(2) For *Drosophila melanogaster* and some other species (for example, *D. funebris*, *Zea*, *Antirrhinum*, barley) one finds that the number of mutations induced by cosmic rays should be at sea-level about 0·1 per cent, and at great altitudes about 3·0 per cent of the number of spontaneous mutations, and therefore negligible in comparison with the latter[3].

(3) We have no reasons to believe that other species would behave in a different manner.

In this connexion we should like to recall some recent conclusions of radiation genetics and mutation theory: (*a*) the spontaneous and induced mutation capabilities show far-reaching parallelisms[4]; (*b*) we have no reasons to believe that small amounts of radiation would show departures from the proportionality rule stated above; and (*c*) the origin of spontaneous mutation can be explained without an admission of special mutation-inducing agents in the external environment[5].

Thus, for the most interesting facts described and summarised in Dr. Hamshaw Thomas's paper, other explanations should be found. Without being able to discuss here in detail this problem, we believe that such explanations can be based on modern views concerning evolution in Mendelian populations (Fisher, Haldane, Morgan, Muller, Tschetverikov, Wright). Great altitudes in mountainous regions offer to the organisms extremely specialised conditions and a great variety of local biotopes. The latter favour the isolation and selection of specially adapted forms. Different mutations, serving as material for this evolution, are abundantly present (in heterozygous condition and in different concentrations) in every free-living population which is sufficiently large[6].

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[1] NATURE, **137**, 51 (1936).

[2] Citations in: Muller 1928, *Proc. Nat. Acad. Sci.*, **14** (1930); *Amer. Nat.*, **64**; Muller 1934, *Science of Radiology*, Springfield. Timoféeff-Ressovsky 1934, *Biol. Reviews*, **9**. Timoféeff-Ressovsky, Zimmer u. Delbrück 1935, *Nachr. d. Ges. d. Wiss. Göttingen*, Fachgr 6, N.F. Bd. 1, Nr. 13.

[3] Muller and Mott-Smith, *Proc. Nat. Acad. Sci.*, **16** (1930); Timoféeff-Ressovsky, *Erg. med. Strahlenforsch.*, **5** (1931); Efroimson, *Biol. Zentrbl.*, **51** (1931).

[4] Muller 1928, l.c.; 1930, l.c.; Timoféeff-Ressovsky 1934, l.c.

[5] Timoféeff-Ressovsky, Zimmer u. Delbrück, 1935, l.c.

[6] Timoféeff-Ressovsky, *Roux's Arch. Entwmech.*, **109** (1927); *Der Erbarzt*, **2** (1935); Tschetverikov, Verh. 5. Intern. Kongr. Vererb., Bd. 2 (1928); Dubinin and collaborators, *Biol. Zurn*, v. 3 (Russian) 1934; Gershenson, *Amer. Nat.*, **68** (1934); Gordon, *Amer. Nat.*, **69** (1935).

THE considerations put forward by Dr. Delbrück and Dr. Timoféeff-Ressovsky are of undoubted importance and were in my mind when my lecture was written. In fact, my suggestions were based on the parallelisms between induced variation and the so-called spontaneous mutations, together with the quantitative relation mentioned in Section 1 of their letter. But I consider that at present the view that "spontaneous mutation can be explained without an admission of special mutation-inducing agents in the external environment" is an assumption which has yet to be proved. The fact that more 'spontaneous' mutations occur than would be expected to result from natural radiation is not a final objection. For as Prof. Blackett pointed out[1] there are certain differences between the nature of the ionisation produced by cosmic rays and by gamma rays, so that it cannot be concluded that the effects of both, when of the same average intensity, are always identical. The differences are connected with the production of bursts and showers. We know that these occur at sea-level[2] and in water[3] while their frequency increases with altitude[4] more rapidly than the cosmic ray ionisation. Thus we are yet scarcely in a position to calculate the mutation rate due to cosmic rays from the X-ray data. Again, some plant species appear morphologically stable over long periods of time, while others are unstable. Apparently X-radiation may set up conditions causing unexpected variation in more than one successive generation of plants[5], and I think we may have to distinguish between the manifestation of genetic instability and its original cause.

The last paragraph of my paper made it clear, I thought, that I realise the importance of considering other modern views in explanation of the facts described.

May I here direct attention to the important considerations put forward by Prof. H. H. Dixon (NATURE, 125, 992; 1930), who originated the view which I tried to elaborate, since unfortunately this article was omitted from my list of references.

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[1] *Att. 1° Congr. Int. Elet. rad. biol., Venice* 1934, **2**, 1169 (1935).

[2] For references, see Hoffmann, Internat. Physics Conference London, 1934, **1**, 226; also Carmichael, H., *Proc. Roy. Soc.*, **A** (in press).

[3] Weischedel, *Phys. Z.*, **36**, 796 (1935). Clay and Clay, *Physica*, **2**, 1042 (1935).

[4] Montgomery and Montgomery, *Phys. Rev.*, **47**, 429 (1935).

[5] Prof. Goodspeed at Sixth International Botanical Congress, 1935.

Gases of War

IN NATURE of February 15, Mr. Arthur Marshall contributes an article on the "Gases of War" in which he says of mustard gas "attempts were made to work out a method of manufacture. This was found to be far from easy, and [*a*] no mustard gas of British or American manufacture was actually fired in the War. [*b*] The French were more successful, and in the last months before the Armistice their [*c*] 'yperite' was used by them and [*d*] the British, causing severe casualties to the enemy".

As very important implications involved in a correct appreciation of what actually happened are perhaps imperfectly understood, I shall be glad if space can be afforded to me to correct several misstatements in this short quotation.

As to (*a*), I have a letter of thanks from the War Office for the assistance rendered, stating that in storming the Hindenburg Line, the culminating feat of arms of the Great War, the mustard gas had been of great value, had caused heavy enemy casualties, and according to the accounts of German prisoners, had severely affected the enemy morale and assisted to break down their resistance. That will serve as proof that our mustard gas was actually used with effect on the enemy.