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Books and Multimedia Reviews

Taking Science to the Moon: Lunar Experiments and the Apollo Program by Donald A. Beattie. Johns Hopkins University Press, Baltimore, Maryland, USA, 2001, 301 pp., $42.50 hardcover (ISBN 0-8018-6599-9).

The Apollo series of missions would, I believe, be considered by the great majority of qualified observers as the most remarkable achievement in space since Sputnik I in 1957. It is now 2002, 45 years later. In the course of nature, many of the leaders of that project are now gone, and the number of trustworthy memories shrinks year by year. So it is clearly a good thing that some participants are still setting down accounts of what happened as they saw it. Donald Beattie's book is a useful addition to this literature.

Another generally understood fact is that the decision by President Kennedy to create this program was driven by competition with the Soviet Union, not by science. So at the beginning many scientists, most notably (and briefly) Harold Urey, publicly criticized the involvement of men in the project as expensive and dangerous. Of course it was, but as he and others soon realized, Apollo as planned was not only necessary but potentially very useful for science. And indeed it proved so.

Beattie, a trained and experienced field geologist, started work for Apollo in September 1963, when the project was still relatively small and busy with organizational tasks. The timing was lucky, because the idea of using the opportunity to do exciting, ground-breaking science with Apollo was just beginning to be understood and find strong advocates.

The author gives us an account of the science side of the project as seen from NASA headquarters through the successful return of Apollo 17, along with some bittersweet conclusions in closing. The only comparable work in the same area is Don Wilhelms' *To a Rocky Moon*, published in 1993. The emphasis in the two books is quite different in detail. Wilhelms shows us a broader sweep, both in time and in the range of topics covered. Beattie tells us more about what forces determined the mission planning and execution on the science side. He chooses not to discuss science experiments carried out from orbit. This is on the reasonable ground that he was not involved with them. These are, luckily, among the topics Wilhelms covers well.

It is probably inevitable that when two people participate in the same events their accounts will differ on some points, especially after the lapse of years. I must allude to one whose extent surprised me. When I arrived in Houston just before the return of Apollo 11, as a member of LSAPT (Lunar Sample Analysis Planning Team), the science effort at the Johnson Space Center was headed by Bill Hess, with Tony Calio as his deputy. Beattie writes warmly of the former, and quite otherwise of the latter. My own view, generally shared, I believe, by my LSAPT colleagues, was exactly the opposite. As we saw it, Calio was a loyal deputy, but as far as he was permitted, and especially after he became the leader, he spent many hours working with us to solve problems and open up opportunities for the following missions. Hess seemed detached and unconcerned. The difference in our views is an interesting puzzle.

Again, Beattie's book is worthwhile. There are of course some fine books about Apollo by astronauts and others who were there. But there is still room for this one and for more.

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Leonid Storm Research edited by Peter Jenniskens, Frans Rietmeijer, Noah Brosch and Mark Fonda. Kluwer Academic Publishers, Dordrecht, The Netherlands, 2000, 606 pp., $235 hardcover (ISBN 0-7923-67383).

The Leonid meteor shower has an uncanny ability to rally scientists into action. Historically its storms and outbursts have result in great spasms of activity and prompted insightful theoretical proclamations, and yet it has also brought fourth publicly embarrassing predictions. Throughout history the Leonids have stubbornly refused to be tamed—the pride of astronomers has not been to know the particulate pride of Leo. Within the volume of work under review one might, at first, form the impression that the Leonids have finally been caged, but upon delving into its pages it is clearly not so. This is not to say that a tremendous amount of new data on the Leonid meteor shower has not been gathered in, nor is it a bad thing to know where our ignorance lies and where future work should be directed. The Leonids may not have been caged but they have certainly been corralled.

Leonid Storm Research is a collection of research papers and review articles reprinted from the journal *Earth, Moon and Planets* (Vols. 82–83, Nos. 1–3, 2000). The papers themselves being initially presented at the Leonid MAC-99 Workshop held at Tel Aviv University, Israel in April of 2000. As with any such collection of works, there is some repetition of background material, but it is also the case that in *Leonid Storm Research*

there are some excellent review articles and many articles on innovative observational techniques. The articles have been mostly written for an audience that is assumed to know something about meteor physics and current ideas on meteoroid stream formation, but this does not mean that the contents are beyond the reach of the more peripatetic reader. And, it seems fair to say that there is something of interest for every possible research taste in this collection of papers.

The text has been divided into eight sections. After the introduction, there are papers grouped under the headings of astrobiology, meteoroid stream dynamics, meteoroid composition and ablation, persistent trains, meteoroid debris, mesosphere and lower atmosphere and impacts on the Moon. A veritable "smorgasbord" of topics is presented in the text, and there is much engaging reading. It seems unfair to pick out just a few of the papers from the 42 included in the text, but unfair or not, I will do so. With respect to inspired reading and truly inspired effort the overview paper by Peter Brown (University of Western Ontario) and 40 coworkers, as well as the review paper by Peter Jenniskens (NASA Ames Research Center) and coworkers are to be highly recommended. Indeed, it is clear from just these two papers that the days of multiple-component, personnel intensive, money absorbing, coordinated observing programs are far from over, and I am reminded fleetingly of the past glories of astronomical expeditions to measure solar eclipse phenomena and the astronomical unit. And while the Herculean efforts of the ground observers and the observers in aircraft have resulted in a vast harvest of new and exciting data, the "stay at home" theorists have also risen to the occasion. The paper by Iain Boyd (University of Michigan) concerned with the rarefied gas flow around ablating meteoroids at a Mach number of 270 is particularly interesting in that an extended high temperature wake in thermal equilibrium is predicted. And this has interesting implications for where the observed meteor emission originates.

Among the review articles I thoroughly enjoyed and recommend are those by J. Mayo Greenberg (Leiden Observatory) on the chemical composition of cometary nuclei and by Frans Rietmeijer (University of New Mexico) and Joseph Nuth (NASA Goddard Space Flight Center) on the composition of extraterrestrial dust. The lengthy paper by Luis Bellot Rubio (Instituto de Astrofisica de Canarias) and coworkers on detecting Leonid meteoroid impact flashes on the Moon also makes highly interesting reading.

The researchers who produced the papers contained within *Leonid Storm Research* deserve our hearty congratulations for producing a stimulating series of experiments and results. The text is sizzling with both new possibilities and new data and I for one was inspired by what I read—I would think that any other reader would be too.

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