seminar of the Yale Medical School. While in New Haven he was the guest of Dr. Harvey Cushing.

DR. RONALD A. FISHER, Galton professor of eugenics at University College, London, delivered two lectures at Yale University on October 27. The first was before the Neurological Study Unit of the Yale University School of Medicine on "Purpose of Design in Experimentation." The second was a Woodward lecture entitled "The Rôle of Genetical Mutations in Evolution." Dr. Fisher lectured at the University of Minnesota on October 19 and a few days earlier at the University of California.

DR. D'ARCY WENTWORTH THOMPSON, professor of natural history at the University of St. Andrews, Scotland, president of the Royal Society of Edinburgh, is giving a series of six Lowell lectures in Boston on "Growth and Form in Plants."

DR. FLORENCE DE L. LOWTHER, professor of zoology at Barnard College, was the guest of honor at the Barnard College Club on November 5. Dr. Lowther, who recently returned from the Belgian Congo, described her experiences and showed motion pictures taken on the trip.

DR. LINUS PAULING, professor of chemistry at the California Institute of Technology, on November 4 addressed the University of California at Los Angeles Chapter of the Society of the Sigma Xi on "The Use of Magnetic Methods in Chemistry."

THE two hundred and ninth regular meeting of the American Physical Society will be held in Chicago on Friday and Saturday, November 27 and 28. On Friday evening, November 27, there will be a joint dinner with the Chicago Physics Club held at the International House, on the university campus. At this dinner Dr. K. K. Darrow, of the Bell Telephone Laboratories of New York, will speak on "Spinning Atoms and Spinning Electrons."

A WIRELESS dispatch to *The New York Times*, dated November 14, reports that Dr. Willi Menzel, professor of armament technique in the Berlin Technical Institute at Charlottenburg, has been appointed director of the German Central Association for Scientific Research, to succeed Dr. Johannes Stark, formerly professor at Würzburg. Dr. Menzel has been for two years head of the research department of the National Socialist Ministry of Education. The association controls the funds available for research work in Germany. Dr. Menzel is said to have published recently an article attacking theoretical physics as developed by Dr. Einstein and other distinguished Jewish men of science.

DISCUSSION

ANOTHER NOTE ON SCIENTIFIC WRITING

MR. URBACH deplores the prevalent low standard of scientific exposition.[1] He complains about (a) verbosity, (b) the circumlocutory passive and (c) mixed figures of speech. His examples convince him and me, but they may not convince their authors and the majority of the publishers of research. And, if there is a difference of opinion, who is right? Doubtless he has found that many persons will not accept his editorial dicta and that he often has to validate against dissent his claim that one form is better than another. So what determines *good* and *bad*? Usage? Hardly. It is scientific usage which Mr. Urbach seeks to improve. Plainly we need to find a principle of validation.

We can not have rules. All cases are debatable, and there is no dictator to hand down decisions. What we need is a clear recognition of the purpose of scientific writing, and then perhaps we may hope for agreement on the principle that the best writing is the writing that most nearly fulfils its purpose. The purpose of scientific exposition, surely, is publication, and what is in the writer's mind becomes public only when many other persons read and understand him. Research, we are told often enough, is not complete until it is published, but we need also to be reminded that the badly written report may find no public because it is too forbidding to be read. Thus it would not be truly published at all. The writer needs to have his public in mind as he writes.

To have his public in mind, to be writing to a definite audience, is a specific mental attitude on the part of the writer, an attitude which, if developed with skill, solves—and here lies my thesis—all the problems which Mr. Urbach raises. There seems to be no good word for this attitude. *Benevolence* and *altruism* are much too pompous, though etymologically exactly right. The absence of *egoism,* the opposite of what the Freudians call *narcissism,* is what I have in mind. The successful expositor thinks about his audience and forgets himself in his eagerness to guide the growth of thought in their minds. That is the goal whose approximation would prevent Mr. Urbach and me from writing notes about scientific writing, and yet how often the researcher thinks he has accomplished his purpose when he puts an idea behind a barrier of confusing verbiage.

[1] W. F. Urbach, SCIENCE, 84: 390–391, October 30, 1936.

Let us apply this "contra-narcissistic" principle to the standard cases and see what happens.

(1) First there are the mixed figures. In them we have a problem of usage and of the prevalence of visual imagery. The novel figure should arrest attention and render the idea vivid. If the figure is mixed, then the alert visualizing reader will at once see an incongruity, and his attention will be diverted by puzzlement or amusement. That is what is the matter with *the ultimate consumers for the body of biological knowledge* (Mr. Urbach's instance): the visual image is either humorous or offensive and in either case it is not illuminating. The reader who is not visually minded may, however, take this phrase as graceful since it is enriched by extrinsic allusion. The answer to the question as to whether the phrase is bad lies not in any absolute dictum about mixing, but in the relative proportions of help and hindrance that it introduces into the comprehension of an idea by the intended audience.

A good figure gets repeated. First it becomes a cliché. Ultimately it becomes a new meaning for a word, and the meaning is put into a dictionary. With repetition the visual imagery tends to drop off. Only the alert stylist objects to the cliché, and no one objects to new meanings after usage has justified them. We write: *This stimulus is far below the threshold.* I defy any one to visualize that figure and get thereby the intended meaning. Vertical doorways have thresholds; trap doors do not. The prepositions for threshold should be *outside* and *inside,* or *before* and *beyond,* but it is easy to see how usage has justified this mixed figure that will not be visualized. Low values of the stimulus are *sub*liminal, and the depths of the unconscious are far below the threshold of consciousness. A figure that is bad when visualized becomes good when usage strips it of its visual context. The author must estimate his audience in respect of visualization and familiarity and write accordingly, if he is to achieve maximal *public*ation.

(2) What is the author to do when he is describing events of which he himself is the agent? Is he to say *I, we, the writer, one,* or does he drop into the circumlocutory passive? No grammatical rule can be adequate to this problem. The admonition to write so skilfully that the problem does not arise is lost on the untrained writer. Yet there is one rule that works very often; it is this "contra-narcissistic" principle. If the author will get his attention off himself and on his readers, if he will forget his own personal activities and begin to talk about facts as a function of method, he will find that half of these difficulties never arise. It is his own preoccupation with himself and the difficulties of his research that make him so personal. Sometimes it is his fear that his results will not stand generalization that makes him limit himself to the minutiae of the particular—the truth as it stood for him on Wednesday afternoon, the 18th. I do not mean that he should obscure the particular in his generalizing, but only that he should be thinking about the generalization because it is all that most of his readers wish to get from him.

In the other half of the cases the author must ask himself: What would my readers prefer? It is simplest to say *I* for the author, *we* for joint authors, and *we* for the single author and his reader having a communal idea. *We* for the single author offends many persons, because there is no visual image for it, short of majesty. The *New Yorker* uses this *we* to achieve humor: "we ourself." The passive irritates the reader who wants clear direct diction. So also does the too frequent use of *I*. It is entirely a problem as to when *I* is egoistic! It is plain that the reader expects more deference and fewer *I*'s from the young author than from an older, well-known writer, but my own judgment is that even the young writer may safely use *I* if he really feels a deference for his reader. And why should he not, since the existence of his public is a necessary reason for his research? The altruistic principle here reduces to a matter of good manners. The first person singular will not offend if it is used modestly.

(3) No argument is needed about verbosity and circumlocution. They are bad because they effect the author's purpose poorly. The reader's comprehension is convenienced by the direct terse statement, and the reader's comprehension is the author's only purpose.

(4) What about the adjectival noun that is common in scientific writing? Is it bad? May one say *maze learning* without a hyphen, or *dementia praecox patient?* And, when these patients learn mazes for experimental purposes, is it all right to say *dementia praecox patient maze learning?* And, if not, where is the threshold *beyond* which safety lies? It is mostly a question of what offends the reader's taste, and his taste is arbitrary and irrational. English is not German, but probably most scientists accept a single adjectival noun without interruption of the flow of thought, and certainly many accept two adjectival nouns connected by a hyphen. Clarity suffers when there are too many because it is then not clear what modifies what. The author must guess how his style will be related to the readers' comprehension and taste. In general, however, he offends less against clarity or taste when he avoids the adjectival noun than when he uses it.

(5) And are not apologies generally out of place? The writer is not serving the reader in defending himself. Writing is not like talking. If a man writes

that for which he must apologize, he can unwrite it before he goes to press. Surely no reader really wants to read apologies.

My conclusion is that good writing is a form of good manners. Like good manners it has to be learned, and there are individual differences in aptitude for it. It is best learned in youth, and the way to start is for the writer to shift his attention away from himself and to focus it upon that audience whose comprehension of his thought is his only reason for writing at all.

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THE APPROXIMATE CONNECTION OF BOILING POINTS FOR VARIATION IN BAROMETRIC PRESSURE

IT is well known[1] and may be readily demonstrated that, for normal liquids, changes in the boiling point, corresponding to small changes in the pressure, may be represented by the following equation:

$$\triangle T = \frac{RT_B}{21} \times \frac{\triangle P}{P}$$

where T_B is the boiling point (in degrees absolute) at the pressure P, R is the gas constant (in calories per mol), and $\triangle P$ and $\triangle T$ are the corresponding changes in pressure and temperature. However, it does not appear to be common knowledge that the relation may be stated in the following readily remembered form.

$$\triangle T = \frac{T_B}{10} \triangle P_{atm.}$$

That is, that the change in the boiling point is equal to one tenth of the product of the normal boiling point (in degrees absolute) and the change in pressure, expressed in atmospheres.

When applied to changes of 15 or 20 mm this rule gives results, for normal liquids, which do not differ from the correct values by more than 0.1° C. Although it overcorrects the boiling points of highly associated liquids, the error introduced by applying it to even such abnormal liquids as water or methyl alcohol is less than half of the original correction.

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OPINIONS RENDERED BY THE INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE[1]

SUMMARIES of the Opinions are as follows:

Opinion 124.—The various Subdivisions of genera published by Linnaeus in 1758 are not to be accepted as of this date (1758) as of subgeneric value under the International Rules.

Opinion 125.—*Borus* Agassiz, 1846, is an emendation of, and therefore an absolute synonym of, *Boros* Herbst, 1797; *Borus* Albers, 1850, is a dead homonym.

Opinion 126.—On basis of evidence and expert advice of outstanding specialists, the commission does not see its way clear to declare the new names in d'Orbigny's, 1850, "Prodrome" as unavailable or as *nomina nuda* under the Rules.

Opinion 127.—Complying with expert advice from specialists in the group involved, the commission herewith suspends the Rules and places *Lepidocyclina* Gümbel, 1868, type *Nummulites mantelli,* in the Official List of Generic Names, with *Cyclosiphon* Ehrenberg, 1856, type *Nummulites mantelli,* as objective synonym. The consultants agree, almost unanimously, that to apply the Rules in this case would produce greater confusion than uniformity.

Opinion 128.—Under suspension of the Rules *Nycteribia* Latreille, 1796, with *pedicularia* Latreille, 1805, as type, and *Spinturnix* von Heyden, 1826, with *myoti* Kolenati, 1856, as type, are hereby placed in the Official List of Generic Names.

The specific name *vespertilionis* of all authors is hereby invalidated for the following generic names: *Acarus, Acrocholidia, Celeripes, Dermanyssus, Diplostaspis, Gamasus, Hippobosca, Ichoronyssus, Liponyssus, Listropoda, Megistopoda, Nycteribia, Pediculus, Penicillidia, Periglischrus, Phthiridium, Pteroptus, Sarcoptes, Spinturnix, Strebla,* on the ground that the application of the Rules would produce greater confusion than uniformity.

Opinion 129.—The rules are herewith suspended in the case of *Bipinnaria* 1835 vs. *Luidia* 1839, on the ground that "the strict application of the Règles will clearly result in greater confusion than uniformity." *Luidia* Forbes, 1839, with monotype *fragilissima* 1839 (subjective synonym of *Luidia ciliaris* 1837), is hereby placed in the Official List of Generic Names. The names *Auricularia, Bipinnaria, Brachiolaria,* and *Pluteus* are hereby excluded from availability as generic names and are reserved as designations of developmental stages.

Opinion 130.—Under suspension of the Rules *Lytoceras* Suess, 1865 (genotype, *Ammonites fimbriatus* Sowerby) is hereby placed in the Official List of Generic Names.

Opinion 131.—The type species of *Tromikosoma* is *T. koehleri.*

Opinion 132.—The "Gattungsbezeichnungen" published by Sobolew, 1914, are of the same nature as the designations published by Herrera; namely, formulae, not generic names, and have no status in Nomenclature. See Opinion 72.

[1] See, for example, MacDougall, "Thermodynamics and Chemistry," Wiley, 1926, p. 133, New York.

[1] Opinions 124 to 133. Smithsonian Miscellaneous Collections, vol. 73, no. 8, October 28, 1936. (Publication 3395).