Carl Emil Seashore, 1866–1949

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THE PROFESSIONAL LIFE THEME of Carl Emil Seashore, who for three decades was head of the Department of Psychology and dean of the Graduate College at the State University of Iowa, was a wholehearted devotion to scientific methodology in both theory and practice. Within a life span of 83 years he made distinguished contributions as a psychologist to music, acoustics, art, child development, vocational guidance, and higher education. Some of his contributions were additions to the field of applied psychology, but quite as important was his imprint upon contemporary university life. He originated or took part in many movements whose results are now taken for granted.

As a member of that forthright and challenging group of department heads and university administrators who were pioneers in American psychology, he was qualified both by ancestry and childhood environment. He was born January 28, 1866, at Mörlunda, Sweden. He came to America as an immigrant at the age of three, shortly after the close of the war between the states. His forebears were long-lived, emotionally stable, deeply religious people of the land. For them there was neither poverty nor riches. His parents brought him to Boone County, Iowa, where they lived as vigorous pioneers, with periods of prosperity and depression, which they took in stride as their blessings and hardships. The effect on him of frontier life can be best summarized in his own words: "Resistance to the cold, struggle against the elements in every way was an opportunity for overcoming difficulties and feeling success. This kept our blood red and our muscles firm and our appetites good" (*1*).

The study of philosophy was his objective when he entered Yale University as a graduate student at the age of 26. George Trumbull Ladd was the guiding light of the department of philosophy, and he was sponsoring experimental psychology as developed by a brilliant and enthusiastic young Leipzig graduate, Edward W. Scripture. The situation as it was presented to Carl Seashore was one of sharp contrast between the approach to psychology of a philosopher and that of an experimentalist. He greatly admired the systematic writings and lectures of Ladd, and at first he found himself objecting to the remarks of Scripture about "armchair psychologists." The logically valid theories might indeed be factually correct, Scripture had maintained, but until they had been verified under controlled conditions they were secondhand. Not until Seashore felt a need for doing independent work did he gain the perspective that was to remain unchanged the rest of his life. In two episodes he found a key to the difference between the sponsors and founders of American psychology. Approaching Ladd with a proposal to investigate the subject of inhibition, he was referred to a completed account in Ladd's book. Scripture's response was quite different. "Try it," he said. "I date the birth of my scientific attitude from that moment," Dean Seashore wrote later (*3*). It is significant that he elected to remain under the stimulating influence of Scripture for two years of training after he received his doctorate at Yale in 1895.

Carl Seashore came to the State University of Iowa as an assistant professor of psychology in the fall of 1897. He rapidly won recognition for his capability and his willingness to accept responsibility. In 1902 he was appointed full professor of philosophy and psychology, in 1905 he became head of the department and in 1908 dean of the Graduate College, in which capacity he served with honor and distinction until 1937. In 1942 he was recalled as dean *pro tempore* and spent the war years at tasks he knew well.

He more than carried his share of the weight in the formative period of psychology at the turn of the present century. Then, as in his later adventures, he was on the front line: building a laboratory, constructing his own apparatus, performing significant experiments, demonstrating by results in specific situations, in short, developing operational definitions of what Scripture had called the "new" psychology. It was this work that was given national recognition in 1911, when Dean Seashore was elected president of the American Psychological Association. Ten years later he was chairman of the Division of Anthropology and Psychology of the National Research Council. From 1933 to 1939 he was chairman of the like-named division of the National Academy of Sciences.

As it was crystallized in Seashore's lectures, books, and activities, the new psychology was one of a specific attack on some definite problem in the daily affairs of human beings. The hypothetical solution to the problem was made explicit as a program, whose testing was controlled by the specifications of a correlated project. Experimentation (in the laboratory, with "brass instruments," if appropriate) was a pre-

requisite. This version of the scientific approach to problems of human behavior reached fruition in diverse fields through the work of Dean Seashore. It matched his pioneer background, his developed cosmopolitan interests, and his rigid laboratory training.

The down-to-earth problems culminating in his programs and projects were found in the course of his experience. He sought out difficulties, enjoyed the challenge that they meant to him, and expressed joy when his or others' efforts led to accomplishment.

Many of his programs can be traced to experiences in his youth. An example is his beloved psychology of music, which he inaugurated as a project in 1910 and which became his primary research interest for the rest of his life. At Gustavus Adolphus College, a Swedish Lutheran college in Minnesota, he was a leader in musical activities. He organized a choir of forty members who were so enthusiastic that they were willing to pay for rehearsals. He earned part of his expenses as a graduate student by his work as church organist. One of his friends, a musician, had repeatedly told him that he had an unusually fine musical ear. Dean Seashore decided to test this opinion and went to work adapting a set of tuning forks for the purpose. Thus began a series of experiments that were to culminate in the "Seashore Measures of Musical Talents" in 1919, books on the psychology of music, published in 1923 and 1938, and more than 100 articles on various phases of music. He was an enthusiastic evangelist for this new field and produced many variations on its themes, each new publication bringing in up-to-date experimental material. Apropos of his policy of repeated publications, he told a story about a minister who preached the same sermon for a number of successive Sundays. When called to task by church members, the preacher asked "Have you started to practice it?"

His projects for higher education, placement examinations, the discovery and motivation of gifted students, sectioning classes on the basis of ability, and independent project work in elementary psychology also had their sources in his early training. His arithmetic teacher did not understand fractions, and young Seashore found that "if you read all the rules carefully and work all the examples yourself, you will not encounter any difficulty" (*1*). In his sophomore year, his mathematics professor realized his boredom in class periods, and excused him from attendance on the provision that he would do the work by himself and pass a rigid examination. Dean Seashore expressed his indebtedness to both of these teachers, who each in his own way had taught him that there were students who were capable of independent work, who needed only guidance, and who were handicapped rather than helped by compulsory attendance at repetitious lectures. Out of these considerations came one of the tenets in his programs for higher education, that of "keeping each student busy at his natural level of successful achievement" (*1*).

In retrospect, many of the propositions in Dean Seashore's programs turn out to be simple, disarming assertions. They played the role of axioms in his thinking, and perhaps could be called truisms. Often they were shown to have practical consequences that were contrary to accepted or at least to going procedures. He made these consequences explicit by organizing projects correlated with his programs, the truisms, and their consequences. Such was his procedure in the early twenties, when he campaigned, under the sponsorship of the National Research Council's Division of Educational Relations, as a champion of the gifted student. He lectured and conferred with the faculties of some 140 universities. He would introduce the topic by acceptable statements such as that of keeping each student busy at his natural level of achievement. It was not until he elaborated what the program entailed that he stimulated the debates that he believed necessary for the success of the project, which became known as "Seashore's Fourteen Points." He had the pleasure of seeing most of these points put into action on his home grounds.

Numerous consequences of the proposition that individuals differ in various capacities and abilities were put up for practical testing in Dean Seashore's projects. He insisted that the first step was to measure these capacities and abilities. The second step was to compare the individual's performance in life situations with his rating in the tests. We now can see that Dean Seashore's approach to applied psychology was partly an emphasis upon the determination of conditions that are necessary but not decisive for behavioral consequences. His tests for musical talents measured ability to differentiate pitch, loudness, temporal intervals, etc. Without ability to differentiate pitch above a specified level, one cannot sing on key, but it does not follow that having such an ability, one can sing on key. The tests, then, were to be interpreted as the determination of limiting rather than causal conditions for given musical behavior. Ability to differentiate pitch, for example, was declared irrelevant to piano playing, and ability to discriminate loudness was taken as a necessary condition for musical touch. He rejected all "omnibus tests of musical talent," his phrase for a test of general musical talent. Such a test was for him not a solution of a problem but rather an area for the location of difficulties, and a challenge for sharply focused, tangible discoveries.[1]

[1] The same approach is found in the Meier-Seashore art judgment tests and the art project captained by Dr. Norman C. Meier.

Dean Seashore did not stop with the formulation of a program and project, but was active in initiating, maintaining, and containing them. Each project was an addition to the university's activities, and it is to his credit that no project was ever started without adequate provisions for housing, equipment, and personnel. Another feature of his planning was his method of matching the man to the job. He always found a trained or trainable young man in the psychology department to whom both responsibility and authority could be delegated for a specific project. His emphasis in training was on explicit understanding of scientific method, rather than on piecemeal learning or incidental transfer effects from performing experiments. In this way he placed in the hands of the young psychologists a powerful set of tools for the administration of the projects, so that they felt at home in directing research work integrating the subject matter of different sciences in applied fields: music, speech, child welfare, otology, physical education, and clinical psychology. He believed that no one subject had as high transfer value as an explicitly formulated scientific methodology, backed by illustrative exercises in the laboratory.

In his work with young psychologists, Dean Seashore applied what had held true in his own experience, that for effective work both responsibility and a free hand within the limits of the project should be given. There was an implied understanding of mutual loyalty and a within-the-family viewpoint on differences of opinion. In addition, he recognized the need for generous administrative overhead that would permit freedom from instructional duties not directly related to the project and freedom from any requirement to find immediate application for research results. These goals were realized to the greatest extent in the child welfare research project, led by George D. Stoddard after the death of Bird Baldwin.

The infusion of psychological research into the life stream of human events was Dean Seashore's ideal, even at the risk that the research might ultimately lose its identity with psychology. It was early evident to him that any practical problem of people was not one that can be solved on the basis of a single science. "Ask one question of nature, and nature will ask you ten," was one of his favorite quotations, and the questions asked by nature did not come marked as physics, biology, or psychology. He recognized an operational meaning of the unity of the sciences, and that was in part the ground for his projects that led to the breaking down of departmental barriers. In his training programs for graduate students he made provisions for courses by specialists in other sciences: acoustics, anatomy, neurology, etc. The course in acoustics was given by George W. Stewart, head of the Physics Department and a collaborator on the gifted student project. Fundamental in Dean Seashore's thinking was the premise that psychological theory, even though not formulated in terms of the concepts of other sciences, is controlled in part by those concepts. In other words, he believed that scientific theories, however verbalized and whatever the problems dealt with, should be harmonious. It happened that some of the questions asked by psychologists had not been considered by other scientists, but some kind of a reply in their terms was basic. One instance that reflected Dean Seashore's point of view was the stuttering project in the psychological clinic, under the direction of Lee Travis. The cerebral dominance theory of stuttering, although it was in the field of neurology, called for testing before the less rigidly formulated emotional theories; but it turned out to be highly restricted, and the field was left open for the latter theories. To Dean Seashore, this was just another example of the way in which science progresses by the elimination of originally plausible hypotheses.

Dean Seashore was alive to the necessity of operational controls, for which he made a number of operating rules. One was: Take one little thing at a time, step by step. Resist the tendency to dabble with a problem, spread it out too rapidly, and rush into publication. This rule is applied in his little book on elementary experiments in psychology, which led the field for twenty years.

Another operating rule in the translation of a program into a research project was, in his own terms, "never to count noses" (*3*). The immediate popularity of a project was irrelevant, and he made no attempt to be all things to all men. Fundamental research was dominant over service and instruction. The same battle was fought without compromise in nearly all of the projects.

It is clear why Dean Seashore placed so much emphasis in graduate training upon the pioneer concept of personal sacrifice in scientific work. (He made this principle the subject of an article in the October 1948 issue of the *American Psychologist.*) Each rule was a restriction, suggesting self-control. From his work in the laboratory on the Measures of Musical Talents, he developed an appreciation of the necessary disparity between the psychological vistas that he described so easily and vividly and the long and arduous work required for the verification of small crossroads in the complete panorama.

"We are in no hurry, we have all time," was one of his propositions that served to steady the highly motivated people who were responsive to outside pressures for immediate results (*1*). The slogan first appeared in Washington when he was chairman of the Division of Anthropology and Psychology in the third year of the organization of the National Research Council. Of the effect of the slogan he wrote (*1*): "This acted as a damper upon numerous efforts to give tone to the Council under the pressure of temporary and sporadic influences and gives some consolidation for the feeling that during those first years the Council was not accomplishing as much as it might." In other situations he ventured an even more general opinion—that beyond a dialectical point in pressure to accomplish, additional pressure results in a reversal of accomplishment. For the background of his attitude toward time, once more we look to his formative years. In his academy work at Gustavus Adolphus College, he recalled that "As a result of having to make the first two years of Latin in the academy under the 'stick' of a teacher, Latin failed for me" (*1*). It was with a different kind of a stick that Dean Seashore found an antidote for overconcentration on problems, and his golf game was remarkable even in later years. He rarely talked shop on an afternoon off.

The "rising scale" about which he often spoke in connection with the life of psychologists also describes his professional output (*3*). The number of publications, starting in 1893, in units of ten-year periods, increased up to the time when he returned to administrative duties during the last war. His greatest yearly output began in 1937, the year following his appointment as dean emeritus. A small proportion of his contributions are found in the standard psychological journals. When he wrote on a subject of interest to several sciences, he published his work in *Science* and *The Scientific Monthly*. Other contributions were made directly in the channels of the field to which psychological methods were applied. The terminology he used was often a compromise between that of psychology and the related fields, either basic or applied. His style was lucid and affirmative, and in his nontechnical writing he used the first person with conversational freedom. He described his programs as potentialities and challenges for research, writing from the point of view of an administrator who was close to the operating states of affairs. It was not until his later years that he took cognizance of technical misunderstandings of his writings. In 1942 he wrote of his program for the psychology of music: "These statements do not mean that psychology has accomplished all these things, but rather that the way has been paved" (*2*). He cooperated with the public press, and welcomed interviews with newspapermen on programs, projects, and specific studies.

Dean Seashore regarded the handling of graduate students' personal problems as a primary part of his work as dean. He was quick to recognize a problem and took the initiative in bringing it out into the open. At the same time, where a project was involved it came first, and personal difficulties were to be solved without any change in the work. In other contexts this might have been an unsuccessful approach, but in the setting of all the other adequate provisions for the testing of the programs it was quite feasible.

In his programs graduate students were encouraged to construct their own makeshift apparatus. Dean Seashore designed or collaborated in the design of many pieces of original apparatus: a tonoscope, a loudness audiometer, the Iowa pitch range audiometer, phonophotographic apparatus, the Iowa piano camera (with Joseph Tiffin), to mention the more important ones. Emphasis was on simplicity and adequate controls, and looks did not count.

The training of graduate students in the psychology department, then, was highly specialized in terms of a problem in an applied field, such as music, speech, otology, and education, and the problem was approached by coordination of psychology with basic sciences. The training was generalized in terms of scientific methodology. An interesting consequence was the frequency with which the graduates were offered positions throughout the country in both applied and basic subjects. When Dean Seashore relinquished his departmental headship, Iowa's Department of Psychology had become one of the leaders in numbers of Ph.D.'s granted, but as a result of the cosmopolitan training, many graduates in their professional pursuits found themselves in a somewhat ambiguous relation with psychology proper. Some of Dean Seashore's students struck out for themselves—the most distinguished men of this group are Walter Miles and Daniel Starch.

One of his sons, Robert, has followed his trail and is chairman of the Department of Psychology at Northwestern University (*2*). Carl, Jr., is a professor of engineering. The career of Marion was tragically cut short when he died in attempting to save a friend from drowning. His talented and kindly wife, Roberta Holmes, whom he married in 1900, died two months before Dean Seashore's death, which occurred on October 16, 1949, at the home of his son, Sigfrid, an attorney in Lewiston, Idaho.

Some of us were fortunate to be close enough to him to share a few of his hardships and blessings. Our appreciation of the man and his works increased

steadily through the years. He helped others far more than others helped him.

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Technical Papers

An Agglutinin in Normal Sera for Periodate-treated Red Cells[1]

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In confirmation of the observation of Burnet (*1*), we found that periodate ions rendered red cells panagglutinable. We have extended this finding with the observation that the agglutinin for periodate-treated red cells (PTC) is distinct from the agglutinin for red cells rendered panagglutinable by the filtrates of cultures of *Vibrio comma* (VTC) (*11*). Experiments demonstrating the specificities of these agglutinins are presented and the significance of the finding is discussed.

Saline-phosphate buffer at pH 7 (*9*, p. 104) was used as a diluent and washing medium. Two percent suspensions of washed human red cells were treated with an equal volume of 0.001 M potassium periodate (in buffer) for 30 min at room temperature. The cells were centrifuged and washed three times with volumes of buffer each equal to four times the volume of the original cell suspension. The washed, treated cells were made up to a 1% suspension for testing. This procedure of treating the red cells with periodate permitted the maximum action of the periodate with minimum damage to the cells. Little or no hemolysis occurred with this treatment, whereas longer treatment or the use of more concentrated periodate solutions caused extensive hemolysis without increasing the panagglutinability of the treated red cells. *Vibrio comma* (Strain 4Z)[3] was grown in 2% Trypticase[4] broth (plus 0.5% sodium chloride) for 20 hr at 37° C and then passed through a fritted glass sterilizing filter. The red cell suspension was treated with the filtrate in the same manner as with the periodate, except that the mixture stood 1 hr at room temperature. No increase in the panagglutinability of the red cells was observed if the enzyme acted on them for a longer time at room temperature or at 37° C.

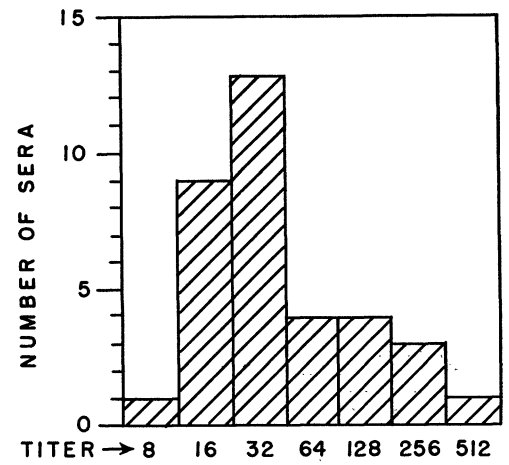

FIG. 1. Periodate agglutinin titers 35 normal human sera. sera.

PTC were agglutinated by all adult human sera tested. PTC were also agglutinated by their own serum. Two drops of the treated cell suspension were added to two drops of twofold serial dilutions of serum and, after standing at room temperature for 30 min, the mixture was centrifuged for 30 sec at 2,000 rpm on a clinical centrifuge. The tubes were gently rotated to dislodge the agglutinates and then read; the highest dilution of serum which gave macroscopic agglutination, e.g., many large clumps with few free cells, was considered the end point. Thirty-five sera from apparently normal individuals were tested with PTC and the results are presented in Fig. 1. Type O cells were used; the untreated

[1] After this article was submitted it was learned that F. S. Stewart (*10*) also noted the difference between periodate and T agglutinins. Since the article was written it has been found possible to render red cells agglutinable by filtrates of cultures of *Staphylococcus aureus, S. albus,* and *Streptococcus pyogenes.* Cells treated with *S. aureus* filtrates were agglutinated by all sera tested; those treated with *S. albus* and *S. pyogenes* filtrates were agglutinated by most, but not all sera. The agglutinin for cells treated with *S. aureus* filtrates is different than the periodate or T agglutinin; the one or more agglutin for cells treated with *S. albus* and *S. pyogenes* filtrates appear to be related to the others in a manner that is not understood at the moment.

[2] Public Health Service Postdoctoral Research Fellow of the National Heart Institute.

[3] We wish to thank Dr. B. A. Brody for this culture.

[4] Baltimore Biological Laboratories.