tap. This will prevent the harmless "snap" from the mixture in the small chamber at the joining of the gas tubes. If a disc more than eight feet be required for the microscope, it will be well to use hydrogen gas instead of ether, since the calibre of the jet cannot in the ether light very well exceed $\frac{1}{15}$ of an inch.

As an extra security, I pack the mixing chamber with asbestos-fibre, moistened with glycerine; but, as before urged, the oxygen must leave the saturator, saturated.

To insure the coincidence of the foci of the reflector with the optical axis of the microscope, it will be well to place three adjusting screws in a triangle behind the mirror, and this last may have both a small vertical and horizontal movement.

I claim for this catoptric arrangement a larger grasp of light than can be got from ordinary lenses, and this may be effected also at a small outlay. For the amateur constructor the plan will afford many advantages. G. B. BUCKTON.

Note on the Colours of the Alkali Metals.

WHEN these metals are heated in a vacuous tube in such a way as to cause an extremely thin sublimate of the metal to condense upon the glass, the film so obtained will be found to possess a beautiful and strongly-marked colour. That this colour is not in any way due to the combination of the metal with any lingering minute traces of oxygen, is evident from the fact that vacuous tubes which have contained the clean and bright metal for years, and in which the metal has been frequently melted and rolled about, and even vapourized in places, and in which, therefore, it is impossible to conceive of any oxygen remaining, will continue to show the phenomenon whenever a portion of the contained metal is heated. The experiment may readily be made by introducing a freshly-cut fragment of the metal into a glass tube sealed at one end and drawn down to a narrow and thickened constriction near the middle. The tube is then drawn out at the open end and connected to a Sprengel pump. As soon as a good vacuum is obtained the tube is warmed throughout its entire length, the pump being still in operation, and the metal heated sufficiently high to cause it to melt and run out of the crust of oxide. When the exhaustion is again as complete as possible the tube is sealed off. The metal is once more melted, the whole tube being at the same time gently heated, and the molten mass allowed to filter through the constriction into the other portion of the tube. The vacuous condition of the tube allows of the metal freely running through an extremely fine aperture, and in this way it becomes perfectly separated from all dross. The tube is then sealed off at the constriction. On gently heating a minute fragment of the bright metal so obtained, by means of a small pointed gas flame, the coloured film of sublimed metal will at once be seen. Viewed by transmitted light, the colour of the film of sodium thus obtained is greenish-blue, inclining to green. Potassium gives a sublimate which is of a magnificent rich purple colour, while rubidium, on the other hand, forms a film which is a pure indigo blue.

In the cases of sodium and potassium, the colour of the metallic sublimates is different from the colour of the vapour as seen when the metals are boiled in an atmosphere of hydrogen. Potassium, it will be remembered, yields under these circumstances a vapour possessing an emerald-green colour, while that of sodium, which appears colourless when seen in small layers, shows a violet or purple colour when viewed through a sufficient thickness.

When the liquid alloy of sodium and potassium is treated in the same way, the sublimate obtained is found to be greenish in colour nearest to the source of heat, quickly shading off to blue and purple as it is more remote from that point, indicating apparently that the two metals sublime separately.

As a means of observing these colour phenomena, this alloy is more advantageously employed than the solid metals themselves, for, by rolling the liquid about, the sublimate may be wiped away and the experiment repeated indefinitely in the same tube.

As to whether the colours of these sublimed films are properties intrinsic to the particular metals, or are merely a function of the physical condition of the substances, it is perhaps rash to dogmatize. A number of other elements have been treated in a similar manner, but without similar results; thus lithium, cadmium, mercury, arsenic, tellurium, and selenium, when heated in vacuous tubes are readily sublimed, but in no case does the film appear coloured. On the other hand, however, it is well known that some of the very malleable metals when beaten out into thin films are capable of transmitting light varying in colour from green to violet. G. S. NEWTH.

Women and Musical Instruments.

IN answer to Prof. O. T. Mason's letter which appeared in a recent number of NATURE (vol. xlvi. p. 561), I may draw attention to the following facts which bear upon a part of the subject which he broaches, namely, the part played by savage women in the use of musical instruments. In the South Pacific the "nose-flute" is very generally, though by no means exclusively, played upon by women. In the account of the voyage of Capts. Cook and King there is in one of the plates a figure of a woman of the Tonga Islands seated under a hut playing upon a "nose-flute." A similar figure of a woman playing upon a "nose-flute" may be seen in plate 28 of Labilladière's "Voyage de la *Perouse*," in the representation of a Tongan double-canoe. Melville ("Four Months' Residence in the Marquisas Islands," p. 251) mentions playing upon the "nose-flute" as being "a favourite recreation with the females." In Wilkes' "U. S. Exploring Expedition," iii. p. 190, there is a description of this instrument as used in the Fiji Islands, and it is stated that "no other instrument but the flute ['nose-flute'] is played by the women as an accompaniment to the voice."

Turning now to another genus of primitive instruments, viz., the "musical bow," we find a peculiar local form, the "Pangolo," occurring at Blanche Bay, New Britain. There are specimens of this at Berlin and Vienna. This instrument is stated by Dr. O. Finsch (*Ann. des K. K. Naturhist. Hofmuseums*, suppl. vol. iii. pt. 1, p. 111) to be only played upon by women of Blanche Bay. Guppy too ("Solomon Islands," p. 142), says that the women of Treasury Island produce a soft kind of music by playing, somewhat after the fashion of a jew's-harp, on a lightly-made fine-stringed bow about 15 inches long.

It cannot, I believe, be said that any of these instruments have been *invented* by women, and it is undoubted that women in savagery but seldom figure as performers upon musical instruments. It would certainly be interesting to collect all the instances recorded. I hope that the above few notes regarding instruments in the South Pacific may be of use to Prof. Mason, and I can only regret that lack of the necessary time prevents my going further into the matter.

University Museum, Oxford, November 7. HENRY BALFOUR.

AN ANCIENT GLACIAL EPOCH IN AUSTRALIA.

A VERY interesting "special report" has just been issued by the Department of Mines of Victoria, giving an account of the remarkable evidences of glaciation observed at a locality about twenty miles south-east of Sandhurst, and about the same distance north of the great Dividing Range.[1] The report is illustrated by a map and sections on a large scale, and by eight excellent photographic prints, showing the character of the deposit on the surface and in railway cuttings, the striated bed rock, and the striated and grooved blocks and boulders, so that full materials are given for the conclusion that we have here an undoubted glacial deposit. A brief summary of this report will therefore be interesting to all students of the phenomena and problems of terrestrial glaciation.

The district now specially described is about fifteen miles in one direction by five in another, and over this area of about thirty-six square miles the conglomerate is continuous, overlying the Silurian rocks of the district. It has generally a rounded or undulating surface, but shows cliffs about 100 feet high in some of the gullies, and its maximum thickness is estimated at 300 or 400 feet, while its highest point is about 700 feet above sea-level. As well seen in the cliffs and several railway cuttings, the conglomerate consists of a matrix of sand and clayey matter containing huge boulders, great angular and sub-angular masses of rock, pebbles, and rock-fragments of endless variety of size, form, and material. Many of these masses are planed, scored, striated, or polished.

[1] "Notes on the Glacial Conglomerate, Wild Duck Creek." By E. J. Dunn, F.G.S. (R. S. Brain, Government Printer, Melbourne, 1892.)

Planing is very common, and is either flat or with a hollow or a convex surface. Some of the intensely hard hornfels blocks have been ground on one or more sides, several planes being sometimes ground on the same stone, while some very hard rocks are deeply grooved. In other cases the striations and scratches are so fine as only to be seen with a lens; while one surface block of very hard material has been ground down and polished, so that it glitters in the sun. In fact, every form of surface-grinding produced by recent glaciation appears to be here present.

The surface of the ground is everywhere strewn with pebbles and boulders, the result of the washing away of the finer materials of the conglomerate; but, besides these, there is a tract of about two and a half miles by one mile near the centre of the conglomerate-area, on the north side of Mount Ida Creek, which is rather thickly strewn with large blocks, termed by the writer "erratics," though they can hardly be erratics in the sense of having been deposited on the present surface by ice. There are forty-five of these blocks, which are either of granite, sandstone, or quartz, and vary in size from 6 feet by 4 feet, to 20 by 12 feet. One of the finest, termed "The Stranger," of coarse-grained granite, is 16½ feet by 10½ feet, and 5 feet thick, the estimated weight being 30 tons. It is planed and scored in a remarkable manner, as are most of the other blocks. It is curious that beyond this limited area only three or four large blocks are found on the surface, while no pebbles or boulders derived from the conglomerate are found more than a hundred yards beyond the present limits of that formation.

A striking feature of the conglomerate is the great variety of rocks present in it, seeming as if "the débris of a continent" had been here gathered together. There are an almost infinite variety of granites, syenites, gneisses, schists, quartzites, sandstones (hard and soft, coarse and fine), slates, shales, conglomerates, amygdaloids, porphyries, vein-quartz, red, yellow, and grey jaspers, and many others. Some of these can be identified with existing rocks, but others are not known in Victoria. In some cases there is what appears to be river shingle, in others the delicate scratches preserved even on soft shale show that the material has not been exposed to any denuding action. There are also sandstone beds of considerable extent and thickness intercalated with the conglomerate, indicating that there were alternating periods of river or current action while the conglomerate was being formed.

The whole of the phenomena here briefly sketched point unmistakably to glacial action; in fact, there seems to be hardly any part of Wales or Scotland where such action is more clearly indicated. There are, it is true, no moraines, because the period when the conglomerate was laid down is too remote, both newer and older pliocene rocks overlying it in some places. Indeed, from fossils found in shales overlying what appears to be a similar conglomerate at Bacchus Marsh, south of the Dividing Range, the writer of the report is inclined to consider the whole formation to be of Palæozoic age. In one part of the area the bed rock is exposed, and this is covered with abundant striations crossing the stratification lines, indicating either powerful glacier or iceberg action.

A list of localities where similar conglomerates have been found is given, showing that they occur to the northward for about 250 miles along the foot of the hills bordering the Murray valley, disappearing under the Tertiary deposits of the lowlands; they have also been met with forming the floor of the auriferous deposits in mines at Creswick and Carisbrook, on the northern slopes of the Dividing Range; and also, as already stated, at Bacchus Marsh, and a few other localities on the south side of the range. We are not told, however, whether similar indications of glacial action occur in these localities. If these deposits are really all glacial and contemporaneous, they indicate an extent of glaciated country that would imply either a very lofty mountain range or the occurrence of a real glacial epoch in the southern hemisphere.

The direct evidence of the superposition of Tertiary rocks of Pliocene age shows that the glacial conglomerate itself is of great antiquity, but no special attention appears to have been given to the question of the age of the so-called "erratics." The fact that they are found in so limited an area seems to show that they are not derived from the conglomerate itself by the process of sub-aerial denudation, and the same thing is indicated by the apparent fact that they all rest upon the present land surface. The photographs seem to indicate this, and nothing is said about their relations to the subjacent conglomerate, or whether any considerable proportion of them still form part of it, merely protruding above the surface, as would certainly be the case if they owe their present position to the mere washing away of the finer parts of the deposit. But, if so, why should they be called "erratics," as distinguished from the blocks and boulders which are still embedded in the formation? If, on the other hand, they are supposed to be true erratics—that is, to have been deposited on the present land-surface by ice agency—they must clearly be much less ancient than the conglomerate itself, or they would hardly retain such fresh-looking striations, grooving, and polishing as some of them exhibit. It is to be hoped that these most interesting deposits will be the subject of very careful study by Australian geologists, since they seem calculated to throw much light on the geological history of the old Australian continent. ALFRED R. WALLACE.

ON THE WALKING OF ARTHROPODA.

IN a letter to NATURE, published January 8, 1891, I described the manner of walking of several insects. Recently I have been able to examine a greater number of Hexapoda, together with several Arachnida and Centipedes, and a few Crustacea. The results of most of these observations were communicated to the Royal Dublin Society a few weeks ago.

I stated in my former letter that most usually the insects examined moved three legs, *e.g.* the 1st and 3rd on one side, and the 2nd on the other, almost, but not quite, simultaneously. In some insects it is the most anterior leg of this tripod which is raised first; in others it is the most posterior. An example of the first case is the cockroach, and of the second the blow-fly. But again exceptions appear to occur in each case. This almost simultaneous raising of the "diagonals" is shown by observations, photographic and otherwise, to be the rule in all the adult Hexapoda which I have examined, except the Thysanura. Of this last group I have observed *Tomocerus longicornus*, and find that, while it often moves by the simultaneous use of the diagonals, it also often raises its opposite legs simultaneously in pairs, especially when the animal is walking on a smooth surface, and using the sucker which is placed on the anterior part of the abdomen.

This use of the opposite legs in pairs was also found very frequently, as well as the diagonal walk, in the larva of one of the Coleoptera, and is always to be observed in caterpillars. Thus it is interesting to find that in one species at least of the Thysanura, which are regarded as having preserved many of the characteristics of primitive insects the adult walks in the same manner as the larvæ of other insects.

It is to be observed that those insects which have long antennæ move them, and apparently the maxillary palps, in accordance with the diagonal rule; for when the front leg of one side is moved the antenna of that side is twitched.