

IDENTIFYING ORIGINALITY

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We may partially identify the thing we are seeking by definitions, though words in the English language have many shades of meanings. One dictionary suggests: not copied, not imitated, or reproduced, underived; new, firsthand; independent in creative thought or action; inventive. We may add: unique, different, discovery, unusual, breaking precedent. Originality has all these elements while no one of them gives a complete description. Voltaire even suggests that "originality is nothing but judicious imitation." Sometimes we call it original when an old idea is clothed in a new garment, or an old law is stated in new phrases.

It will help us to identify the quality if we refer to some who are known to have had it or who are recognized as having it today. Socrates may have been an episode in Greek life, but his method is known as the method of inquiry, the method of instruction, and the method of searching for the truth. Four hundred years later a brief visitor in Athens described the Athenians by a parenthetical remark which has become classic:* Socrates is the symbol of the searching, the telling and the knowing of new things.

Jesus was original and unique because He taught as one having authority and not as the scribes. It was a new thing in Israel to have a teacher who did not pore over old books and give quotations from them, but one who was willing to use the words: "You heard that it hath been said, but I say unto you."

We may jump fifteen hundred years and find again this spirit of searching, inquiring and finding in Galileo. Grover Wilson, in *Great Men of Science*, suggests that the teachers of that day may have been forerunners of the teachers today:

A new baby at Pisa? What of it? We have a mold ready for him. We'll just pour him in, and after a bit he will come out fashioned like the rest of us. That is always the dream of the schoolmaster who is first cousin to the Button Molder.

He came out a new spirit who went further than his predecessors. "When he had outgrown the Aristotelian beliefs of his youth, he grasped the new principles; he learned the modern need of concentration, and worked out his carefully delimited

* Acts 17:21

(For the Athenians and the strangers which were there spent their time in nothing else, but either to tell, or to hear some new thing.)

problems in a more complete and methodical way than the universal genius of Leonardo could stoop to accomplish." (1)

We could continue by citing Langmuir, Edison, Kettering, and many others, but we have given enough examples to allow us to recognize the leaders of originality.

SOME EXAMPLES

Fortunately there is a growing literature showing how men and women get ideas for new things in many fields of endeavor. New books are appearing which show the techniques of research and which analyze the approach of the worker. The industrial research institute sponsored a conference to study the nature of creative thinking. The meeting was held at the Skytop Club, Skytop, Pennsylvania, May 5-7, 1952. A monograph has been printed showing the discussions. In October 1953 the Administrative and Research Divisions of the American Society for Engineering Education sponsored a program in New York on a similar topic. The approach has been to discover how original thinkers arrive at the moment of insight, and how from this point they produce music, paintings, poems, novels and inventions.

The following examples give some incidents which may be unusual, but they point to the difficulty in generalizing about originality. No doubt many new things have come in the regular order of study and contemplation. However, the examples emphasize the necessity of mental preparation before the moment of insight comes. Wolfgang Amadeus Mozart (2) wrote a letter saying:

When I am, as it were, completely myself, entirely alone, and of good cheer—say, traveling in a carriage, or walking after a good meal, or during the night when I cannot sleep; it is on such occasions that my ideas flow best and abundantly. Whence and how they come, I know not; nor can I force them.

Then he goes on to say that his memory will sort the ideas and those which he likes will be retained. It will soon occur how he may use the ideas to make them conform to rules of counterpoint and will allow him to fit them to the various instruments.

Henri Poincare (2) says:

For fifteen days I strove to prove there could not be any functions like those I have since called Fuchsian functions. I was then very ignorant; every day I seated myself at my work table, stayed an hour or two, tried a great number of combinations and reached no results. One evening, contrary to my custom, I drank black coffee and could not sleep. Ideas rose in crowds; I felt them collide until pairs interlocked, so to speak, making a stable combination. By next morning I had established the existence of Fuchsian functions, those which come from the hypergeometric series; I had only to write out the results, which took but a few hours.

He goes on to say that the unconscious work is only possible and fruitful when preceded and succeeded by a period of conscious effort. The sudden inspiration does not happen except after some days of voluntary work.

Mr. Edison (3) was working on the telephone receiver when an idea came to him. He made a sketch of a small machine and had one of the workmen make it. When the device was ready the workman asked what it was, and Edison said: "It is a talking machine."

In this instance, there was a carry-over from the telephone disc to the talking machine disc. The inspiration was the similarity of the two devices, though it took a mind conditioned as that of Edison to detect the similarity. Even such an alert mind as Edison's failed to associate the Edison effect in the vacuum tube with the possibilities of the wireless or the radio.

One more example will be enough to illustrate the conditioning of the mind for the moment of insight. James Watt (4) was working on a Newcomen engine in the year 1765 and he was trying to solve the heat losses occasioned by condensing the steam in the engine cylinder, which caused the cylinder to be alternately hot and cold. How he hit upon a workable idea is better told in his own language:

It was on the green of Glasgow. I had gone to take a walk on a fine Sabbath afternoon. I had entered the green by the gate at the foot of Charlotte street—had passed the old washing house. I was thinking on the engine at the time and had gone as far as the Herd's house when the idea came to my mind, that as steam was an elastic body it would rush into a vacuum, and if a communication was made between the cylinder and an exhausted vessel, it would rush into it, and might be condensed without cooling the cylinder. I then saw that I must get quit of the condensed steam and injection water, if I used a jet as in Newcomen's engine. Two ways of doing this occurred to me. First the water might be run off by a descending pipe, if an outlet could be got at a depth of 34 or 36 feet, and any air might be extracted by a small pump; the second was to make the pump large enough to extract water and air . . . I had not walked further than the Golf-house when the whole thing was arranged in my mind.

In the cases given it seems that the moment of insight came when the mind was reasonably free from forced effort. Professor Thurstone suggests that the moment of insight can be expected in dispersed attention more often than in concentrated effort. The example of Edison illustrated the wandering of the mind from the problem in hand to a similar problem, which uses the same principle.

All of the cases point to the need of preparation. It is hardly possible for the stroke of genius to take the place of preparation

in the field, along with a large amount of previous thinking about the problem. A writer cannot write an original essay or a poem without skill in the craft of writing. Watt could not have thought of the condenser had he not understood the action of steam in the Newcomen engine. In all types of originality the mind must be conditioned for the next step and the person must have a large amount of skill in thinking in the area.

Following the insight there must be the exercise of concentration to delineate the idea. There must be development, examination of the idea from many sides, and the testing of its truth or falsity. In science these activities require objectivity, freedom from emotional bias, and an ability to look at the results with detachment.

MAY WE DETECT ORIGINALITY EARLY?

We are all convinced that college education is good for the individual and good for the public. It has become such a big business that we are tempted to interpret its values by measures of ability to acquire a knowledge of facts and laws, rather than the use of facts and laws to create new solutions or new devices. Too often we expect the student to return our precepts and our teachings in the same way and often in the same language we gave in class. We are disturbed if the ideas come back a bit threadbare, or embellished, or changed end for end because they were turned over in the mind of the student. Many of our methods tend to develop routines and discourage original thinking. Unfortunately, high scholastic performance, as we know it, does not guarantee later productivity with original ideas. We must do something to our routines to place the student more on his own resources. In science we should design problems to develop understanding of laws rather than to illustrate laws. Most of our illustrative problems help to remember the law rather than to understand it.

Few tests have been developed which will detect aptitude for original thinking. Professor Thurstone at North Carolina is engaged in this type of activity, but he is just in the beginnings of his study. Last year, in a Sigma Xi talk he showed how he was breaking down intelligence into a profile rather than a quotient, as is the custom with the tests for I.Q. It may be that certain elements of the profile will point to originality, such as visual ability, perception of details, retention, etc.

We probably know more about the atmosphere in which originality works than we know about the quality itself. Mr. Giselin says:

A great deal of the work necessary to equip an active mind for the spontaneous part of invention must be done consciously and with an effort of the will. Mastering accumulated knowledge, experimenting, gathering new

facts, observing, exploring, developing technique and skill, sensibility, and discrimination, are all more or less conscious voluntary activities. The sheer labor of preparing technically for creative work, consciously acquiring the requisite knowledge of the medium and skill in its use, is extensive and arduous enough to repel many from achievement.

The very naming of the items suggests some of the characteristics of the original worker.

It is apparent, too, that our present teaching does some "of the sheer labor of preparing technically for creative work." My suggestion is that we do more than we have been doing in the hope that we may find better methods of discovering originality, in order that we may better create the atmosphere in which such talents may grow. We have already said that high scholastic performance is not a guarantee, though we will all first search the high group to find these qualities. My best suggestion is that we throw the student on his own resources more than we do. It is so easy to help over the rough places. In helping, let us not try to do all the student's thinking for him.

Original workers are capable of prolonged concentration; they have a keen appreciation and desire for new knowledge; they are capable of independent work; they have dissatisfaction with things as they are; they have a love for discovery; they can look at ideas and methods from a detached point of view; they can organize their ideas. We do not have time to suggest the many methods which may be used to discover these trends; we can only say, that if they are discovered, do not allow any method or technique to blunt them or cause them to dim and disappear.

Lawrence A. Hawkins gives the following description of Dr. Willis R. Whitney, first director of the General Electric Research Laboratory: (5)

. . . a personality that attracts, a mentality that commands respect, a character to inspire enthusiastic loyalty, and a wisdom to give full play to individual interests and abilities, such are Whitney's characteristics.

The difficulty is to depict the man himself. For pervading, unifying, and illuminating his other qualities—his friendliness, his mental vigor, his breadth of interest and knowledge, his stimulating originality, his delightful flashes of humor, his modesty, courage, directness, and simplicity—is an infinite charm which defies portraiture but which is felt at the instant of meeting him and which is increased and strengthened through the years of close association.

It may be difficult for one not possessing the qualities to help others develop them. My word to those in my position, is to search for teachers who are original and employ them, and to those who are doing the great work of teaching, examine your-

selves and determine whether you are original or not. If you can detect the quality, remember that it is the most precious commodity which may come from the college or university.

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OBSERVATIONS OF SOME MEMBERS OF THE GENUS *PHEIDOLE* IN THE SOUTHWESTERN UNITED STATES WITH SYNONYMY (HYMENOPTERA: FORMICIDAE)¹

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I have awaited publication of the recent important contribution by my colleagues, Drs. Creighton and Gregg (1956), concerning certain species of *Pheidole* from the southwestern United States before preparing for publication a number of my observations of southwestern *Pheidole*. The present paper lists previously unrecorded localities from which I have collected a number of the forms discussed in the paper by Drs. Creighton and Gregg. It also presents information on some other forms, my opinion concerning three complexes in the genus, and some suggested synonymy.

Pheidole cerebrosiar Wheeler

Arizona: Madera Canyon, Santa Rita Mts. (1 nest). Under a stone on a dry, grassy, gravelly, lightly timbered slope.

New Mexico: 4 mi. N. of Las Cruces (1 nest). At base of dead acacia root in sandy semidesert. This record extends the known range into southern New Mexico.

Pheidole pinealis Wheeler

Texas: Fisher Hill, Davis Mts. (type locality, 1 nest). Small colony beneath a stone on a moist shaded slope.

Pheidole titanis Wheeler

Texas: Fisher Hill, Davis Mts. (6 nests). Beneath large stones on a moist, lightly timbered slope. Both majors and minors were foraging in long trails.

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