# DISCUSSION

## A MAJOR CYCLE IN INSECT FLIGHTS

FROM June 1 to September 15, 1939, a period of unusually uniform and predominantly fair weather in northeast Georgia, a nightly record was kept of the insects which were attracted to a neon-mercury light trap in operation from dusk until 1:00 A.M. at Demorest, Habersham County. By an actual count of certain insect types representative of entire catches, a rather accurate estimate could be gained of the extent of insect aerial activity for each evening. These index forms, which waxed and waned independently throughout the season, included all moths, micro as well as macro, small scarabaeid beetles of the genera *Aphodius* and *Ataenius,* carabid beetles of the genus *Harpalus,* scolytid beetles of the genus *Xyleborus* and a minute, reddish brown cydnid bug, *Amnestus pusillus* Uhler.[1] The last two named often came in swarms during the early part of the evening and, over the four or five weeks of their dominance, constituted dependable indicators of general flight conditions.

During the course of these observations, several remarkable flights were recorded. The evenings on which they occurred stood out in marked contrast not only to the average night of fair yield but even to the less frequent occasions when yields were relatively large. On June 6, 7, 22, July 5, 22, August 18, 19 and September 4, from dusk until midnight, thousands of insects (on August 19, tens of thousands) came to light and were trapped, a phenomenon which was out of all proportion to the hundreds or even tens captured on other evenings. According to a solar-lunar gravitational table,[2] these dates coincide exactly with periods when the combined pull of the sun and moon acted tangentially on the earth at the appropriate meridian during the hours from 10:30 P.M. till 12:30 A.M. The only similar period included in this series of observations which was not characterized by insect flights of especially great magnitude was coincident with two successive evenings (August 5 and 6) featuring heavy thunderstorms followed by a pronounced drop in temperature. However, there was every indication, judging by the progressively increasing numbers of flyers on August 3 and 4, that conditions were building up for a major movement on the 5th and 6th, an event which most probably would have taken place had the weather remained congenial. As though in compensation for a thwarted impulse, the flights during the subsequent swarming period, August 18 and 19, were the heaviest of the entire season. Midway between the times of intense nocturnal activity was noted a much less clearly defined cycle of minor flights, while few or sometimes almost no insects came to light on intervening dates. Although cold or windy weather may noticeably restrain nocturnal insects, temperature seems not to be the primary factor in determining whether or not they will take to the air en masse. This is clearly indicated by the observation that, on several supposedly ideal flying evenings when the atmosphere was sultry and warm (70° F. or more at midnight), the turnouts were only fair or even poor; whereas it was somewhat cooler (68° F.) on the night of August 19 when the greatest flight among 76 consecutive recordings took place.

It therefore seems quite possible that nocturnal swarmings of insects, presumably essentially nuptial in character, are governed in some way by gravitational or related forces. At any rate, it appears fairly certain that such mass movements are cyclic and broadly predictable, recurring every 13 to 17 days so long as season and weather permit. Striking confirmation of this periodicity comes from data collected by the writer in Fiji. There, at an altitude of 2,600 feet, thousands of miscellaneous insects (mostly *Lepidoptera, Coleoptera* and *Hemiptera*) arrived at light on the evenings of October 6, 7, 21 and 22, 1937, despite low temperatures and showers, while at the identical spot on all other nights, mild or cool, from October 3 to the end of operations on the 28th, the collecting sheets were virtually empty; and in the lowlands, the first spectacular spring flights since collecting began in July were recorded on September 23 and 24 when the temperature (70° F.) was far from unusually high.

J. MANSON VALENTINE,
*Dazian Fellow*
SOMERSET, VA.

[1] The writer is indebted for determinations to Dr. E. A. Chapin, Dr. M. W. Blackman and Mr. H. G. Barber of the U. S. National Museum.

[2] J. A. Knight's "Solunar Tables" for 1939.

## CALCIUM CARBONATE DEPOSITS MARGINAL TO GLACIERS

BLACKFEET GLACIER[1] is located on the north slopes between Mount Jackson and Blackfeet Mountain, members of the Livingston Range in the central part of Glacier National Park, Montana. The glacier rests upon limestone and dolomite of the pre-Cambrian Siyeh formation. The front of the glacier is now completely divorced from its immediate recessional moraine, which forms a striking and almost continuous ridge, interrupted where the main melt-water streams escape. Since its mapping in 1914 by the U. S. Geological Survey, the glacier has separated through ablation into two separate bodies of ice, a large one to the east and a smaller one to the west. A contoured map of the western ice body was com-

[1] W. C. Alden, "Glaciers of Glacier National Park," Department of the Interior, pp. 4–11, 1914.

pleted by the National Park Service, Belton, Mont., in 1939.

A conspicuous feature on the bed-rock exposed by retreat of the glacier is the incrustation of its surface with deposits of calcium carbonate. These carbonate deposits are almost pure white and therefore stand out in sharp contrast with the gray- and buff-colored dolomites. Close examination shows that the deposits are of lamellar structure and that they consist principally of calcium carbonate, in which tiny resistant rock fragments, predominantly of chert, are just visible megascopically. The deposits must once have completely covered the submarginal extent of the glacier floor, since they are regularly distributed over the entire area between the present ice front and the moraine. Minor advances of the glacier have eroded much of the material from existing smoothed surfaces, but it is retained in depression irregularities and in larger joint planes and fracture faces.

The writer infers that these calcium carbonate deposits have resulted from deposition by submarginal and marginal melt-water, which acted upon fine limestone rock flour resulting from ice abrasion. Calcium bicarbonate was produced, which was then taken into solution by the melt-water. A rise in temperature of the water as it issued from the glacier, loss of carbon dioxide to the air as the water passed over the irregular rock floor, changes in concentration of the solution and evaporation may have contributed to the precipitation and deposition of the calcium carbonate. Several specimens removed from the down-slope side of the rock surfaces showed distinct stalactitic structure. The individual lamellae average less than .05 inch in thickness, while the total thickness of the incrustation is usually not more than an inch. In a series of lamellae there is no consistent alternation of colors, although some lamellae are darker than others. It is probable that the lamellar structure is a result of seasonal fluctuations—most of the deposition taking place during the summer months and erosion or cessation of deposition during the winter months.

That such deposits persist only for a short period is indicated by the fact that none exists extra-morainally. Their presence in view of their short-lived occurrence should serve as evidence in support of postulations asserting very recent recession of glacier fronts. The phenomenon is, however, limited in its application to regions where the main erosive activities of the ice are directed against carbonate rocks.

Many instances of glacial striae cutting directly into the carbonate incrustations were observed at the Blackfeet Glacier site. These scorings, as noted above, indicate that even during the recent rapid retreat of the glacier front, the recession of the ice front was not progressive but was composed of alternate advances and retreats with retreat dominant.

Similar calcium carbonate incrustation deposits exist marginal to Sperry Glacier on the north slope of Gunsight Mountain, Glacier National Park. Like the occurrence at Blackfeet Glacier described above, these have not been heretofore referred to in the literature.

JOHN C. LUDLUM

CORNELL UNIVERSITY

## COMPOUND WORDS IN SCIENTIFIC NOMENCLATURE

LIKE a bolt out of the blue, the subject of English compound words has suddenly assumed an importance it should have assumed many decades ago; this fact is clearly evidenced by numerous letters appearing in recent issues of SCIENCE.[1] The diversity of opinion regarding compounding which was expressed in these letters is indicative of a chaotic situation which has been steadily developing over a long period of years.

The underlying causes of this development are: (1) a confusion of thought regarding the fundamental difference between a bona-fide compound word and a two-word phrase, frequently miscalled a "two-word form of compound"; (2) a wide-spread ignorance of the fact that a bona-fide compound may be a solid word as well as a hyphened word; and (3) a failure on the part of grammarians in general to give compounding and hyphenation the attention they deserve.

However, the situation is not at all hopeless; for the United States Government has taken the initiative in reducing the chaos to order. In 1933 it enunciated its first system of compounding, in the Style Manual of the Government Printing Office; and in 1937, its latest, most complete, and most rational system, in the Style Manual of the Department of State. The department system, in a slightly revised and augmented form possible of wider application, has recently been incorporated in a volume by the present writer entitled "Compounding in the English Language: A Comparative Review of Variant Authorities with a Rational System for General Use and a Comprehensive Alphabetic List of Compound Words."[2] It is the only system now generally recognized as authoritative. Scientists will be particularly interested in the following statement appearing therein: The compounding and hyphening of scientific and technical terms are governed by scientific and technical usage.

Scientific and technical terms constitute a category of compound words of such a special nature that no effort was made to take care of them in this system. But the system is just as adaptable to those terms as to any others, as will be seen from the following brief description.

The definition of a compound word stresses the need

[1] SCIENCE, 89: 413, May 5, 1939; 89: 582, June 23, 1939; 90: 155–157, Aug. 18, 1939.

[2] New York: The H. W. Wilson Company, 1939.