pot, and then should let them grow there so long, untill he had successively by little and little, gotten an hundred weight of them, hee would finde the earth but very little diminished, when he came to weight it againe: by which he might gather, that all the aforesaid herbs, had their weight from the water. Therefore the waters being ingrossed (or impregnated) in the earth, attracted a terrestreity, and by the operation of the Sunne, upon the Herb were condensed (or were condensed into an Herb.) If these Herbs bee then burn't to ashes, mayest thou not guesse by the diversity of the weights of all: How much earth thou foundest more than the hundred weight, and then conclude that the water brought all that? For the Elements are convertible one into another by parts, as we finde by a glass put into the snow, where we shall see the aire condensed into Water and flowing in the glass. So wee finde by experience, that some water is turned into stones, as some is into Ice; and there is in some fountaines a hardening and petrifying vertue, which turns the things that are put into them, into stone. For so say they, there is a certain water found in *Hungary,* which through the power of the vitriall which is in it, turneth Iron into Copper; for by such powers and vertues, it is manifest that the waters are not purely elementary, but elementated. And it were pleasant to have the weights of all these waters, of such divers vertues, that by the diversity of their weights in aire & oyle, one might come the nearer to the conjectures of their vertues.''

Whether Cusanus actually performed one or more specific experiments with plants of the type indicated probably can not be certainly determined. It is obvious, however, that he had a true concept of experimental method long before any one else is known to have put it to trial, so far as botany is concerned. That he probably did actually perform many tests with balances seems indicated by the circumstantiality of the phraseology. This opinion seems further confirmed by the fact that this plant experiment was not merely alone; the text contains others so factually correct that they practically eliminate the possibility that his citation of them may have been due to *a priori* reasoning. Two others are given below for their evidence of Cusanus's objective and inductive point of view.

Orator. ''Might not the breath of a man be so weighed?''

Idiot. ''There is one weight of the same man, when he draws in or holds his breath, another when he breathes it out; one weight of a man whilest he lives, another when he is dead; And so in all living things. And therefore it were good to have these differences noted, in divers living things, and divers men, and divers ages of men, that so by conjecture, a man might ascend to the weight of the vitall spirits.'' . . .

Orator. ''How may the strength of a man be known by this means?''

Idiot. ''Make a paire of scales even, then let a man lay hold of one of them, and in the other put as much weight as he can by the utmost of his strength pluck up from the ground till the balance be even: (which will be found more true (say I) if he have a rest to stay one or both his feet against) then take the weight of that which he hath pulled up, and deducting the weight of the man himself, all the remainder of the weight is portioned to his strength.''

When all the circumstances are considered, the question of credit for the first experiment in plant physiology seems to be resolvable about as follows: The works of Cusanus were extant and perhaps fairly well known in the seventeenth century, but his chief reputation then, as to-day, came from his contributions in the field of cosmology and philosophy, known from his influence on Giordano Bruno. In his experimentation, he had been so far ahead of his time that little attention had been paid to such matters of precision. By the seventeenth century, however, the intellectual soil had been cultivated further. Harvey had demonstrated the circulation of the blood. Francis Bacon had strongly advocated the use of the inductive method, and in his Sylva Sylvarum (1627) had described "ten centuries" of experiments, including not a few in plant physiology. Some of these are given in general terms, like the Cusanus account above, but others are as circumstantial as the Van Helmont experiment, and some even include carefully stipulated controls. Botanists will find in this Bacon work the forerunners of a variety of plant experiments. Since Sylva Sylvarum, published posthumously, antedated Van Helmont apparently by twenty-four years, it would appear that the question of priority for the first experiment in plant physiology lies between three men, rather than between two, with Van Helmont probably third in the series.

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METHOD OF ENTRANCE OF CERTAIN FISH INTO AN ESTUARY

THE factors responsible for the migration of fish into an estuary are not as yet fully understood. Various theories, some of them incorporating an "instinctive" behavior, have been put forward to explain certain phases of these migrations, but scientific investigation tends to discredit such theories, and places instead great importance on the influence of certain purely environmental factors.[1,2,3,4]

The mouth of the five-mile long tidal part of the Margaree River in Nova Scotia is of such a nature that it offers an excellent opportunity for studying the passage of certain fish into and out of the estuary. The common estuarine fish of this river is the stickleback, *Gasterosteus aculeatus,* and large numbers are

[1] A. G. Huntsman, SCIENCE, 85: 313–314, 1937.
[2] E. B. Powers, *Publ. Puget Sound Biol. Sta.,* 3: 1–22, 1921.
[3] V. E. Shelford and E. B. Powers, *Biol. Bull.,* 28: 315–334, 1915.
[4] H. B. Ward, *Ann. Mag. Nat. Hist.,* 10: 6, 18–36, 1930.

carried from the estuary periodically with the outflowing tide. They gather at the ends of the breakwaters forming the narrow harbor mouth, and eventually, when the strength of the current has decreased sufficiently, make their way against it back into the estuary.

Two of the factors found to influence the entrance of sticklebacks into this estuary are (1) current and (2) low salinity, or something associated with it. Lyon[5] has described the orientation of fish in a current, and states that the normal tendency for a fish is to orient itself against the direction of current flow. Sticklebacks at the mouth of the Margaree exhibited just such a behavior. If they left their position in slowly moving water at the end of the breakwater to breast faster currents emerging from the river, they were carried back out again, but if the velocity of the outflowing water was not more than 1½ feet per second, their "cruising speed" was sufficient to take them into the harbor. At the turn of the tide, when the water became motionless, their orderly orientation was destroyed. With the commencement of the flooding tide, fish were seen to turn about and, stemming the current, make their way out of the estuary, which recalls Rutter's[6] account of the behavior of migrating quinnat salmon in San Francisco Bay. Such actions suggest the lack of any purposeful behavior in the migration of these fish, for they might be expected to swim in and regain their natural habitat at such times when entry could be most easily accomplished.

Sticklebacks at the mouth of the estuary were found to be attracted by river water. At the end of one of the breakwaters, they were frequently subjected to a second current of water in addition to that flowing from the estuary. Depending upon the direction of the wind, this second current consisted either of salt water from outside or of fresher river water which had left the estuary a short time before. In the latter case, fish would enter it in much the same manner that they breasted the current from the river, even though it did not lead into the estuary. When it was salt water that produced the current, fish shunned it. The results of an experiment performed with sticklebacks in a trough, in which they were subjected to currents of fresh and salt water of the same temperature entering at one end, gave added support to the indication that river water is attractive to these fish. Of the three dozen individuals used in the trough experiment, there were always twice as many fish in the current of river water as there were in the salt. *Menidia* and *Fundulus* reacted similarly. Whether the influence of the fresher water was due merely to its lower salt content or perhaps to the fact that it contained materials from the land was not determined.

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COMPOUND WORDS IN PRESENT-DAY ENGLISH

I WONDER if philologists and students of style have noticed that, at least in scientific writing, the English language is rapidly acquiring a facility in forming compound words comparable to that possessed by ancient Greek and contemporary German? Such is undoubtedly the fact. As yet, our technique is rather awkward; the elements of a compound are written as separate words, and the resultant construction, if taken literally, would often defy parsing. But its essential nature is quite clear.

The new usage seems to be wholly unpremeditated and instinctive. There is something in the air; though trained in quite different methods, I find myself unconsciously eliminating prepositions and compressing phrases into compound words.

Thirty years ago every one, probably, would have written "Department of Biology." Now half the colleges in the United States have "Biology Department," or the like, on their stationery. Certainly, thirty years ago no one would have put forth such a title as "Cost Analysis of Scholarly Periodical Printing." Then it would have read: "An Analysis of the Cost of Printing Scholarly Periodicals." In time, as we become more definitely conscious of what we are doing, it may read: "Costanalysis of Scholarlyperiodicalprinting."

The whole phenomenon may serve as an illustration of the mysterious manner in which changes in language (and some other things) take place. Learned men in any number might have argued for years that compounds were convenient, concise and generally desirable in English, and have produced no more effect than have the advocates of "reformed" spelling. But, all at once, there comes some sort of inner urge—some mental epidemic—and the thing is done.

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SCIENTIFIC WORK OF THE TENTH SOKOL FESTIVAL

THE Sokol is a national movement conceived in 1862 by Dr. Miroslav Tyrš, lecturer in the history of art at the Czech University in Prague, as a means of stimulating the cultural and political regeneration of the Czech people. Abroad it is recognized largely as a gymnastic organization, but behind the pageantry

[5] E. P. Lyon, *Amer. Jour. Physiol.*, 12: 149–161, 1904.

[6] C. Rutter, *Bull. U. S. Fish Com.*, 22: 65–141, 1902.