

In other words, the present war has wiped out the growth of chemical progress during the last eight years, setting chemistry almost back to the year 1929.

Under the headline "Pure Science Held up by War," the *New York Sun*, October 21, 1942, explained how the Smithsonian Institution has turned away from its path of peaceful days when it "devoted itself to the furthering of fundamental knowledge, much of which has had little practical significance at the moment, but which has produced a secure foundation for practical development."

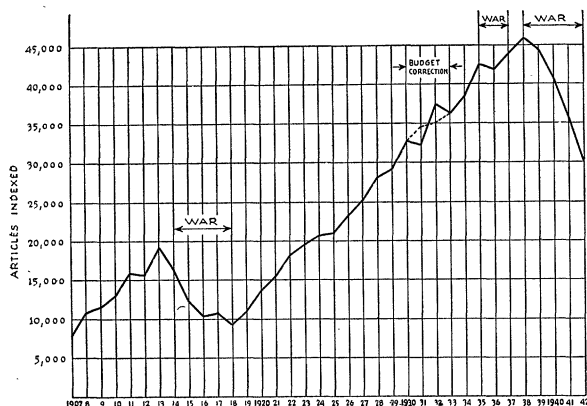


FIG. 1

During the war this work "must be temporarily suspended," and the staff of almost 100 scientists has been coordinated for the work of answering scientific inquiries sent in by the military, drawing the answers from "accumulated knowledge." Thus there have been no research results to publish from the Smithsonian Institution, to take it as one example of the effect of war on scientific progress.

The apparent drop at the year 1931 is apparent only. The budget makers mistakenly assumed that the financial depression, beginning in 1929, would begin to show in diminishing journal articles by 1931, and therefore they restricted the budget of the *Chemical Abstracts* editors in that year.

No such diminishing of journal articles appeared and 2,500 journal articles were held over from 1930 for indexing until 1931. The dotted line crossing 1930 makes this correction for the 2,500 held over so that the curve becomes practically straight until it drops slightly in 1936, the year Italy conquered Ethiopia.

Apparently the threatening war clouds of that year, 1936, adversely affected chemical progress nearly as much as the war clouds affected it in 1939.

One added phenomenon seems worth mentioning, and that is the parallelism between chemical progress and mechanical progress. The ratio of chemical patents to mechanical patents issued in the United States has not altered greatly in many years. For

the last year, with wide fluctuations, the issue of chemical patents has averaged about 10 per cent. of all patents issued, as against 7 to 8 per cent. in the thirty years preceding 1936. The obvious inference is that war affects mechanical and chemical progress alike, and now seems to be adversely affecting mechanical progress a little more severely than it affects chemical progress.

To those who set up the theory that wartime progress is kept secret for some years and is published later the answer is that no such phenomenon can be deduced from the curve following the year 1919. The oft-repeated statement that war helps progress is true only in a few very narrow fields where industry learns to turn to hitherto unused sources of information, such as Smithsonian Institution, and profits by that information.

For the most part, research organizations, in wartime, are weakened or the experts are put on inspection work or are set to work in unfamiliar fields, so that less progress becomes possible.

#### JOURNAL ARTICLES ABSTRACTED ANNUALLY IN CHEMICAL ABSTRACTS

Year	Numbers of Abstracts	Year	Numbers of Abstracts
1907	7,975	1925	20,951
1908	10,835	1926	23,103
1909	11,455	1927	25,037
1910	13,006	1928	28,153
1911	15,892	1929	29,083
1912	15,740	1930	32,731
1913	19,025	1931	32,278
1914	16,468	1932	37,403
1915	12,290	1933	36,139
1916	10,519	1934	38,371
1917	10,921	1935	42,593
1918	9,283	1936	41,927
1919	10,957	1937	44,032
1920	13,619	1938	45,917
1921	15,211	1939	44,414
1922	18,070	1940	40,624
1923	19,507	1941	35,588
1924	20,523	1942	30,479

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#### SYNCHRONY IN FLOCK WHEELING

THE problem of the synchronization of action of cells and organisms has long attracted the interest of biologists. Separate units often respond with such simultaneity or under such other conditions that, in the case of neurones, ordinary conducted nerve impulses seem to be excluded.<sup>1,2,3</sup> Similarly with the behavior of organisms—insect flashes,<sup>4</sup> plant blooming, fish wheeling, and the like.<sup>1,5</sup>

<sup>1</sup> R. W. Gerard, *Scientific Monthly*, 44: 48-56, 1937.

<sup>2</sup> R. W. Gerard, *Ohio Jour. Science*, 41: 160-172, 1941.

<sup>3</sup> R. W. Gerard, *Annual Review of Physiology*, 4: 329-358, 1942.

<sup>4</sup> R. Ruedeman, *SCIENCE*, 86: 222-3, 1937. G. Alexander, *SCIENCE*, 82: 440-1, 1935. H. A. Allard, *SCIENCE*, 82: 517, 1935.

Some time ago an opportunity presented which enabled me to time the wheeling of a small bird flock with considerable precision. As I drove along a Vermont hilltop road at 35 miles per hour, the speed noted by chance just at the right time, a flock of something under half a hundred birds flew parallel to me not over fifteen feet from the car window and at precisely my speed. After a few seconds of this the flock wheeled away—not columns left, but each individual left face. I could not detect the slightest shift of position of one individual relative to the group. Surely none continued forward anything like its own length, perhaps 9 inches, after the others had turned.

Flying at 35 miles per hour, a bird lagging only ten milliseconds behind its fellows would have shot six inches ahead before making the turn. Clearly all the birds swerved simultaneously, within a maximum variation of less than five milliseconds.

What the cue or signal was which initiated the group maneuver, I do not know. No leader moved first and was followed by the others—I could not have failed to see the sequence. And any optic or even auditory stimulus, with a probable minimal reaction time of at least 100 milliseconds, must have acted with extreme constancy on the separate individuals. Even the Rockettes, elaborately trained to prearranged movements, can not approach such precision.

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### SCHOOLCRAFT AND THE AMERICAN ETHNOLOGICAL SOCIETY

IN recent issues of *SCIENCE*, there are some interesting articles about the American Ethnological Society in which Albert Gallatin has been mentioned as its founder. The centennial of this organization seems a proper time to consider the suggestion that Schoolcraft should be given at least joint credit for its establishment.

Schoolcraft had a genius for the construction of vehicles for scholarly activity, first manifested at the age of sixteen at Gunderland, N. Y., and afterwards wherever he went.

The last words in his first book, published in New York City in 1819, emphasized the need of a society for the study of antiquities in the United States ("A View of the Lead Mines of Missouri," p. 294).

In the spring of 1825, again while visiting in New York City, he, with Mr. Conant and Mr. Dwight, definitely arranged for a magazine devoted to Indian sub-

jects, with Wilder and Campbell, publishers ("Memoirs," p. 207).

Disappointed in this, in December of the same year, at Sault Ste. Marie, Mich., Schoolcraft began a literary-ethnological magazine of his own, in manuscript, which circulated not only in that military outpost but considerably in the East as well.

In 1832, in Detroit, he organized the ethnological-humanitarian Algic Society, whose activities centered wherever he went and did not survive his interest.

Credit for establishment of the first common school journal in the United States, published in Michigan, 1838-1839, was originally given to John D. Pierce, then state superintendent of public instruction. It has now been shown that the launching influence in this was Schoolcraft, whose committee chose Mr. Pierce for editor and publisher because of the prestige of the latter's position as well as his ability.

The great Lewis Cass for years has been proudly claimed as founder of the Historical Society of Michigan. Now it has been made clear that, although deeply interested in scholarly matters, Governor Cass manifested no organizational urge for the better part of two decades of residence in Michigan; but that the Historical Society of Michigan sprang into being within a few weeks after Schoolcraft arrived in Detroit, in 1828, as a member of the Territorial Legislative Council. Schoolcraft secured for the organization its state charter and the potent name of Cass for its first president; and made all members of the legislative council members *ex officio* in order to give the society official countenance and secure a place of meeting for it.

Late in 1841 Schoolcraft left Michigan for New York City. The middle months of 1842 he spent in Europe, where he contacted and was particularly interested in scholarly organizations (manuscript paper, "Scientific Associations Abroad," in files of New-York Historical Society). On his return from Europe in 1842 he settled in New York City. Immediately the American Ethnological Society was founded—in November of that year.

The distinguished Albert Gallatin had been in New York City since 1828.

A contemporary biographical sketch of Schoolcraft, published unquestionably with his approval, says that "in 1841 he removed his residence from Michilimackinack to the city of New York, where he was instrumental, with Mr. John R. Bartlett, Mr. H. C. Murphy, Mr. Folsom and other ethnologists, in forming the American Ethnological Society—which, under the auspices of the late Mr. Albert Gallatin, has produced efficient labors" ("Memoirs," xlv).

It would appear that, in the case of the American Ethnological Society as so often, Schoolcraft again had hitched his vehicle for scholarship to a starry

<sup>5</sup> W. C. Allee, "Animal Aggregations," University of Chicago Press, 1931.