REDUCTION IN INCIDENT SOLAR ENERGY BY DESERT SHRUB COVER.[1] Modification of the microclimate by the cover of vegetation is a well-known phenomenon. Even in arid lands, the harshness of the environment is ameliorated in the immediate vicinity of the widely separated plants. This effect is important under arid conditions, in that it is generally only under such plant cover that a microhabitat moderately suitable for germination and early growth is provided. The environmental modification produced by the cover of foliated trees and shrubs is the result of a reduction in air and soil temperature, plus associated effects, details of which have been reported by a number of investigators, including Shreve (1931) for the Arizona Upland Desert. An opportunity was afforded me to investigate one aspect of this modification of the microclimate—the reduction in incident solar energy to the space beneath certain selected defoliated shrubs in an extreme environment, the Colorado Desert of southwestern United States (Shreve, 1942).

The investigation was conducted during the latter part of August, 1963, at the Philip L. Boyd Deep Canyon Desert Research Area (latitude 33° 39′ N, longitude

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116° 22′ W, elevation 1000 ft), located near Palm Desert, California. The vegetation of the area is representative of the Creosote Bush Shrub Community (Munz and Keck, 1959). Solar energy input (cal/cm²/min) to a horizontal surface in the open and under the cover (north side) of certain selected shrubs of the larger species of importance in the area was determined by use of a Belfort recording pyrheliometer, a bimetallic actinograph (Gates, 1962) responding to radiation chiefly in the wavelength range 0.36 to 2.0 microns. The instrument was placed as close as possible to the base of each of the plants to insure potential coverage during the recording period. The recorded solar energy input to open ground and under shrub cover was integrated over the 12-hr recording period (7 AM to 7 PM) for purposes of comparison. On the days of recording, there was cloudiness at the horizon and a few thin clouds higher in the sky; the sun was never obscured. Individuals of several species of shrubs were chosen for observation on the basis of being approximately equal in crown volume, and representative of the gross morphology of the species in the area. With the exception of one fully foliated individual of *Larrea divaricata*, located near a small artificial pool maintained by the custodian of the research area, the shrubs were in the summer-dormant (80 to 100 per cent defoliated) condition. A full day's recording was allotted to open ground and to a particular individual of each of the species of interest. As a check on reproducibility, the recordings were triplicated during additional half days for the same individual shrub and with the instrument in the same (marked) position. Replicated recordings agreed within 6 per cent. The full day's recordings are discussed below as representative of the variations that might be expected under the conditions specified.

The per cent reduction in incident solar energy to the space beneath the cover of several shrubs is presented in table 1. In the near absence of leaves, intricacy of branching (extent of minor branching) appears to be the chief morphological factor involved in the reduction of solar input, since an ordering of the plants on the basis of estimated decrease in the intricacy of branching (no. 3–6 in table 1)

TABLE 1

Reduction in incident solar energy under shrub cover

Species	Per cent reduction	Max (cal/cm²/min)*	Min (cal/cm²/min)*
1. Open ground	0	1.2	0.8
2. *Larrea divaricata* (foliated)	57	0.5	0.3
3. *Cercidium floridum*	49	1.0	0.1
4. *Dalea schottii*	31	1.0	0.3
5. *Larrea divaricata*	18	1.1	0.4
6. *Fouquieria splendens*	10	1.2	0.2

*For values recorded between 10 AM and 4 PM, the interval during which pronounced fluctuations occurred.

results in a corresponding ordering on the basis of per cent reduction in solar input. In general, these desert shrubs were observed to afford a considerable reduction in incident solar energy under conditions (dormant and defoliated) which might superficially appear to render the reduction inconsequential.—WALTER T. McDONOUGH, *University of Cincinnati, Cincinnati 19, Ohio.*

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