The practical utility of aerial germicides is of course open to debate, but the indications are that α-hydroxyisobutyric acid may have some applicability to such use because of its ready volatility with dry heat. The acid is likewise somewhat volatile with steam, which might make it useful where a steam inhalation of mildly germicidal vapours is desired. It has the disadvantage of being corrosive to some metals.

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April 11.

[1] Lovelock, J. E., *Nature*, **156**, 782 (1945).
[2] Ayres, G. B., and Tobie, W. C., *J. Bact.*, **41**, 43 (1941).
[3] Tobie, W. C., and Ayres, G. B., *J. Bact.*, **50**, 333 (1945).

Misuse of the Term 'Evolution'

IN the review of my "Essays on Human Evolution" in *Nature* of June 8, p. 749, Prof. A. D. Ritchie raises a matter of high importance to students of human origins—the right use of the word 'evolution'. "Biological evolution in the proper Darwinian sense," he claims, "is the process by which the normal kind of species, of fairly definite and fairly homogeneous genetic character, gives rise to one or more daughter species of different but equally definite and homogeneous genetic character." In giving this definition, Prof. Ritchie has failed to note that Darwin, when he came to write "The Descent of Man", revised his evolutionary terms; in "The Origin of Species" he speaks of competition and selection as taking place between "individuals", "varieties" and "species"[1], but in "The Descent of Man" his "evolutionary units" become "communities", "tribes" and "nations", and it is between such units that the processes of evolution go on, the processes of variation, competition and selection. Over and over again, Darwin emphasizes the fact that primitive man confined his sympathy and aid to members of his own community. The following is the only passage in which he mentions "race" as a competing unit: "Extinction follows chiefly from the competition of tribe with tribe, and race with race"[2]. This must be regarded as a slip of the pen, for elsewhere he recognizes very clearly that competition and struggle for survival are carried on between communities, tribes or nations of the same race. Only when a community of one race is brought into contact with a community of another race does an interracial struggle arise. Thus if I have erred in using the term 'evolution' to describe the processes which change the nature and destiny of a community, a tribe, or a nation, I have erred in very good company.

Prof. Ritchie apparently denies that civilization has any part in human evolution. This is what I suppose him to imply when he writes: "to call changes in human habits, tradition, culture, in what men learn in the course of their lives, evolutionary, is to make clear thinking impossible". Is not industry part of a nation's heritage? And is not industry the parent of military power? Has not military power, as exerted in the recent War, altered the evolutionary destinies of nations? Every event and process which weakens or strengthens a nation I regard as a factor in human evolution. It is not the recognition of this truth which confuses; confusion has arisen from a failure to recognize it.

One other important point remains. Is the whole species of mankind (*Homo sapiens*) now in process of evolution? Prof. Ritchie thinks not, for he has written: "The term evolution in the . . . sense of full transformation of species cannot be applied to anything that is known to have happened to the human race since the earliest agricultural settlements, 200–300 generations ago". I am content with a period much shorter than the 7–8,000 years postulated by Prof. Ritchie. Four or five centuries will suffice for my purpose. Let us take a map of the world, one showing the strength and distribution of human races before Columbus and Capt. Cook sailed the seas, and place alongside of it another which shows the distribution and strength of races as they are in the modern world; the differences between those two maps represent the evolutionary changes which have transformed the whole species of humanity in the course of less than five centuries. Many thousands of evolutionary units have been exterminated; hundreds of new units have been formed. Races which are confined to small areas in the old map have spread into great new regions in the later map; a few peoples have just held their own; numbers are on the downward path. The assemblage of human genes in the modern world is very different from that of five centuries ago. All the factors which have brought about these changes are, in my opinion, factors in human evolution. I hold that evolutionary changes are taking place in the human world of to-day at a more rapid pace than ever before in the long history of mankind.

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June 10.

[1] "The Origin of Species" (6th Ed., 1885), p. 58.
[2] "The Descent of Man" (Murray's reprint, 1913), p. 282.

A MAN 'inherits' the colour of his eyes from his ancestors; that is a process which has to do with evolution. He may 'inherit' a house from them; that is a different process, which in itself has nothing to do with evolution. Sir Arthur Keith's question, "Is not industry part of a nation's heritage?", and what follows, show that he fails to distinguish between genetic and social changes. I still think this is a mistake, even if 'inherited' from Darwin. In some cases there will be a relation between social and genetic change, but specific evidence as to what it is and where it occurs is needed before it can reasonably be asserted. Sir Arthur Keith, I submit, does not produce such evidence.

A. D. RITCHIE

Tyndall and Stefan's Radiation Law

THE reference to the work of Tyndall asked for by Prof. John Satterly recently[1] is to a paper in *Annalen der Physik*, **124**, 36 (1865), and not in a book by Tyndall. The paper describes experiments on the emission of radiation from a platinum spiral, with an apparatus having a rock salt lens and prism and a thermopile. Tyndall's paper is mentioned by Wüllner[2], who gives the calculation referred to by Prof. Satterly.

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[1] *Nature*, **157**, 737 (1946).
[2] "Lehrbuch der Experimentalphysik", **2**, 215, 5th edit. (Leipzig, 1896).

IN the published account of the 1865 Rede Lecture, "On Radiation" ("Fragments of Science", 1871), John Tyndall describes an experiment showing that a rise in temperature of an incandescent body augments the invisible radiation along with the visible. He tabulates the energy of the obscure radiation for increasing temperatures of his source, a spiral of platinum wire, and describes the appearance of the spiral, though the actual temperatures were not measured.

The relative energies measured by his thermopile for an intense white appearance and for red were as 440 is to 37, or 11·9 to 1, exactly the figure mentioned by Prof. V. Satterly[1]. Hence it is likely that these experiments gave rise to the legend referred to, though the temperatures associated with red and white heat seem a little low.

Estimating the approximate temperature of Tyndall's wire from the colour scales published in engineering and laboratory handbooks, and converting to absolute scale, his results, when plotted on double logarithmic paper, yield for the eight highest temperatures quite a good straight line of the correct slope. The interpretation of his colours was as follows:

Tyndall	Dull red	Red	Full red	Orange	Bright orange	Yellow	White	Intense white
Estimated temperature	700	850	950	1000	1100	1200	1300	1500° C.
Energy of obscure radiation	25	37	62	89	144	202	276	440

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[1] *Nature*, **157**, 737 (1946).

Scientific and Industrial Research in Great Britain

IN the admirable article on "Scientific and Industrial Research in Great Britain" appearing in *Nature* of June 1, the suggestion is made, concerning the grants made by the Department of Scientific and Industrial Research to promising research workers or as maintenance allowances to students, that "such awards might well be made on a more generous scale; further, they might be given without the irritating inquiry into personal means and individual circumstances".

Reference to the "Notes on Grants Awarded by the Department to Research Workers and Students" (H.M. Stationery Office, 1945. 2*d*.) shows that attention has already been directed to these matters. The amount of the maintenance allowances to students is now £260 a year at Oxford and Cambridge, £250 a year at London, and £220 a year at other universities. When the student lives at home the allowance at all universities is £180 a year. In making the grants no account is now taken of the income of the student's parents; but deductions are made in respect of the student's private income, if any, other awards which may be held by him, and 50 per cent of any demonstrating or teaching fees he may earn. On the other hand, the Department pays all necessary university and college fees, including those for higher degrees. The allowances are also free of income tax. In the case of awards to senior research workers, the amount of the grant depends on the particular circumstances but is not normally less than £400 a year plus approved fees.

Sir Edward Appleton has made reference in several of his addresses mentioned in the article to the very substantial nature of a number of the recent grants made by this Department for the encouragement of fundamental researches at universities of "special timeliness and promise".

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Lantern Slides of Diagrams, Formulæ, etc.

THE methods of making lantern slides of text-book figures, etc., described in *Nature*[1] are interesting but unnecessarily ingenious. If a plain glass slide is clean, it can be written on with any ordinary ink in any colour with any pen. Erasures can be made with a penknife. If the finished slide is covered with another and the two are bound in the usual way, the result seems to be as permanent as anything else made of glass.

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[1] *Nature*, **156**, 574 (1945); **157**, 591, 700 (1946).