flowing style add charm to the value of an outstanding contribution. The extreme fragmentation and quasi-anarchy of Toubou culture are explained clearly and briefly. The overall pattern is shown to be "molecular," with no clear hierarchy of clans, no religious aristocracy, and no hereditary chief or even strong ones, as a rule, above the level of the extended family. The general tendency to operate relatively small caravans regularly over enormous distances, while still maintaining attachment to wretched little sedentary bases, is discussed and shown to be much more developed among the Teda of the Tibesti massif than among the Daza of the lowlands farther south, where life is easier and nomadism consequently more restrained.

Four excellent chapters by Cauneille, Bataillon, Sarel-Sternberg, and Rovillois-Brigol describe, respectively, seminomadic tribes of western Libya, the northeastern Algerian Sahara, and southern Tunisia and the breakdown of nomadic tribal organization around Ouargla. All four are good general studies, but they are most important in that they show how seminomads, who already have a foot permanently on the threshold of sedentary semiurban life, can adjust to increasing sedentarization without undergoing the shattering cultural disintegrations that such adjustment provokes in more exclusively pastoral nomadic groups.

Finally, Bataillon sums up in three masterful chapters (one written partly by Verlaque) and a conclusion. The problem posed is this: How can a pastoral nomadic tribe be integrated into modern political and economic administrative structures without demolishing the tribe's entire culture and so destroying it? To this, Bataillon's reply is that is really can't be done. Unquestionably he is right. To be sure, he does his best to sugarcoat the pill. He shows that in the relatively fertile *sahel*, where the southwestern Sahara merges into the Sudan, fully nomadic tribes can perhaps be coaxed into a state of seminomadism, and thence eventually into sedentary life, while still retaining their sociopolitical structures and self-respect intact. But this very argument involves the tacit admission that the great majority of Saharan pastoral nomads are beyond effective help, because their territories are isolated semirefuge areas far removed from the potential zone of adaptation.

In short, pastoral nomadism on the grand scale cannot survive the effects of modern transportation, centralized administrative control, and economic expansion that syphons off laborers and makes them economically more powerful than the warrior-nomad class. So far no efforts to modify the pastoral nomadic way of life have been really successful. The only hope seems to lie somewhere between two extremes, a strictly hands-off policy, on the one hand, and, on the other, an intensive program to improve pasturage, fodder storage, and breeding methods, and thus make nomadism progressively less necessary. Bataillon closes with these ominous words (freely translated by me): "In the last analysis one must hope that the nomads themselves can find a viable way of life in the midst of buffetings." And I, at least, can only say Amen!

To sum up, we have here available, and for the first time, a broad and reasonably coherent survey of the critical situation of pastoral nomadic cultures in the Sahara, and it is a very good one on the whole. In spite of several factual and interpretative errors, it is well worth the time of any reader who approaches it with due caution as regards details.

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Solar Energy

Introduction to the Utilization of Solar Energy. A. M. Zarem and Duane D. Erway, Eds. McGraw-Hill, New York, 1963. xii + 398 pp. Illus. $13.50.

"The amount of solar energy reaching the earth each year is over thirty thousand times that presently used in the same time period. In view of the rapidly diminishing supplies of fossil fuels it is clear that we must soon devise means for converting solar energy more economically into useful power. This problem has challenged us for many years but there are still very few applications which are economically sound." This paragraph, which is from the editors' preface to a series of lectures given during the academic year 1954–55 and published in this volume, is as valid today as it was 8 years ago.

The introductory lecture, by Farrington Daniels, is followed by a chapter on energy sources of the future, much of which is from Putnam's 1953 study. The availability, collection, and concentration of solar energy occupy four chapters, and the conversion of solar energy to various other forms of energy —mechanical, electrical, and chemical —is covered in the next three chapters. Thermal applications of solar energy—the heating and cooling of buildings, the distillation of sea water, and high temperature applications—are then considered (3 chapters). A chapter on the economics of solar energy and a long chapter on space applications of solar energy complete the book.

It is very interesting, in 1963, to look back to a research field as it existed in 1955. This is particularly true of a subject like silicon solar cells: in 1955 the cells were a laboratory curiosity that offered some promise for use in the conversion of solar energy to electrical energy on the earth's surface; today, owing to their use in space programs, they are the backbone of a $10,000,000-a-year business. The economics of solar energy is another subject about which much has been learned during the past 8 years. (One wishes the contributions had utilized the excellent surveys on this topic which were presented at the 1961 United Nations Conference on New Sources of Energy, even though the papers have not yet been published for general use.) The conversion of solar energy to chemical potential energy is another field about which much more information is available today.

The updating of the various chapters is quite uneven. In his chapter on space applications of solar energy, W. R. Menetrey lists work published as late as December 1961. Another chapter that has been considerably updated is the one by George O. G. Löf on heating and cooling buildings with solar energy; Löf provides very precise descriptions and data on cost for solar houses in Lexington (Massachusetts), Denver, Albuquerque, and Tucson, as well as brief mention of several houses in other locations. Apparently other chapters received less updating during the long delay that preceded the publication of the lectures.

The oldest process for utilizing solar energy, one that each of us uses every day, is photosynthesis. It is unfortunate that this interesting topic is hardly mentioned in the book, for much progress has been made in that area during the last 8 years.

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