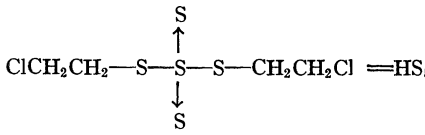
Current status due to Fuson, et al. (*6*): The Edgewood Arsenal postulates were summarized (*8*, *10*) in June 1943. Intensive work on the isolation and properties of the polysulfides in Levinstein H was undertaken not only by Fuson's group at the University of Illinois but also by British investigators. Both sets of investigators reached the conclusion that HS_2 does not sulfurize readily (the basis of the Edgewood theory) but that HS_3 does add sulfur easily and is the structurally important unit among the polysulfides:



Fuson (and British workers) assume that the —S—S—S— unit in HS_3 adds more sulfur at the central atom. The polysulfide generally present in highest concentration in Levinstein H newly made is HS_7, but all these higher polysulfides lose sulfur readily down to the stable HS_5 level with is illustrated here. This new conception is quite different from the well-known Thiokol two-in-line structure described earlier in this article.

The Edgewood theory assumed that polysulfides of H are built up on the HS_2 unit. Fuson, in experiments designed to find out how HS_2 disappears in the Levinstein process, discovered that it reacts with sulfur monochloride to yield S_3Cl_2 as a most important product. This reacts with ethylene in the Levinstein process

$$2C_2H_4 + S_3Cl_2 \rightarrow ClCH_2CH_2S_3CH_2CH_2Cl$$

and the HS_3 is sulfurized by the S_2Cl_2 present to higher polysulfides. For further details on a brilliant piece of work the reader is referred to the papers by Fuson and his associates (*6*).

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Starring in *American Men of Science*

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IN 1903 J. McKEEN CATTELL, THEN PROfessor of psychology at Columbia University and editor of *Science*, undertook to prepare a list of the 1,000 most significant living American scientists. The methods which he used were, in brief, as follows:

Ten outstanding leaders in each of 12 sciences were asked to list in order of merit the leading research scientists in their science. These 120 judges were well distributed geographically, represented several different educational institutions, and were considered to have good judgment. From their lists, Cattell worked out the average rank of each of the scientists voted upon. The number selected in each science to make up the 1,000 was approximately one-fourth of the number of such scientists then productive in America. Biographical sketches were obtained of all the scientists of 1903 judged worthy of sketching in a biographical directory. When the first *American men of science* was published in 1906, asterisks were inserted to indicate the 1,000 leaders. The directory proved so widely useful that later editions were issued in 1910, 1921, 1928, 1933, 1938, and 1944. These successive editions contained an increasing number of sketches—approximately 4,000, 5,500, 9,500, 13,500, 22,000, and 34,000, respectively.

For the second edition, voting on starring was done by all living starred scientists who would cooperate. For subsequent editions, all those nominated by a number of persons as meriting starring also were asked to vote.

The decision as to which fields of work were to be recognized by the starring of leaders was made personally by Cattell. He chose anatomy, anthropology, astronomy, botany, chemistry, geology, mathematics, pathology, physics, physiology, psychology, and zoology. Thus, even the most eminent workers in other fields were not eligible for a star. Moreover, a man who worked between well-recognized fields—in biochemistry, geophysics, or astrophysics, for example—or whose work overlapped two or more sciences, as does that of many ecologists and biologists, was rarely starred unless highly distinguished.

Another arbitrary decision made by Cattell was that few workers in applied or "practical" sciences were classed as meriting sketching in *American men of science*. This is significant because in 1903 the number of persons to be starred in any field was, it will be recalled, approximately one-fourth of the number judged worthy of a sketch in the directory.

An especially significant decision by Cattell was that during his lifetime (he died in 1944) no change should be made in the system of starring after the third edition, and that new stars should be added only in such numbers as to preserve the percentages assigned to each science in 1903. Thus, there was no adjustment to the differential growth of the several sciences. Because the number of scientists grew much more rapidly than the number of stars allowed, the proportion of scientists starred has decreased rapidly. (One thousand were starred in 1903 and approximately 250 for each later edition except the third (1921), in which 351 were starred.) For example, in 1943 about 34,000 scientists were judged worthy of sketching, but only 256 were newly starred, or approximately 1/32 as many as there were scientists newly sketched in *American men of science* since the previous starring. The total number of scientists newly starred in the fourth to seventh editions, inclusive, was about 1,000, or only 1/25 of the number who attained in those years sufficient scientific standing to be judged worthy of sketching.

In brief, while in 1903 about one-fourth of the scientists were starred, in 1943 fewer than 1/25 of those who were not elderly were starred. In some fields—chemistry, for example—less than 2 per cent of the research workers under age 60 were starred, as against about 25 per cent in 1903.

Another unfortunate consequence of using almost the same basis for starring for nearly 40 years resulted from the multiplication of scientific publications. Because of the much greater output and specialization, few men are now competent to evaluate the work of any large share of the younger men in their science. Most of the 12 sciences of 1903 now have several well-separated divisions, some of which include more active research workers than the entire science had in 1903.

On the Significance of Starring

Despite imperfections of methods of starring, it is considered by numerous competent men to have been a notable contribution to scientific progress. The following summary, from a study of starred psychologists (*Amer. J. Psychol.*, 1939, **52**, 278–292), is quotable in this connection:

> Cattell's inauguration of the system of starring the leading research workers in each of 12 fundamental sciences is considered by competent judges to have been a major contribution to the growth of research in America.

The star indicates that, in the private opinion of his peers, the starred scientist is distinguished for research. It implies either a large volume of good work or a considerable amount of especially original work. Of course it does not imply that the work done by others is not decidedly worth-while, but merely that it has not impressed the voters as quite so worthy of approbation.

The star is a recognition which not only gives the recipient satisfaction, but also increases his opportunities. It is a challenge to the recipient to continue his good work and to others who aspire to win this recognition. Vast amounts of good work have been completed as a result of this friendly rivalry. Many scientists who are not starred feel confident that they are "as good a man as . . . " and consequently set out to prove it.

The good that starring does is increased by the widened knowledge as to who are starred and why. This widened knowledge not only encourages and puts the starred men more fully on their mettle, but it also attracts attention to their work and increases their opportunities for further research. It, moreover, augments the opportunities of promising persons not starred in the hope that, as a consequence of encouragement and improved facilities, they will win this coveted recognition. The various universities employing starred scientists are placing increased value upon this recognition as a proof of individual merit and institutional strength. They not only attempt to retain and attract men already starred, but also to have local men not yet starred win this high honor; to this end they often increase facilities and otherwise encourage their more promising men.

Among the 770 starred scientists whose replies to a recent questionnaire expressed opinions as to the influence of the star on their own careers, nearly three-fourths reported that the star "improved their status" (231 slightly, 141 moderately, and 34 notably). Most of the 160 who reported no improvement were starred late in life. (A considerable number specifically stated that their stars came too late.)

More than three-fourths of those reporting considered that "starring has in general been beneficial" (135 slightly, 286 moderately, 142 notably). Only 6 considered starring harmful.

The Desirability of Broadening the Basis for Starring

According to nearly nine-tenths of those replying, starring would be beneficial "if in the future stars are awarded to the top 10% of the workers active in research in numerous fields (not only the present 12), by secret vote of the top third or so of the active workers in that field." (One hundred twenty-five voted "decidedly beneficial," 185 "moderately," 145 "slightly." Only 57 considered it would be inconsequential or undesirable.)

The increased specialization, which is almost unavoidable as knowledge accumulates, makes it increasingly desirable that those persons who are qualified to judge the merit of achievement in any particular field do so.

The secret balloting by competent experts should be extended to numerous additional fields. Aside from the encouragement that such recognition affords, another major advantage of such rating by secret ballot of those high in a wide variety of fields is that it increases the prospect that those who are judged outstanding will be given better opportunities to use their special talents and skills in the making of a better world. This happens partly because universities and other institutions dedicated to human betterment actively desire assistance in locating persons of especial merit so that they can obtain their services. Hence, the extension of starring to numerous fields not now represented would be highly advantageous and would certainly result in increased achievement.

Not only have nine-tenths of the 770 starred scientists who recently voted on the matter approved of a broadening of the basis for starring and expressed the conviction that the consequences would be advantageous, but large numbers of nonstarred scientists and persons who employ scientists have expressed similar opinions. It therefore appears that in the eighth edition of *American men of science*, now in preparation, many more persons should be starred than in the previous editions. Moreover, the voting should be done in fields small enough so that those selected to vote are better qualified to rate the younger workers than is possible when the fields are large and diversified (all of zoology, for example, or all of chemistry). This will mean extra work for those who arrange for and assemble the votes and for the publishers, but the benefits should abundantly justify the extra efforts.

NEWS *and Notes*

The Army's electronically-controlled C-54 recently used to demonstrate pilotless flight across the Atlantic was first developed early in 1946 and since then has been used on many shorter hops within the United States. From the time the flight commander, Col. J. M. Gillespie, set the automatic controls into action on the runway of the Newfoundland airport at Stephenville, it was not necessary for him or his crew to direct the flight in any way. Signals from two radio transmitters, located on ships at sea along the course of the flight, were interpreted by the plane's radio compass, and a third set of signals from a transmitter on a truck at the British airport brought it in for an automatic landing.

The 14 passengers making this initial flight included several U. S. scientists and an observer from the RAF.

About People

S. H. Katz, senior consultant, Chemical Corps Technical Command, Army Chemical Center, Maryland, is visiting England and Germany to investigate work on Chemical Warfare Protective Equipment. His investigation will cover materials, manufacturing processes, testing, and the theoretical aspects.

Allan D. Maxwell, formerly of the Nautical Almanac Office, U. S. Naval Observatory, has been appointed professor of astronomy, Howard University, Washington, D. C.

R. L. Meier, research chemist, California Research Corporation, has been appointed executive secretary, Federation of American Scientists, Washington, D. C., for one year to succeed **William Higinbotham.**

Arthur B. Bromwell, Northwestern University, was appointed secretary, American Society for Engineering Education, effective October 1. The headquarters of the Society will be moved from the University of Pittsburgh to Northwestern University.

Bowen C. Dees, assistant professor of physics, Rensselaer Polytechnic Institute, has been appointed physicist, Economic and Scientific Section of Gen. MacArthur's organization in Tokyo. In this position, Dr. Dees will survey and advise concerning the physical research being conducted in university and commercial laboratories in Japan.

Marjorie T. Bingham, formerly botanist, Cranbrook Institute of Science, has been appointed assistant professor of biology, Northern Michigan College of Education, Marquette.

C. Lee Huyck, professor and head, Division of Pharmacy, Columbia University College of Pharmacy, has resigned in order to become director, Department of Pharmacy, Howard College, Birmingham, Alabama.

Jacques Rousseau, director, Montreal Botanical Garden, has recently returned from a botanical survey in the interior of the Ungava Peninsula. Dr. Rousseau traveled by canoe from the source of George River to its mouth and crossed that peninsula from Seven Islands on the St. Lawrence River to the Ungava Bay.

Alexander Brunschwig, formerly professor of surgery, University of Chicago, has been appointed head, Department of Surgery, Memorial Hospital, Center for Cancer and Allied Diseases, New York City. Dr. Brunschwig also holds the concomitant appointment as professor of clinical surgery, Cornell University Medical College.

George A. Edwards, Harvard University, has been appointed assistant professor, Department of Biology, Tufts College, Medford, Massachusetts.

Frederick C. Frick, Columbia University, and **Moncrieff H. Smith,** Stanford University, have been appointed instructors in psychology at Harvard University.

Ethel Melsheimer Miller, librarian of the Botany and Zoology Library, Ohio State University, and of the Ohio Academy of Science, retired September 30. Mrs. Miller established the Botany and Zoology Library in 1917.