Indian scholars might ask why so few Navajos were interviewed for the study. Reardon (p. 10) should be Riordan. Enhancing the volume are photographs of the principal actors, a reservation map, a bibliography, and an index.

Highly readable and thoughtfully written, Parman's book not only broadens our understanding of the New Deal, but presents an in-depth look at one of its most ambitious programs. It throws into bold relief the efforts of a government bureaucrat who misread the role of culture in his zeal to promote change on the largest Indian reservation in the country. Parman's work is a sober appraisal that offers valuable insights into the history of the region and the nation during a troubled decade.

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Native American Astronomy. By Anthony F. Aveni, ed. Austin: The University of Texas Press, 1977. 286 pp. $15.95.

Archaeoastronomy in Pre-Columbian America. By Anthony F. Aveni, ed. Austin: The University of Texas Press, 1975. 436 pp. $19.50.

Archaeoastronomy is a relatively new field. It is an attempt to evaluate the astronomical knowledge of civilizations whose knowledge was never preserved in the form of writing, or where most of the written records have been destroyed or lost.

The tools of the archaeoastronomer are ethnographical, textual and archaeological. Thus many disciplines are brought to bear on this problem. These two books are collections of papers concerning various particular aspects of the current activities in these areas. They are not broadly based surveys for casual reading, but the works of active scholarship — some requiring intensive reading and study coupled with background knowledge to follow the threads of the arguments.

Because the field is new, many traps still await the unwary. Thus for a simple example Britt points out (*Archaeoastronomy in Pre-Columbian America;* hereafter cited as PCA) that within a given culture a specific symbol — the cross — can represent stars in some instances, and only be a symbol in other instances taken from the same context. Thus it is not even safe to assume that a symbol has the same meaning at all phases.

It is well known that the Native Americans had detailed knowledge of some astronomical phenomena. This knowledge comes to us from the records of the conquerers and their successors, and from the few documents which managed to escape the fanatical destruction, for example the Dresden Codex. The questions which remain are: how much and what type of knowledge did they have, and how can we recover as much of what is lost as possible?

Any collection of papers, particularly papers representing active research, displays variation in quality and approach which make generalized statements about the collection risky. In reviewing this entire collection, however, one cannot help but be struck with the frequency of terminal fallacies (imposition of current knowledge on the past) and even of the Frazer syndrome (the interpretation of all cultures in the same framework) which one encounters. Thus phrases like "must have" — with which some of these works are liberally endowed — become signposts that what follows is probably based upon suppositional rather than evidential grounds. At points such as these the reader should proceed with some caution.

Turning to some more detailed comments, one of the most powerful tools available is the meager written evidence. Thus seven papers in these books are concerned with the interpretation of Mayan codices. Here enough can be read to be somewhat familiar with the material, and the thrust is to understand what is written down and still preserved. This is not easy, despite considerable work by numerous investigators over a long period of time. Even the correlation of the Mayan calendar with the Western one is not totally unambiguous. We have tables of astronomical character, both for Venus — which was a very important astronomical body — and for eclipses. Though the construction of the tables is probably understood, consisting of simple numerical sequences, their use is not quite so clear. Thus Kelley finds (*Native American Astronomy;* hereafter cited as NAA) ". . . this period has other

properties, not yet recognized, in which the Maya were interested"; "I think enough material has been presented to show that the astronomical tables were used in ways which were substantially more complex than has usually been realized . . . "; and finally, "The observational basis behind all of this astronomy remains very obscure . . . " Closs points out (NAA) that the Dresden Codex probably did not represent a scholarly work on astronomical matters, but was more like a field manual for use by the secular priests, and thus is only a distillation of the (presumably) more complete and complex knowledge by those who did the original computations. A number of interesting points are made with regard to the various inscriptions on the various monuments which still stand, and their correlations with the Codex information. Since the number of glyphs which can be securely read is increasing, this type of approach will become less subject to debate as the work goes on.

Though not quite textual, Zuidema's (NAA) analysis of the Inca calendar proceeds from post-conquest western sources (not always consistent) through pre-conquest cloths to give a glimpse of the social, political and technical aspects of the civilization.

Another possible way to gain back some of this lost knowledge is to investigate modern people to see if the traditions have been passed on. This has been done by Remington (NAA) for the Maya and by Ellis for several North American tribes and Britt for the Navaho. Remington limits data to "those which fall into the Western cognitive category of astronomy." Why? They paint an alarming picture: apparently the knowledge which is still held is *not* being passed on to the younger generation, and this situation requires some immediate attention. Somehow the knowledge of the medicine men must be recorded, but recorded in a way which is acceptable to them. Publication is not acceptable — publication of the Blessingway ceremony has stifled attempts to gain further knowledge. So much knowledge has already been lost, surely the rest can't be allowed to vanish also. This will require some immediate effort, and effort which can probably only be made by Native Americans. The article by Ellis, incidentally, is an absolute must for anyone with even a passing interest in this subject material. It is broad enough to interest anyone, and yet points out the vast differences between purpose and function of astronomical observations in the Americas as opposed to the

Western world. Marshak (PCA) shows a calendar which was kept in the "old way" into the 1960s and one is led to wonder if perhaps other living people have vestigial traces of this knowledge. Finding such individuals could lead to far greater understanding of what is in the few manuscripts. This cannot be put off.

Another type of "manuscript" are the petroglyphs. These are discussed adequately, and at length in several articles. The correlations between petroglyphs and the physical appearance is delineated by Mayer (PCA) and the correlation is excellent. One absolutely fascinating discussion concerns the possible recording of the 1054 Crab supernova explosion in petroglyphs. Records of this have been known from Chinese sources for a long time, and have quite recently been unearthed in middle eastern sources. Western Europe is strangely silent — what about America? Some petroglyphs are suggestive. Ellis counters with the interpretation of a sun watcher's station, and modern informants who declare that the unusual would not be recorded, just the usual. Brandt and Williamson (NAA) object to her extrapolating back 900 years, and then proceed to extrapolate from English culture of 1066 to American culture, and even from ancient Greece to America! The overall impression the reader receives is possibly that the petroglyphs do represent the Crab supernova explosion, but it is far, far from certain.

One form of remains are the effigy mounds. They are not understood, and Cowan first interprets the Ohio serpent mound as either Ursa Major or Minor, and later as perhaps an eclipse! Quite some difference.

We are happy to see the mythical astronomical congress at Copan laid to rest by Carlson (NAA).

One main interest was to use the sun, moon and Venus as a means of keeping the calendar straight. This led to practices of observing the sun at the solstices. To ease the observations, stations were built over which, or near which, the sun would rise at the appropriate times. From a western viewpoint it is interesting how little attention, in fact if any attention, was paid to the other planets. Jupiter is notable by its almost complete absence, though some suggestions of its presence are presented.

This leads to the subject of possible astronomical alignments in the existing monuments and structures, and this to by far

the least satisfactory portions of these books. A recent activity has been to survey accurately the existing structures, and search for significant alignments with astronomical events. It is well known and well accepted that many structures (pyramid of the sun at Teotihuacan, for example) are built with a definite astronomical orientation. The current question is what is there which we have missed. Cowan (PCA) points out "The search for alignments, at times, seems to reflect a haphazard, almost random 'groping,' and the accompanying explanations have tended to be after-the-fact . . . In short, archaeoastronomers have all too rarely used anything approaching the scientific method."

Hawkins (PCA) points out that the "errors" at Stonehenge are large, and leads one to wonder how large they must be before one questions the theory instead of the builders. This paper represents a constellation of terminal fallacies. It points out that Stonehenge could be used to predict eclipses today. It can also be used to predict tides in the Thames. Phrases like "was observed" on the basis of no evidence, and "its function is" leave one wondering. One is even more startled to find Williamson et al. (NAA) as defining a solar observatory as " . . . a site which has a demonstratable alignment to one or another significant solar direction, *whether or not it could actually be used to observe the sun*" (italics in original). One must protest. They later postulate windows for which there is no evidence. The field is poorly served by this procrustean approach.

The problem here is how close do you have to be in order to consider the alignment significant? As Hartung points out (NAA), "If we take the rise and set points during the year of all possible heavenly bodies, almost any orientation can be justified." If the center of a door doesn't align, the edges are tried and vice versa, until some sort of alignment is squeezed out. Here we encounter (Aveni, NAA) assumed alignments and moving the observer to make it work. Hartung (NAA) points out that at Tikal one right angle alignment has an error of only 3′. If construction is this good, why are angles off by 1 to 2° accepted? The dates of construction are in most cases quite uncertain, and this could shift the alignments by more than their "error."

One interesting aspect of western culture is the attempt to make anything out of the ordinary astronomical. Thus one is reminded of the tortured interpretation of the Codex Vindo-

bonesis as an astronomical document by Lehmann. Here it appears in interpreting such as Building J at Monte Alban, etc. No mention is made of the standard capture glyphs which are on the building — including place designations which are partly understood. The sign for "observatory" possibly is really the place sign for Tlaxiaco (Hartung, NAA).

We even encounter the copying hypothesis. This is that similar structures with similar alignments are copies of the original, which is, of course, the only one where the astronomy works. This has been done before for stone circles in Britain, for the pyramids in Egypt — where we know it's nonsense — and now it is postulated here. The continual surveying of the sites does serve to get the geometry down well, and thus serves future purposes. The impact of this on the knowledge of ancient astronomy is dubious.

Both books are well done technically. In text this difficult, they are remarkably free of typographical errors, but Figure 5 of Hatch's article has each individual panel upside down (PCA).

In short these two books are fascinating glimpses into a growing field. They are not without their problems, but are absolute musts for the bookshelf of anyone with a serious interest in these cultures, and will amply repay serious study.

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The Indian Legacy of Charles Bird King. By Herman J. Viola. New York: Smithsonian Institution Press; Doubleday & Company, Inc., 1976. 152 pp. $19.95.

In *The Indian Legacy of Charles Bird King* Herman J. Viola reproduces together for the first time the extant works of the first government sponsored series of Indian portraits done in America. From 1822 to 1842 Charles Bird King, a skilled Washington portrait painter, produced approximately 143 portraits of Indian chiefs and other Native North American dignitaries for the War Department. Many of the originals