in any given case is far beyond the number that actually does so, and that the characteristic appearance of the cortex in the various localities depends in a measure on the expansion of dissimilar layers of the primitive granules."²

If, then, mental exercises aid the development of the brain, formal education must, to some extent at least, be a fact. Just what effect study has upon brain development has not yet been fully established, but there are indications that it assists this process. Laura Bridgman's case³ is cited as an instance of this. In the examination of her brain, Professor Donaldson found "that those parts of the cortex which, according to the current view, were to be associated with the defective sense-organs, were also particularly thin. The cause of this thinness was found to be due, at least in part, to the small size of the nerve cells there present. Not only were the large and medium-sized nerve cells smaller, but the impression made on the observer was that they were also less numerous than in the normal cortex." Apart from

¹ Donaldson: *The Growth of the Brain*, p. 159.

² Donaldson: *The Growth of the Brain*, p. 238.

³ Reported by Donaldson in *Am. Jour. of Psychology*, Vol. III, No. 3; Vol. IV, Nos. 2 and 4. Cf. Halleck: *Education of the Central Nervous System*, p. 46.

this evidence, it can hardly be doubted that the exercise of the brain, and the increased flow of blood which it causes, will aid in the development of the cells and of their connections with other brain centers, just as physical exercises have a like beneficial effect upon the other parts of the physical system.

It may, therefore, be safely concluded that mental exercises assist in the development of brain power. How far this is of service in other kinds of work than that in which it was produced, is of course another question. It would appear not to be of such general application as to warrant the supposition that this stored-up energy can be expended in any form of mental activity.¹ The development of the brain centers for the various senses would evidently be of service only for the production of sense images belonging to the senses with which they are concerned and the corresponding motor reactions. Further, the separate development of the main divisions of the central nervous system, the afferent fibres, the central connections, and the motor nerves, would evidently produce very different psychical results. The growth of the associative fibres, upon which doubtless the association of ideas depends, must lead to the development of the intellectual type of character, which, in extreme cases, gives us men in whom "the native hue of resolution is sicklied over with the pale cast of thought." The over-cultivation of the sensory portion of the system on the other hand might lead to a life of sensuality, while the development of the motor regions would give us men of action.² Hence an all-round education of the central nervous system cannot be secured from any circumscribed series of exercises. At the same time it seems probable that the increased development of any part of the system must prove beneficial to the whole, especially in the development of associative fibres, which bring all parts of the system into connection and therefore increase its effectiveness.

It seems, then, that formal education is to some extent a reality, according to the teachings of physiological psychology, both in the permanence of the acquisition derived from studies apart from their knowledge value, and also in the general application of this increased power for other forms of mental activity. Intellectual training stands on very much the same basis as physical training. A man's physical nature can be trained by doing useful work or the exercises of the gymnasium, which have no value whatever except their effect upon the physical system of the performer. So one's brain system can be trained in studies that have a knowledge value for the individual, but also in those that have none. In both cases, of course, it is best that the gymnastics should be secured in the performance of useful work, as in this case two ends are gained at the same time; but as, perhaps, all kinds of work only partially develop one's physical powers, so that it is necessary to have recourse to gymnastics to complete the physical training, in the same way it may be necessary to have special exercises to develop particular brain functions, though such exercises have no knowledge value in themselves. In fact, it may be found that many physical exercises that usually are not classed as mental training, have no less value for the training of the mind than the study of the classics or the sciences, that manual labor, foot-ball, and other forms of athletics are just as potent factors in intellectual development as many subjects of the curriculum; as they not only train the muscular system, but also the brain cells by which the muscles are controlled.

While, therefore, physiological psychology does not appear to justify the conclusion that formal education is either a "myth" or a "fic-

¹ Cf. Hinsdale: *The dogma of formal discipline. Educational Review*, Sept., 1894.

² Cf. Donaldson: *The Growth of the Brain*, p. 342.

tion," the writer of this paper does not wish to place himself on record as advocating exclusive attention to formal studies, without regard to their knowledge value. On the other hand he is utterly opposed to such a procedure, and believes that the disciplinary value of studies should be sought, as far as possible, in those that have a value on account of their content. At the same time we should not close our eyes to the two-fold value of all instruction through our allegiance to an antiquated form of psychology that denies such a possibility. While we must ever be grateful for the immense contribution that Herbart and his followers have made to modern pedagogy, it is surely much better for us to translate those fruitful principles, such as apperception, which they have taught into terms of our modern psychology, which is capable of doing justice not only to them but also to many others of which Herbartianism, on account of its manifest limitations, can take no cognizance.