large part from social and scientific contact with most of their fellow-scientists. On the other hand, the problem exists also in our Northern states. The chemist Percy Julian found his home bombed in Chicago. Recently, in the same city, Dr. Julian was barred from a luncheon of scientists at the Union League Club. Very few Northern universities and colleges have more than a token representation of Negroes on their faculties. Many schools, including medical schools, discriminate against Negro students through the so-called quota system.

Lorch *et al.* certainly are justified in complaining against discriminatory practices at a Nashville meeting of the southeast section of the Mathematical Association of America. Their suggestion that an antidiscrimination clause should be placed in the bylaws of that organization should be extended to cover all organizations of scientists. Furthermore, it would seem desirable for the AAAS and all its affiliated organizations to make concerted, though belated, efforts to break down some of the gross discriminatory practices that besmudge the training and hiring policies of most of our schools and laboratories, both in the South and in the North. In this manner the AAAS can better fulfill its function of serving scientists, both Negro and white. Perhaps a first step could be taken through the appointment of an interracial committee to make a thorough investigation of discrimination against American scientists. The committee thereupon could make specific proposals for appropriate action by the AAAS and its affiliates.

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Limiting Factors

WHEN considering the principle of limiting factors, plant scientists still lean heavily on Blackman's concept (*Ann. Botany,* **19**, 281 [1905]), which implies that, in a process influenced by several factors, only one (the one having the "slowest pace") can limit the process under a given set of conditions. The recent excellent textbook of Curtis and Clark (*Introduction to Plant Physiology.* New York: McGraw-Hill [1950]) presents two figures showing that increased photosynthetic yields can be obtained by increasing either CO_2 or light intensity within certain parts of their range, but when interpreting these data they say that the more obvious and more important reason for this phenomenon is that different parts of the test plants are under different environmental conditions. The implication is that Blackman's concept is correct, but that the failure of experimental conditions to insure uniform environment for all plant parts is responsible for the apparent discrepancy between experimental results and Blackman's diagram.

The fact is, however, that Blackman's diagram is oversimplified. This can be demonstrated by discussing the utilization of relatively "slow factors" in a process such as photosynthesis. Let us assume that all the factors in the photosynthetic process are relatively abundant, except CO_2 and light supplies. Let us give light the value x and allow CO_2 to vary between 0 and ∞; then give light the value $2x$ and again let CO_2 vary between 0 and ∞. A diagram of CO_2-utilization graphed against CO_2 concentration would then appear as shown in Fig. 1. Note that for any given light supply there are three ranges of CO_2 concentration: the range $O–L$, in which CO_2-utilization approaches 100%; the range $L–S$, in which CO_2-utilization decreases from near 100% to near 0%; and the range $S–\infty$ in which CO_2-utilization approaches 0% asymptotically. In the range $O–L$ utilization is so near complete that increased light supply does not increase yield detectably. In this range yield is linearly proportional to CO_2 supply. In the range $S–\infty$ CO_2-utilization represents such a small fraction of the available supply that variation of the CO_2 supply has no detectable influence on yield. This is the "saturation" range. These two parts of the range were understood by Blackman, but he ignored the $L–S$ range. Therein lay his oversimplification. In the $L–S$ range CO_2-utilization is detectably less than 100%, and increase of other factors may provide higher efficiency of CO_2-utilization and higher yields; but CO_2-utilization in this range is detectably more than 0%, and so an additional CO_2 supply improves the availability detectably, and higher yields result. The relationship between CO_2 supply and yield, however, is not linear in this range.

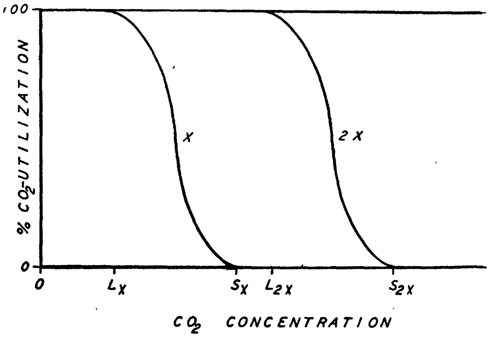

FIG. 1. Diagram of the relationship between CO_2-utilization and CO_2 concentration in photosynthesis, when light is held constant at a relatively low level.

Fig. 1 also illustrates the meaning of relative scarcity and relative abundance. With a light supply of x the CO_2 supply S_x represents approximate saturation. When light supply is $2x$, the CO_2 concentration L_{2x} represents relative scarcity, although the absolute value of L_{2x} is greater than S_x. It is obviously possible for several factors in a process such as photosynthesis to lie in an $L–S$ range simultaneously. Under such conditions an increase in any one of these factors will provide detectable yield increases. The postulation of nonuniform environmental conditions is not needed to explain such a phenomenon.

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