of the house-fly and retain their virulence for more than three weeks, but the more recent discovery by Faichne, that flies bred from larvæ which have developed in infected material carry the typhoid bacilli in their digestive tracts, is one of great importance in its practical bearing.

The most important factor which affects the numbers, activity, and potential danger of flies is temperature. Experiments show that at a high temperature the whole life-history can be passed in eight days. Further, it was found that the second generation of flies are able to begin to deposit their eggs as early as the fourteenth day after emerging from the pupa; in short, the second generation of eggs may be deposited in about three weeks after the deposition of the first. Each fly is able to deposit from 100 to 150 eggs in a single batch, and at least six batches are laid during the lifetime of a single female. It is not difficult, in view of these facts, to understand the production of enormous numbers of flies during hot weather, and how the activity and numerical abundance of flies increases with the rise of temperature. During the hot months of July, August, and September flies are most abundant, and it is a significant fact that in those years when the temperature is high during those months, that is, during the third quarter of the year, there is almost invariably a high mortality from typhoid fever and the infantile disease, summer diarrhœa. In connection with summer or infantile diarrhœa, a curve prepared from statistics covering the last twenty years showed, with the exception of one year, that a rise or fall in the number of deaths per thousand living in a large English city was associated with a rise or fall respectively in the temperature.

The relation of flies to summer diarrhœa is practically based on epidemiological and other circumstantial evidence, since the specific cause of the disease has not yet been determined with certainty. Morgan, however, has found a bacillus occurring in a large percentage of the cases of the disease, and the same bacillus has been isolated from flies captured in infected houses. An objection has been made to the idea that the house-fly is a carrier of the cause of summer diarrhœa, this objection being founded on the fact that at the end of the summer the fall in the fly curve follows the fall of the curve representing the diarrhœa mortality, the flies being still more numerous than they were earlier in the season, when the diarrhœa curve was rising. In meeting such an objection it may be pointed out that we are not considering the numerical abundance of the flies in the houses only; it should be remembered that with a decline of temperature the activity of the flies, especially out of doors, which is important in this case, is not so great, even though their numbers may be considerable indoors. With the fall of the temperature, therefore, the possibility of their carrying the infection decreases without a necessarily corresponding decrease in their numbers, and the diarrhœa curve will fall in consequence.

The fly problem, which is more serious in the United States and Canada than in England, is one that may be attacked and solved in cities and towns, provided that the authorities will take the necessary steps. As in districts previously infested with mosquitoes, these insects have been reduced to a negligible quantity by the abolition of their breeding-places or the rendering of the same unsuitable for the larvæ; so also the number of flies and their danger could be lessened very considerably by the removal of their breeding places, by preventing their access to the breeding places, or by treating these with substances noxious to the larvæ or flies. Flies are a public nuisance, and, therefore, to maintain places where flies are able to breed should be made a misdemeanour. Stable refuse should not be left exposed for a longer period than six or seven days in the summer, but should be removed from the vicinity of dwellings or treated with such a substance as chloride of lime, which will prevent the breeding of the flies, the refuse being kept in a closed fly-proof chamber. The presence of mews and stables with their exposed rubbish heaps will always account for the abundance of flies. The household dustbin or other repository for kitchen refuse, unless securely closed or screened and regularly emptied, also forms an excellent breeding ground. Public tips on to which all kinds of organic and decaying matter is deposited produce their flies in myriads; it is invariably found, where actual investigation has been made, that the percentage of cases of zymotic diseases of an enteric nature is abnormally high in the neighbourhood of public refuse tips and depôts where rubbish is allowed to accumulate.

In considering the relation of house-flies to disease, although the one species of fly, *Musca domestica*, usually constitutes from 90 to 98 per cent. of the fly population of houses, certain other species are also found to occur. The lesser house-fly, *Homalomyia canicularis*, has the next place in the scale of frequency, and is generally mistaken by the uninitiated for a young house-fly, on account of its general resemblance. Although both the adult fly and the larva have pronounced structural differences, the habits of the larva and the economic relationships of the fly resemble those of *M. domestica*. The blood-sucking fly, *Stomoxys calcitrans*, is not infrequently mistaken for the true house-fly, which has adopted vicious habits. *M. domestica*, however, is unable to pierce the most delicate skin, and *S. calcitrans*, which frequently enters and is found in houses in the spring and also in the autumn, especially in rural houses, presents considerable differences, the chief being the possession of an awl-like, piercing proboscis, a more robust build, and its coloration. Not infrequently inflammatory swellings, sometimes of a serious nature, result from the "bite of a fly," and such cases are instances of the mechanical transference of such bacteria as the Streptococci from infected material to a healthy human being by a blood-sucking fly. Malignant pustule may be caused by the mechanical transference of the *Bacillus anthracis* by a blood-sucking fly, or it may be by a non-blood-sucking fly, such as the blowfly, *Calliphora erythrocephala*, if the skin is broken to provide entrance for the bacillus.

Wherever there is filth, suppuration, or purulent discharge, flies are invariably attracted, and as they are cosmopolitan in their attentions and no distinguishers of persons, they are potential disseminators of such bacteria as these substances may contain. It is not a question of eradication in the case of this insect; such is impossible. Control and prevention, however, are within the bounds of possibility, and these will be regarded as essential when the facts are more generally realised. C. GORDON HEWITT.

THE NEXT TOTAL ECLIPSE OF THE SUN.

ON April 28 of next year there will occur a total eclipse of the sun which will begin on the earth generally at 7h. 49·2m. G.M.T., the central phase commencing at 8h. 46·1m. G.M.T. The path of the moon's shadow is restricted for the most part to the equatorial regions, and is confined to the longitudes between Australia and South America, so that as far as Europe or Asia are concerned the eclipse cannot be observed there even in a partial phase.

The actual line of central eclipse commences on

the south-east portion of Australia, and passes in a north-eastern direction, crossing the equator in about longitude 154° W. It then sweeps round in an easterly direction, terminating in about longitude 90° W. just off the west coast of Central America. The line thus extends over the full width of the Pacific Ocean, and it is therefore from islands in that ocean that the expeditions which may be sent out will have to make their observations. While there is a great number of islands in this ocean, there are, unfortunately, remarkably few which lie in the narrow band of the totality track. Following the line from west to east, the first that one finds on the Admiralty chart is Tofua, in the Tonga or Friendly Islands. The next that is met with is Vavau, in the same group, and also close to the central line of totality. Much further eastward we reach Nassau, which lies a little to the south of the central line, but well within the central zone, and not far away are the Danger Islands, which are situated to the north, but further away from the central line. Thus, so far as is indicated on the chart, there are only four available points from which observations can be made.

In order to find out the suitability of these islands for eclipse parties, Mr. F. K. McClean determined to make detailed inquiries on this point on his way out to the recent eclipse, travelling from England *via* San Francisco and New Zealand specially to gather this information. Particulars are now to hand, and at his request they are published here so that intending observers may benefit thereby.

With regard to Tofua the information is brief and concise. It is that Tofua is an active volcano and high, and therefore unsuitable. As regards Vavau he says very little, because, as he knows, it is generally recognised as being a good place for observation. He adds, however, that there are hills there several hundred feet in height; that the island is called at by mail steamers; and, finally, that there are many small and low islands in the neighbourhood.

Coming now to Nassau and Danger Islands, these are described as "difficult, but possible by using owner's boat and landing tackle." As observing stations he defines them as "good." The mode of procedure to utilise these islands is suggested by him in the following words:—

> A small steamer of several hundred tons (*The Dawn*), belonging to Captain E. F. Allen, runs to both Nassau and Danger. He does the whole of the landing and embarking of copra, &c. This steamer would have to be chartered at approximately 40*l*. per day when under steam and 20*l*. when not under steam. . . . Captain Allen says that he would undertake to get all cases on shore in good condition if they were water-tight, but he cannot undertake to keep them dry. If for any reason he could not land on one island, he could on the other in any reasonable weather conditions.

In most of the Pacific islands the chief difficulties to be met with are confined to the landing and embarking of the *personnel* and material. As many of the islands are fringed with coral reefs, with only small, narrow passages through them, in some cases natural, in others made by blasting operations, considerable skill is required in negotiating the breakers, and special surf boats are usually required. Mr. McClean's advice, therefore, is that it is almost imperative to employ someone accustomed to such work, "as certainly no one unused to the conditions could do it."

Should any of the parties who intend to go out on the occasion of this eclipse wish to locate themselves on some island other than Vavau, then Nassau and Danger Islands are their only alternatives. It is hoped, however, that one or other of these will be made use of, as they are sufficiently distant from Vavau to be subject to different weather conditions should the parties at Vavau be clouded out.

WILLIAM J. S. LOCKYER.

GLACIERS, GOLDFIELDS, AND LANDSLIDES IN NORTH AMERICA.[1]

AS an example of organised public research, the U.S. Geological Survey is unparalleled in its activity. Bulletins, professional papers, monographs and reports flow from the Government Printing Office at Washington in a stream that is well-nigh overwhelming to the student who tries to arrest it for systematic examination. Written, or brought by capable editing, to a standard of lucidity that is positively monotonous, well printed, lavishly illustrated, and distributed with enlightened generosity, these publications contain a store of precise information which illuminates every branch of earth-knowledge. The range of subjects which they cover is no longer confined even within the spacious limits of geology, palæontology, petrology, mineralogy and physiography;—it has overspread into many cognate branches of applied science, such as analytical chemistry, hydraulics, mechanics, engineering, metallurgy and mineral statistics.

FIG. 1.—Margin of Atrevida Glacier west of Esker Stream. Trees being buried by the ice.

The three handsome memoirs before us are good examples of the broad spirit in which the work is carried out; each, while dealing primarily with a particular district, is a notable addition to our knowledge of the continent as a whole; and each finds room for matter likely to be interesting to any educated reader, along with that which appeals directly to the specialist. In the first and third, the physio-

[1] Professional Papers of U.S. Geological Survey. (Washington, 1909.)
(1) No. 64, "The Yakutat Bay Region, Alaska: Physiography and Glacial Geology." By Ralph S. Tarr; "Areal Geology." By R. S. Tarr and Bert S. Butler. Pp. 183; with 37 plates and 10 figures.
(2) No. 66, "The Geology and Ore Deposits of Goldfield, Nevada." By F. L. Ransome, assisted in the field by W. H. Emmons and G. H. Garrey. Pp. 258; with 2 maps, 33 plates and 34 figures.
(3) No. 67, "Landslides in the San Juan Mountains, Colorado, including a Consideration of their Causes and their Classification." By E. Howe. Pp. 58; with 20 plates and 4 figures.