

ten times as large. As a final example, the caption on one photograph is erroneous. The photo is not of the Matilija overturn but of an east-plunging anticline in upper Sespe Canyon north of the Santa Ynez fault. The road in the photo is the highway from Ojai to Cuyama Valley.

Despite some errors of this sort, I found *Geology of California* an informative and very readable work on a fascinating parcel of real estate. Without question, it is bound to stimulate the interest of all those who peruse it. The book seems suitable as a text for an introductory course on California geology.

JOHN ALBERS

Analyse des klassischen nordalpinen Mesozoikums; by ALEXANDER TOLLMANN. P. 680, 256 figs., 3 tables. Wein, 1976 (Franz Deuticke, 1400 öS, 200 DM) and *Der Bau der Nördlichen Kalkalpen*; by ALEXANDER TOLLMANN. P. 449, 130 figs., 7 tables. Wein, 1976 (Franz Deuticke, 1400 öS, 200 DM).—These two volumes form parts II and III of Professor Tollmann's extremely impressive trilogy "Monographie der nördlichen Kalkalpen." The first part, "Grundprinzipien der alpenen Deckentektonik" was published in 1973 and was reviewed recently (Burchfiel, 1975). Together the three parts contain 1433 pages, 556 figures, 10 tables, and a list of references which in part II covers 55 pages; the monograph must rank as one of the most complete works yet to be published on a single tectonic element in the eastern Alps, or on any single tectonic element in the entire Alps for that matter.

Part II, "Analyse des klassischen nordalpinen Mesozoikums," is principally a description and discussion of stratigraphy, fauna, and facies of the Mesozoic rocks of the Northern Calcarous Alps. After brief introductory remarks concerning the historical works on the rocks of the Northern Calcarous Alps and general material on rock types, thickness, chemistry, nomenclature, and symbolic representation follows the main body of the work. Rock units that range from Permian through Tertiary are described by age in lexicon fashion. Each rock unit is thoroughly described as to its nomenclature, type locality, lithology, contact relations to adjacent units, regional distribution, thickness, age, fauna, and for many units depositional environment. Faunal data are given for both macrofossils and microfossils, and for many units the fossils are figured by photomicrographs, photographs, and line drawings. Outcrop-scale photographs of many units are figured as well as cross-sectional line drawings, small stratigraphic columns, and index maps of the Northern Calcarous Alps showing their principal areas of outcrop. Particularly useful are several figures showing facies relations between some rock units and interpretive diagrams showing environmental reconstructions. Occasionally rare data on oxygen isotopes, heavy mineral content, and even the presence of cosmic particles in Jurassic rocks are covered.

The final chapter consists of a discussion of the facies realms of the Northern Calcarous Alps. It begins with introductory information

concerning the nature and character of facies zones in general and the facies zones of the Northern Calcarous Alps; a particularly interesting discussion for me concerned influences of Carpathian facies in the eastern part of the Northern Calcarous Alps. In the introductory material on facies realms, Tollmann argues that rocks of the Northern Calcarous Alps cannot be classified easily as either miogeosynclinal or eugeosynclinal and classifies them as aristogeosynclinal, a term he first used several years ago. In Tollmann's reconstruction, rocks of the Northern Calcarous were deposited far from the Pennine eugeosyncline, on a rapidly subsiding continental crust, with evidence of minor volcanic activity in a predominantly shallow water Triassic carbonate environment, separated from the eugeosynclinal terrane by the less rapidly subsiding carbonate-covered terrane of the Middle East-Alpine facies realm. These were the first rocks to show direct evidence of deformation in the eastern Alps. These characteristics, he argues, do not fit classical geosynclinal nomenclature—hence the term, aristogeosyncline. *Aristos* is Greek for best, but then everyone's favorite sedimentary trough is an aristogeosyncline.

In the second and last part of the final chapter, Tollmann describes the details of each of the three major subdivisions of Northern Calcarous alpine facies realms (Hauptdolomite, Dachstein, and Hallstät facies) as well as many subfacies realms. The descriptions follow a lexicon format similar to that used in the description of rock units earlier in the book.

I found Part II of the trilogy very useful and undoubtedly will use it frequently in the future. Very often in works on alpine geology, rock units and facies zones are given by name with no descriptions. It is taken for granted that geologists working in the region know the full meaning of the names; but for those who have a continuing interest in alpine geology, but are not actively working there (the reviewer fits in that category), the terminology is tedious and often confusing. Tollmann's "Analyse des klassischen nordalpinen Mesozoikums" goes a long way toward solving this problem.

Part III, "Der Bau der Nördlichen Kalkalpen," is a detailed description and discussion of the structure of the Northern Calcarous Alps in three chapters. The first two short chapters are introductory and deal with the history of investigation and the position of the Northern Calcarous Alps in the Alpine-Carpathian orogen. The second chapter reviews the evidence for the allochthony of the Northern Calcarous Alps and contains a two-page discussion on subduction in the structural evolution of the Eastern Alps, reminding us that the Eastern Alps is where Ampferer first developed the concept of *Verschluckungen* (subduction).

The remainder of the book (chap. III) covers 349 pages and contains detailed descriptions of the three major tectonic divisions of the Northern Calcarous Alps (Bajuvarikum, Tirolikum, and Juvavikum) and all their more than thirty subdivisions, range by range, across northern Austria. The descriptions are supported by 130 figures that contain

numerous cross sections, photographs, and sketch maps of the structural units. The volume is accompanied by seven tables, five of which form a tectonic map of the Northern Calcarous Alps at 1:100,000, and the remaining two show a series of 26 profiles spaced across the entire allochthon. When finished, the reader feels that he has a detailed picture of the three-dimensional geometry of the structures and structural units and their relation to stratigraphy.

These last two volumes of Tollmann's Trilogy are a detailed up-to-date monumental work on the descriptive structure and stratigraphy of the Northern Calcarous Alps. It is really all you ever wanted to know about the Northern Calcarous Alps from a purely descriptive point of view supported by extensive figures and bibliography. It can form basic data for anyone who wants to speculate on mechanical or regional tectonic analyses, subjects rarely treated in these two volumes, but I have the impression they were never intended to cover this ground. Further works which cover the geology of Austria in two volumes are in press and in preparation by this incredibly prolific writer, and the preliminary announcements suggest some of the mechanical aspects of the Austrian Alps will be covered there. The "Monograph of the Northern Calcarous Alps" is important reading for any serious student of alpine geology but not for those with only casual interest.

B. C. BURCHFIELD

REFERENCE

Burchfiel, B. C., 1975, Grundprinzipien der alpenen Deckentektonik-eine Systemanalyse am Beispiel der nordlichen Kalkalpen: Am. Jour. Sci., v. 275, no. 8, p. 987-988.

Remote-sensing applications for mineral exploration; edited by W. L. SMITH, P. xiv, 391, num. figs. and tables. New York and Stroudsburg, Pa., 1977 (Halsted Press and Dowden, Hutchinson and Ross, Inc., \$50.00). —This book is primarily a summary of what has been learned from NASA's Earth Resources Technology Satellite (LANDSAT) after about three years of use. Thus, it presents a preview of what can be expected from future satellites specifically designed for particular user needs. LANDSAT has contributed to a wide variety of studies; some of the most useful have been in agricultural surveys, landuse analysis, and, in geology, lineament recognition. As you read many times (each author is a recognized authority), LANDSAT has a number of unique characteristics: synoptic and repeated coverage at essentially the same time of day but throughout all season changes; a variety of sensors and the ability to handle and manipulate the data via special processing and enhancement techniques. Many of the studies summarized use the imagery as photographs without computer assistance other than using the false-color imagery along with black and white prints of the individual band print-outs. Two chapters give short courses (mini-courses) on digital enhancement and spectral ratioing methods that are of particular interest for mineral exploration. These methods can also be applied to aerial photography but with the additional (and costly) step of converting a picture to