announcements evolve something like this?—and then everybody will be happy.

T. C. M.

DRESDEN,
November 12, 1906

IS THERE DETERMINATE VARIATION?

PROFESSOR KELLOGG has presented some very interesting facts and arguments regarding the variation of *Diabrotica soror,* under the above title (SCIENCE, November 16, p. 621); but I venture to think that the dilemma has more horns than he has credited to it.

He shows (Fig. 7) that the Sierra Morena collection contains a very large proportion of fused-spots specimens. This material is from a locality about three miles from Stanford University campus. Now why is it not possible that a distinct Sierra Morena strain exists (perhaps the prevalent form of higher levels throughout the region), and that this has in recent years invaded the campus of Stanford University? If this is likely, or even possible, the whole matter may assume a different aspect.

If there exist different strains of *D. soror,* some free-spotted and some with a prevalence of fused spots, it is altogether likely that they differ in other characters, *e. g.,* power of resistance to particular forms of disease. If, in certain parts of the world, people with light complexions have supplanted those with dark, we are not obliged to assume that complexion is in itself a common cause of survival, or else abandon the idea of selection. We know, on the contrary, that the familiar color-characteristics accompany many others, some of which, singly or in combination, may have a high selection-value.

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November 18, 1906

SPECIAL ARTICLES

THE ADVANCING MALASPINA GLACIER[1]

THE Malaspina Glacier lies at the seaward base of Mount St. Elias in Alaska, where a number of large valley glaciers descend from the St. Elias Alps, and coalesce at the mountain base to form a great ice plateau some fifteen hundred square miles in area. The characteristics of this piedmont ice plateau, the Malaspina Glacier, have been made known to us mainly through the splendid work and descriptions of the late Professor Russell.[2]

One of the striking features of the Malaspina Glacier, as described by Russell and others, was its smooth surface due to the general absence of crevassing. So well developed was this characteristic that the glacier has served as a highway of travel for a number of expeditions having for their object the ascent of Mount St. Elias. Twice Russell himself used the Malaspina for this purpose; Prince Luigi Amedeo, Duke of the Abruzzi, made use of the same highway on his successful ascent of St. Elias; and Mr. H. G. Bryant also traveled across the glacier toward Mount St. Elias. Each of these expeditions crossed the Malaspina Glacier on the side toward Yakutat Bay where my studies have been carried on. Other expeditions have crossed the glacier further west. In these expeditions it was found possible not only to move freely over the ice, but also to draw loaded sleds across it.

A second characteristic feature of the Malaspina Glacier is the presence of a moraine-veneered margin, developed by melting of the ice and concentration of the included rock fragments at the surface. In places, this veneer of moraine soil is so thick, and the ice under it so stagnant, that forests have developed upon it.

In the summer of 1905 I looked down upon the Malaspina Glacier from several high points in Yakutat Bay; and late in August

[1] Published by permission of the director of the United States Geological Survey. I wish to acknowledge in this work the assistance of Lawrence Martin and B. S. Butler, in 1905, and of the latter, together with O. VonEngeln, J. L. Rich, and R. R. Powers, in 1906. A paper, with photographs and map illustrating the changes described below, will appear in the forthcoming number of the *Bulletin* of the Geographical Society of Philadelphia.

[2] *Nat. Geographic Mag.,* Vol. III., 1891, pp. 53–204: Thirteenth Annual Report U. S. Geol. Survey, 1891–2, Part II., 1893, pp. 1–91.

two of my associates, Lawrence Martin and B. S. Butler, made an expedition to the western margin of the Floral Hills, where they had a clear view, and took photographs of the eastern margin of the Malaspina Glacier. At that time no unusual conditions were noticed.

In the summer of 1906, I made a second expedition to Alaska, having for its object the crossing of the Malaspina Glacier from east to west. It was my purpose to follow Russell's route as far as the Marvine Glacier, crossing it about where he did, then cross the route of Prince Luigi and Mr. Bryant, and proceed thence westward to the western margin if possible, in the meantime making side trips up the tributary glaciers and to various parts of the margin of the Malaspina.

This plan was most unexpectedly interfered with. The Marvine Glacier, which in 1890 Professor Russell crossed with ease, carrying his entire mountain-climbing outfit, was transformed from a smooth ice surface to a labyrinth of crevasses, across which we found it totally impossible to carry supplies. Even the passage of the glacier unburdened would have been a task which no one short of expert Alpinists could attempt; and I doubt very much if even they could possibly cross the glacier from side to side.

The evidence of our photographs of 1905, and of the views which we had from the neighboring mountains, clearly demonstrate that this remarkable change in the glacier has occurred since August, 1905. In 1906 we passed along the eastern margin of the Malaspina Glacier from the point of emergence of the Marvine Glacier from its mountain valley west of Blossom Island down the Kwik Valley to the sea. Thence southwestward along the shores of Yakutat Bay to Point Manby we saw the ice front from a boat. During his retreat in 1891, Professor Russell traveled freely from Point Manby to the Kwik River along this seaward margin of the glacier. Now it is impassably crevassed throughout the entire distance.

As we passed along the margin of the glacier, we found abundant evidence that the forward movement which has broken it is still in progress. The ice was even then being broken into blocks; ice fragments were falling from its face; moraine was tumbling down the front and into the crevasses; new streams were emerging from the moraine-covered front; and during the interval of a month which elapsed between our traverse up the glacier margin and our return, there were numerous changes in detail.

In places where the moraine on the glacier was occupied by forest, the crevassing had greatly disturbed the tree growth. The trees, some of which must have been at least fifty years old, stood at all angles and were frequently seen to fall down the ice front and into the crevasses. That the ice movement was wholly of the present season was proved by the fact that all the overturned trees had developed leaves before the disturbance affected them.

By this advance of the Marvine tributary to the Malaspina Glacier, the eastern portion of this piedmont glacier has been transformed to a sea of crevasses. The crevassed area starts with the width of the Marvine Glacier at its emergence from the mountain valley, but expands toward the sea into a bulb-shaped area of crevasses which includes the entire portion of the Malaspina Glacier bordering upon Yakutat Bay. Thus the crevassed area cuts across the routes followed by Bryant and Prince Luigi, so that at the present time a journey to Mount St. Elias from their point of starting (the Osar River) is out of the question.

We were unable to closely examine the tributaries of the Malaspina Glacier west of the Marvine; but from a distant view it is evident that no such disturbance as that caused by the advancing Marvine Glacier is present to the westward, as far as one could see. The Seward Glacier, next west of the Marvine, is, however, badly crevassed near the point of its emergence from its mountain valley; and one of my party, Benno Alexander, who was with Prince Luigi, asserts that it is far more broken than in 1897. Whether this represents the beginning of an advance similar to that of the Marvine can not now be stated.

The Hayden Glacier, which joins the Malas-

pina just east of the Marvine, shows no notable change from its condition in 1905; nor does the Lucia Glacier, which is the next glacier east of the Hayden, and which at the present time does not quite join the Malaspina. The glacier next east of the Lucia, however, has entirely changed its condition since we saw and crossed it in 1905. This glacier, the Atrevida, was crossed by Professor Russell on his first expedition in 1890. In August, 1905, we made several trips to its margin and one out upon it, while Messrs. Martin and Butler crossed it from side to side on their way to the Floral Hills. Where we crossed the Atrevida, in 1905, it was an undulating, moraine-veneered, apparently nearly stagnant glacier which could be crossed with great ease, and at all points, entirely without danger from crevasses. It was our intention to enter upon the Malaspina Glacier along this route; but, to our astonishment, we found that in ten months, between August, 1905, and June, 1906, the conditions had totally changed. We were unable to ascend even the margin in 1906, and views from above the glacier, on both the east and west sides, prove it to be broken from side to side, and from far up its mountain valley down nearly to its terminus in the moraine-veneered, alder-covered, bulb-shaped expansion beyond the mountain front. In its lower portion the Atrevida coalesces with the Lucia Glacier and thus we have the anomaly of two glaciers side by side, one of which shows no change, while the other is absolutely different from its condition only ten months before.

There are a score or more notable glaciers in Yakutat Bay, all but two of which are essentially as they were in 1905. Of these two exceptions one lies in a small mountain valley immediately north of the Turner Glacier. In 1905, this small valley glacier was apparently stagnant at its end, which was approximately a quarter of a mile back from the coast. Ten months later, in June, 1906, this unnamed glacier, which we will call the Haenke Glacier, was found to have advanced well out into the fiord, and to have joined the ice cliff of the Turner Glacier. By this addition the ice cliff of Turner Glacier is lengthened fully a mile. The Haenke Glacier was also profoundly crevassed during its forward rush. There is a glacier similar to the Haenke in the valley next north of it, and less than a mile distant, which shows no change from its condition in 1905.

The great Hubbard Glacier is the next in the fiord and it shows no change; but just east of it is a small glacier, which we named the Orange Glacier, in 1905, and over whose bulb-shaped terminus we walked freely, paying special attention to it because of an interesting series of concentric colored moraines which then covered it. We also walked up this glacier some five or six miles in a half day, and in that distance found no undue crevassing. In June, 1906, on the other hand, this glacier was crevassed from as far up the valley as we could see (about the point we reached in 1905), well down into its bulb-shaped terminus, which was shoved up much higher than in the previous summer. Its surface is so broken that in 1906 we were not able to even approach the colored moraine area over which we walked so easily in 1905. In the place of this moraine covered area of 1905 was clear, crevassed and pinnacled ice.

These facts prove that some of the glaciers of the Yakutat Bay region have been subjected to a paroxysmal thrust of great force. The thrust has been sufficient to break the glaciers not only in their mountain valleys, but also far down in their hitherto nearly stagnant bulb-shaped termini. In the case of the Marvine Glacier, the crevassing extends a distance of at least twelve or fifteen miles. Other glaciers, even those that are the nearest neighbors to the advancing tongues, have not yet been subjected to this forward thrust.

This is not the place to fully discuss the cause of this striking and unique change in the glaciers. Suffice it to say, that in seeking for a cause, we have felt obliged to discard the operation of normal climatic variations. It happens that in 1899 this region was visited by a series of exceedingly severe earthquake shocks during which the coast line in Yakutat Bay was greatly deformed, in one place being uplifted forty-seven feet. The hypothesis which we advance in explanation

of the changes briefly outlined above, is that during this, or possibly some previous earthquake, vast quantities of snow and ice were shaken down from the mountains upon the gathering grounds of these glaciers, starting a wave of advance whose thrust is now being felt by some of the glaciers, the thrust being sufficiently powerful to crowd forward and break up even the nearly stagnant termini. The selective action of this process, by which some of the glaciers are caused to advance and others not, may be only apparent, for it is possible that the wave of advance has not yet affected glaciers which will ultimately begin to move forward. It is highly probable, however, that in some instances the supply ground of the glaciers did not have conditions favorable to the large accession of snow necessary to cause a rapid crowding forward.

The future progress of this interesting phenomenon should be carefully watched. In order to discover and definitely prove its cause, we need to have a series of observations extending through successive years to see what happens to those glaciers which have just advanced, and to determine whether other glaciers are influenced in the same way, and exactly how they are affected. There is no region of active glaciers known to me which promises to yield more important results than this, if carefully watched for the next few years.

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SCIENTIFIC NOTES AND NEWS

DR. EDWARD L. NICHOLS, professor of physics in Cornell University, has been elected president of the American Association for the Advancement of Science for the meeting to be held next year at Chicago. The New York meeting, held from December 27 to January 1, under the presidency of Dr. W. H. Welch, professor of pathology in the Johns Hopkins University, has had no equal in size and probably no parallel in its service for the advancement and diffusion of science. The full report of the general secretary will be printed in the next issue of SCIENCE, and reports of the proceedings of the national scientific societies which met in affiliation with the association will follow.

THE council of the British Association has now appointed the presidents of sections for the meeting of the association to be held at Leicester next year. Of Section A (mathematical and physical science) the president will be Dr. Love, Sedleian professor of natural philosophy at Oxford; Section B (chemistry), Professor A. Smithells, professor of chemistry in the University of Leeds; Section C (geology), Dr. J. W. Gregory, professor of geology at Glasgow; Section D (zoology), Dr. W. E. Hoyle, keeper of the museum in the Victoria University, Manchester; Section E (geography), Mr. George G. Chisholm; Section F (economic science and statistics), Professor W. J. Ashley, dean of the Faculty of Commerce in Birmingham University; Section G (engineering), Professor Silvanus Thompson; Section H (anthropology), Mr. D. G. Hogarth; Section I (physiology), Dr. A. D. Waller, director of the Physiological Laboratory in London University; Section K (Botany) Dr. J. B. Farmer, professor of botany in the Royal College of Science; and Section L (educational science), Sir Philip Magnus.

PROFESSOR THOMSON, of Cambridge, M. Moissan, of Paris, Professor Golgi, of Pavia, and Professor Ramòn y Cajal, of Madrid, were present at Stockholm on December 10 to receive the Nobel prizes awarded to them.

DR. HENRY RUTGERS MARSHALL, of New York City, has been elected president of the American Psychological Association, and Dr. H. N. Gardiner, of Smith College, has been elected president of the American Philosophical Association.

MR. F. H. NEWELL, chief engineer of the Reclamation Service has been elected president of the Washington Society of Engineers.

GRAF VON ZEPPELIN, known for his work in aeronautics, has been given the honorary doctorate of engineering by the School of Technology at Dresden.

DR. ADOLF LIEBEN, formerly professor of chemistry at Vienna, has celebrated his seventieth birthday.