

Letters to the Editor

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, nor to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

Altitudes to be Reached by Air Pilots by Breathing Oxygen

SCHROTTER (1904)¹ gives the following figures :

Altitude.	Pressure.	Tension of Oxygen if Pure Oxygen were breathed.
11,000 m.	190 mm. Hg.	25 per cent of an atmosphere.
14,500	127	16.6
17,000	93	12.5
20,000	76	10

At normal atmospheric pressure, most people can bear a reduction of oxygen from 21 to 12.5 per cent of an atmosphere without distress, but if the tension of water vapour in the lungs is, as assumed by Schrotter, 47 mm. of mercury, and that of carbon dioxide 30 mm. Hg, a total pressure of 77 mm. Hg, then at 17,000 m., where the pressure is 93 mm. Hg, the tension of oxygen, even when pure oxygen is breathed, must be far too low to support life, namely, 93 - 77 = 16 mm. Hg. Argyll Campbell found that animals could live when the tension of oxygen in the lungs fell to 50 mm. Hg, but degeneration of the heart and other organs resulted on prolonged exposure to this tension, which is one-third of the normal, and corresponds to that at the top of Everest. We know how very distressed the best climbers became on reaching 28,000 feet ; two lost their lives, never returning from their final effort to reach the top.

On repeatedly exposing 4 mice, 7 rats, 2 guinea-pigs, 1 rabbit, and 2 goats in chambers to oxygen (about 98 per cent) and evacuating the chambers, I found all these animals to be not distressed when kept for five minutes or more at a pressure of 100 mm. of mercury, but to be uncomfortable at 90 mm. Hg, and prostrated, or convulsed, at 85-70 mm. Hg. The experiments were carried out in special chambers and with vacuum pumps and animals (goats) kindly placed at my use by Sir Robert Davis at the works of Messrs. Siebe, Gorman and Co., Ltd.

Very conclusive evidence was obtained from the two goats. When the pressure sank to less than 100 mm. Hg, each goat licked its lips and moved a little as if uneasy ; at about 90 mm. Hg each lay down ; at about 84 mm. Hg a convulsive movement due to want of oxygen was apparent. All the animals recovered at once on letting in more oxygen and raising the pressure.

It is clear from these experiments that the total tension of water vapour and carbon dioxide in the lungs must be considerably lower than that assumed by Schrotter, at any rate at low atmospheric pressures. The tension may be reduced by better ventilation of the lungs. Haldane says the tension of carbon dioxide in the lungs may be halved at 35,000 ft., but he assumes the tension of water vapour to be 47 mm. Hg. This scarcely can be the case.

Schrotter put the limit of altitude attainable by air pilots with the help of breathing apparatus at 11,000 m. or a little above this figure. These animal experiments show that, given an efficient oxygen breathing apparatus and an hour, say, spent in breathing oxygen before the climb in order to wash out nitrogen from the body, a pilot might attain certainly to 50,000 and perhaps even to 55,000 ft. A pressure of 95 mm. Hg corresponds, according to

Schrotter's figures, to 55,800 ft., and all the animals withstood decompression to this figure without serious signs of discomfort. It is noteworthy that Paul Bert (1878)² records that a sparrow decompressed in 92 per cent of oxygen fell over as if dying when the pressure was lowered to 75 mm. Hg.

LEONARD HILL.

¹ Schrotter, "Die Sauerstoff in der Prophylaxe und der Therapie", 1904.

² Bert, Paul, "La Pression barométrique" (1878).

The Practice of Dental Mutilation

IN NATURE of Aug. 20, p. 268, reference is made to a letter published in the August number of *Man* in which I state that the earliest evidence I could find of evulsion of teeth and other dental mutilations in Nubia could not be pushed back before about 300 B.C.

I have no reason for modifying that statement. Nevertheless, as Dr. Wilfrid Jackson reminds me in a personal letter, I overlooked the fact that there is evidence from other places to suggest that the practice of dental mutilations may be very much more ancient than the Nubian record suggests. In October 1914, Dr. Jackson published an article entitled "Dental Mutilations in Neolithic Human Remains",¹ in which he quotes evidence which seems to establish the fact that during the Neolithic period evulsion of the teeth was practised in North Lancashire and North Wales. Moreover, in this article he cites information suggesting the possibility of dental mutilations at the time of the Egyptian Middle Kingdom (about 1800 B.C.) on the basis of a skull of the twelfth dynasty in the Manchester Museum. Moreover, Dr. Douglas Derry describes a case which, so he claims, reveals dental mutilation in a late pre-dynastic skull from Lower Egypt, found by Sir Flinders Petrie. In view of this information, it is clear that I must modify the statement which I made on the basis of the Nubian evidence. The addition of fifteen (and possibly thirty) centuries to the antiquity of the practice of removing the teeth, if the somewhat sketchy data should be confirmed, will prepare the way for the elimination of certain difficulties in interpreting the evidence obtained by Miss Dorothy Garrod on the skeletons from Palestine regarded by her as mesolithic.

Dr. Wilfrid Jackson directs my attention to an article by Prof. Yoshikiyo Koganei² on the occurrence of dental mutilations in so-called stone-age Aino remains from the shell-mounds of Japan. I have the less excuse for forgetting this fact because two years ago, during my visit to Tokyo, Prof. Koganei showed me the actual specimens.

While none of the evidence which escaped my memory when I was writing my letter to *Man* is quite conclusive, its cumulative effect is to raise the possibility that the practice of evulsion of the teeth may be much older than I assumed to be the case.

In drawing inferences from sporadic instances of the absence of incisor teeth, the fact should never be overlooked that such deformations may easily be produced as the result of disease or accidental injuries inflicted by a process no more lethal or culturally significant than prize-fighting. In fact, it is doubtful whether the instances attributed to the Egyptian pre-dynastic period and Middle Kingdom are of any real significance as evidence of a cultural practice, and Dr. Wilfrid Jackson's Neolithic examples may possibly come into the category of accidental injuries.

G. ELLIOT SMITH.

Aug. 30.

¹ *J. Anat. and Physiol.*, vol. 49, p. 72 ; 1914.

² *Mitt. d. mediz. Fakultät d. Kaiser. Universität zu Tokyo*, Band 28, Heft 3 ; 1922.