

ciently well known, which can be said to present in any great degree the characteristics of a primeval people, and that is the Australians. As I have elsewhere noticed, all the weapons and tools of the Australians, whatever the uses to which they are applied, are closely allied to each other in form. The spear, the club, the malga, the boomerang, and the heileman, or rudimentary shield, all pass into each other by sub-varieties and connecting links, and all consist of the but slightly modified natural forms of the stems of trees, and other natural productions. The Australian in his arts corresponds the most closely of any people now living to those of the palæolithic age. His stone axe is sometimes held in the hand when used, and like the palæolithic man, he has not yet conceived the idea of boring a hole through it for the insertion of a handle. In some cases he cannot without instruction even understand the use of such a hole when he sees it in the axes of European manufacture. A most remarkable instance of this was brought to my notice not long ago by Mr. Grimaldi, who found on the site of a deserted native camping-ground, a European axe having a hole for the handle, which the natives, unable to conceive the use of this part, had filled up with gum, and hafted by means of a withy bent round the outsides of the hole, in accordance with their traditional custom. In the temporary museum established here during the meeting of the Association, you will see a case containing knives of stone, glass, and iron, all of exactly the same form, and hafted, if one may use such a term for the attempt to form a handle, precisely in the same manner; showing with what tenacity these people retain their ancient forms, even after they have been supplied with European materials.

Now it has been shown that in some cases—and here I especially refer to the account lately published by Mrs. Millett, of the Native School, established under conditions only partially favourable to its success, in the interior of Western Australia*—The Australians are found to be not only capable, but even quick in receiving instruction. It is evident, therefore, that we should be wrong if we were to attribute the extraordinary retardation of culture on the Australian continent to racial incapacity alone; racial incapacity is one item, but not the only item to be considered in studying the development of culture.

The earliest inhabitants of the globe as they spread themselves over the earth, would carry with them the rudiments of culture which they possessed, and we should naturally expect to find that the most primitive arts were, in the first instance, the most widely disseminated. Amongst the primeval weapons of the Australians I have traced the boomerang, and the rudimentary parrying shield—which latter is especially a primitive implement—to the Dravidian races of the Indian peninsula and to the ancient Egyptians, and although this is not a circumstance to be relied upon by itself, it is worthy of careful attention in connection with the circumstance that these races have all been traced by Prof. Huxley to the Australoid stock, and that a connection between the Australian and Dravidian languages has been stated to exist by Mr. Morris, the Rev. R. Caldwell, Dr. Bleek, and others.† And here I must ask for one moment to repeat the reply which I have elsewhere given to the objection which has been made to my including these weapons under the same class, "that the Dravidian boomerang does not return like the Australian weapon." The return flight is not a matter of such primary importance as to constitute a generic difference, if I may use the expression, the utility of the return flight has been greatly exaggerated; it is owing simply to the comparative thinness and lightness of the Australian weapon. All who have witnessed its employment by the natives, concur in saying that it has a random range in its return flight. Any one who will take the trouble to practise with the different forms of this weapon, will perceive that the essential principle of the boomerang, call it by whatever name you please, consists in its bent and flat form, by means of which it can be thrown with a rotatory movement, thereby increasing the range and flatness of the trajectory. I have practised with the boomerangs of different nations. I made a *fac simile* of the Egyptian boomerang in the British Museum, and practised with it for some time upon Wormwood Scrubs, and I found that in time I could increase the range from fifty to one hundred paces, which is much farther than I could throw an ordinary stick of the same size with accuracy. I also succeeded in at last obtaining a slight return of flight; in fact it flies better than many Australian boomerangs, for they vary considerably in size, weight, and form, and many will not return when thrown. The efficacy of the boomerang consists

* "An Australian Parsonage, or the Settler and the Savage," by Mrs. E. Millet, chap. vii.

† Journal of the Anthropological Institute, No. 1, vol. i, July 1871.

entirely in the rotation, by means of which it sails up to a bird upon the wing and knocks it down with its rotating arms; very few of them have any twist in their construction. The stories about hitting an object with accuracy behind the thrower are nursery tales; but a boomerang, when thrown over a river or swamp will return and be saved. . . . To deny the affinity of the Australian and Dravidian or Egyptian boomerang on account of the absence of a return flight would be the same as denying the affinity of two languages whose grammatical construction was the same because of their differing materially in their vocabularies.

(To be continued.)

LETTERS TO THE EDITOR

[The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

Kinetic Energy

PROFESSOR EVERETT asks from what source is the gain of Kinetic energy in water which has flowed from higher to lower latitudes derived? I answer, undoubtedly from the earth's rotation. If so, it will be asked, what becomes of the Kinetic Energy which disappears when water flows from a lower to a higher latitude? Mr. Ferrel, a physicist of high authority in all questions relating to the earth's rotation, says that it is all consumed in friction. "If a free body on the earth's surface," says Mr. Ferrel, "should be moved from a lower to a higher latitude without friction by a force in the direction of the meridian, it would acquire a certain amount of relative eastward velocity, which would be the same whether the body moved toward the pole with a very slow uniform velocity arising from a single impulse, or whether it moved with a continual accelerated velocity down a gradient by the force of gravity. If a particle of atmosphere or of the ocean is moved in the same way by a similar force, and does not acquire the same amount of relative eastward velocity, the difference between the velocities in the two cases is the true measure of the effect of friction." (NATURE, June 13).

In my last two letters on the subject, I have inadvertently made a similar statement. But as regards the amount of energy lost being the measure of the effect of the friction, we are, I fear, evidently both wrong. A considerable amount of the 9,025 foot-pounds of energy would be consumed, not in friction, but in work of rotation. But let it be observed that so far as the argument under discussion is concerned, it is a matter of perfect indifference in what way the energy is consumed. The point which Prof. Everett, Mr. Ferrel, and all those who defend Dr. Carpenter's theory has to explain is this, *viz.*, How is it that six foot-pounds of energy can carry a pound of water from the equator to latitude 60°, while during the passage of the pound of water not less than 9,925 foot-pounds of energy is consumed in overcoming the resistance to its eastward motion? How is it that in a fluid, in which the molecular resistance to motion is equal in all directions, a body manages to lose 1,500 times more energy in moving in one direction than it does in another, and yet the velocity of motion is the same in both directions? Then if this cannot be explained, how is the gravitation theory of oceanic circulation to be maintained?

JAMES CROLL

Edinburgh, August 9

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ERRATA.—Vol. vi. p. 273, col. 1, line 31, for "Lenou's" read "Lesson's"; line 45, for "special" read "spiral"; line 57, for "fold" read "folds"; col. 2, line 6, for "Edentata" read "Edentate."

THE BRITISH ASSOCIATION.—*Authors of papers are requested to favour the Editor of NATURE with copies or abstracts of their communications as soon as possible, addressed to him at the Post Office in the Reception Room, as by these means alone can an accurate and early notice be insured. The Editor appeals to men of science to aid him in his attempt to give an account of the results of their investigations to their brethren throughout the world.*