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HISTORY IS TOO IMPORTANT TO BE LEFT TO THE HISTORIANS

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Abstract. The author reflects on previous essays by historians of astronomy and by the astronomer Donald Osterbrock as to what it takes to create useful and accessible history of astronomy. Suggestions are put forward for astronomers in particular who may be interested in following Don's example of contributing to the history of astronomy.

1. "The View from the Observatory"

At the January 2002 annual meeting of the AAS, the Historical Astronomy Division awarded the third LeRoy E. Doggett Prize for Historical Astronomy to Donald E. Osterbrock. The citation read that he won the Prize "for his many books and articles on the history of astronomy." Don delivered the Doggett Prize Address at the meeting, and its blatantly provocative title, "The View from the Observatory: History is Too Important to be left to the Historians," insured a large audience and much anticipation. Unlike the first two Doggett Prize winners, Curtis Wilson and Owen Gingerich, who surveyed the state of their particular specialties and concentrated on internally directed intellectual themes, Don painted with a broader brush. His essay was later published in *Organizations and Strategies in Astronomy III* (Osterbrock 2002b).

Don's essay was, indeed, memorable and thought-provoking. It helps us appreciate Don's view of what it takes to do history and reminds us indeed that history is not the exclusive province of historians. Certainly he was projecting that message in the subtitle to his talk, assigning to his perspective the authority of place. Given the fact that the American

Astronomical Society and the International Astronomical Union have been strong supporters of the history of astronomy, I wanted to interpret the title of Don's talk as an affirmation that this support had been worthwhile, and that he was arguing that astronomers should be invested in their history. There were some historians of astronomy, however, who bristled at the title, sensing that it also raised the question of "who owns history?" Although that was a continuing question among historians at the time, this was not the intention of Don's essay, nor was it the way I took it.[1]

Don's message was, in fact, a far cry from when, during my days as a fledgling astronomer in the 1960s, I acquired an interest in history from spending cloudy nights spelunking in the old records in the attics of Lick and Yerkes. Referee's letters and commentary and personal correspondence revealed evidence that statements in the published record were not always true to "what happened" but were linearized rationalizations that were crafted to make a convincing argument. The process of discovery was rarely as clean and direct as their reports would have us believe. I told some people about this and was puzzled when my fellow astronomy students expressed annoyance that I was just stirring the waters, and that the published record was as far as anyone should be allowed to go. But I persisted, and as an historian have been exploring this revealing characteristic practice ever since.[2]

The published record is not a record of what happened, and Don certainly agreed with that. But one can find examples, even today, however, of astronomers, writing popularly on historical topics, who apparently do not appreciate this fact, or do not wish to explore it in public. Clearly they are not writing for an historical audience, rather for the popular reader, which from a marketing standpoint is understandable, as there are not that many historians available to consume astronomical history. But this is a loss to history and this essay is in a way an appeal to astronomers to try and be more helpful to history, or at least to the preservation of their own history.

2. Contributing to the History of Astronomy

Astronomers make the history of astronomy possible, of course, and professional historians of astronomy will forever be in their debt for doing so. But the fact is that adequately capturing the nature and many flavors of a profession that has grown by orders of magnitude in size and complexity in recent times (see Fig. 1) has become a daunting challenge for professional historians and archivists. So this is a plea for help. I will express this plea by

[1]Among others, see Crew (1996), Miller (1998), Munro (1994) and Matson (2011).
[2]See, for instance, DeVorkin (1975) and DeVorkin (2000).

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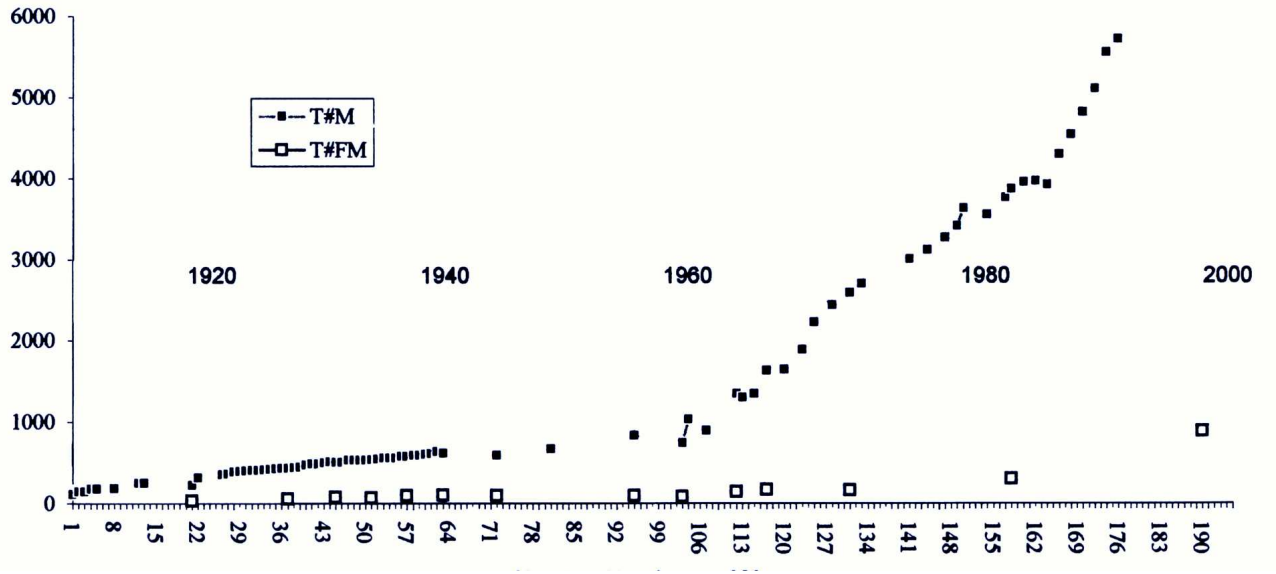

Figure 1. Membership trends in the AAS. Horizontal axis: meeting number and year. Vertical axis: number of members. Dark squares represent total number of males; open squares, females. Membership numbers derived from a variety of sources, including AAS records, AIP membership statistics, AAS Council records. The AIP and AAS statistics differed by up to 10% in the 1980s, possibly due to different polling techniques or to the inclusion or exclusion of corporate members and affiliates. (from DeVorkin & Routly 1999, p. 128)

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reflecting on Don's 2002 essay, juxtaposing it with one by Marc Rothenberg in 1985.

In an *Osiris* theme volume devoted to writing on American science (*Osiris* is a journal central to history of science but probably read by few if any astronomers), Marc identified three general types of writers who contribute to the history of American astronomy: historians of American science primarily interested in the social, cultural and institutional frameworks within which astronomy has flourished; specialist historians of science more interested in the intellectual content; and practicing astronomers who have been passionate writers of chronologies, biographies, and anecdotal episodes (Rothenberg 1985, p. 117).

In the ensuing three decades since Marc's essay, these categories still hold, more or less, for writing on astronomical history, not only American history but beyond American boundaries. But there seems now to be considerable overlap in the three groups; especially in the first two. And today there are many more defined specialties that pay attention to astronomy, in its sociological, anthropological, and technological contexts. What still holds true is Marc's original observation that the "diversity of interest, background, and methodology" of these three groups gives the field robustness and intellectual breadth.

So in this informal and somewhat impressionistic essay, I'd like to explore some of Don's contributions, in light of Marc's categories, as exemplars of how the third group, practicing astronomers, might make even more valuable contributions to history, and what they might expect as a result of their labors. Of particular importance, however, and the point I will try to get across here, is what I wished Don had done during his lifetime: first, to more deeply engage the efforts of the first two groups in his research and writing, giving them feedback from the perspective of a gifted practitioner, and second, to make more of an effort to preserve the history of his own generation.

In his acceptance speech for the Historical Astronomy Division, Don talked about how he got interested in history, and then he thanked people who nurtured his interests and activities in the history of astronomy – these included Mary Lea Heger Shane, who pioneered the creation, formation and maintenance of the Lick Observatory Archives, now named in her memory.[3] Don also thanked Helen Wright, who as Hale's biographer was a prolific writer of 20th century history of astronomy, and whose writings made many astronomers aware of history (Lankford 1999). Third came the eminent historian and Harvard astronomer Owen Gingerich, the most widely known name to American astronomers and who continues to inspire

[3]See Shane (1971), Vasilevskis & Osterbrock (1989) and Osterbrock (1984).

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Figure 2. Don Osterbrock surrounded by other historians of astronomy at the January 2002 meeting of the Historical Astronomy Division of the American Astronomical Society in Washington, DC. From left to right: Craig Waff, Ron Brashear, Brenda Corbin, Don Osterbrock, Marc Rothenberg, and André Heck.

us all. And fourth, Bill Hoyt, whose series of books on the Lowell Observatory stimulated much interest in history at that famous observatory and beyond, among astronomers at least.

Don made clear what he thought was required to do proper history of astronomy, giving us examples of writers he admired. As he said in his abstract (Osterbrock 2002a):

> *"I believe it helps anyone who wants to understand the history of astronomy to know and understand astronomy. History must be based on facts, which archives, scientific papers, and books can provide. Immersion in a field like astronomy makes one better qualified to understand what others have done in that field, and how they did it, as Ibsen, Hemingway, Tuchman, and Grisham have all stated and proved by example."*

Don's choices call for comment. I failed to ask Don, after his talk, or subsequently, just what he meant. Were Ibsen, Hemingway, Tuchman and Grisham especially adept at exploring the histories of their respective fields? Or was Don saying that these luminaries were especially adept at observing their own professions, acting as, for instance, critics? Daniel Fuchs (1965, p. 431) asks this question about Hemingway, suggesting he was "a critic in spite of himself." Ibsen's dramas were informed by his own life, and he has been credited with establishing modern playwriting through his penchant for critical analysis, personal introspection and confrontational morality.

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All of Don's exemplars were terrific writers and communicators, of course, but is this what Don was suggesting? Maybe Tuchman comes closest as an exemplar we can apply, with a BA in history and a distinguished career as a journalist and a widely influential Pulitzer-winner for history writing. Tuchman devoted much ink to the practice of historical writing but couched it in context of her fascination with political ambition. As a writer of non-fiction, she was not trained specifically in the subject areas she wrote about. However, as did Don, she spoke passionately of the importance of reading and knowing history. Unlike Don, she strongly interacted with the relevant historical literature. This is what I'm asking astronomers to do if they care to write history.

Possibly what Don was really trying to say was that history is all about telling stories, and telling them well; and well-armed with defensible points of view. But of the exemplars cited by Don who wrote non-fiction, none were professional practitioners in the subject matter fields they typically wrote about.

Historians, including historians of science, generally craft contextual arguments for why they are telling a story. Whether they call it a point of view, a perspective, or a historiographical argument, it almost always is a way to frame a more or less chronological narrative in order to make a point or uncover patterns of cultural behavior that provide useful insight. An excellent example is what historians call the center-periphery view, which can be explored as a geographic or demographic model. For the history of astronomy, centers are not necessarily spatial, but typically have been. For instance, if you were a theorist in Cambridge in the 1930s, you were subject to close scrutiny to adhere to the standards of practice so successful in that center. This could explain in 20th century history why individuals as widely spaced as Henry Norris Russell and Meghnad Saha were able to make important breakthroughs in unconventional ways. Both were far from centers of rigorous physical theory and methodologies, and thus both were freer than, say Eddington, Milne, Jeans or even Bohr to play fast and loose with theory. Gamow, once at Georgetown, enjoyed similar freedom, as no doubt did Luyten at Minnesota. Similarly, the standards of conduct of colleagues in large dense disciplines tends to be more constrained and diplomatic than those in smaller, more esoteric specialties. Karl Hufbauer has utilized this perspective in his landmark studies of Bengt Edlén and Bernard Lyot (Hufbauer 1993 & 1994).

There are plenty of other examples of perspectives taken by historians that might help astronomers as they ponder the significance of their astronomical experience. The journal *Osiris*[4], noted above, can be useful here. It

[4] *Osiris*, "A research journal devoted to the History of Science and its cultural influences" Chicago: University of Chicago Press.

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offers yearly thematic compilations that address issues of current interest. Volume 9, in 1993, compiled and edited by Albert van Helden and Thomas Hankins, was devoted to Instruments, juxtaposing them into four separate contextual frameworks, including Authority, Audience and Culture. Volume 11 explored Science in the Field, looking at how the place where the work was done played into the nature of the work, and its reception by audiences, intended and accidental. There was also a volume devoted to identifying and describing Research Schools (Vol. 8) as literal, figurative, and symbolic collectives which I found most helpful appreciating the influence of an astronomer like Henry Norris Russell.

3. Resources for History

Don listed what he considered are the main resources for historical study. He placed archival resources first, then published scientific papers, and finally books, which historians call secondary sources whether they be written by historians, by astronomers, journalists, etc. Even though this may seem standard practice today, his view was indeed progressive for his time, and especially among astronomers and popular authors who write history. And I mark that from the beginning of his activity in historical writing in the mid-1970s.

Don also made a passionate point, reflected in his title, that one needed to know astronomy in order to comprehend its history. Few specialist historians of astronomy, I feel, would seriously disagree with this assertion, certainly not members of Marc's second two groups. And it is quite true that Don's first foray into history dealt with a phenomenon he experienced. His early series of papers on the California-Wisconsin axis was perceptive and gained positive attention among historians of astronomy. He had been Director of the Lick Observatory since 1972, having arrived there from the University of Wisconsin, and apparently was stimulated to trace the legacy of his personal move. These two papers, written for a popular but technically savvy audience, were in fact case studies in a genre historians call "prosopography" or collective biography (Stone 1971 and Shapin & Thackray 1974). He examined how staff and students moved between Wisconsin, Lick and Mount Wilson showing how the relationship was synergistic. At the same time, David Dewhirst explored the same relationship between Cambridge and Greenwich. Neither knew of the other's work, I believe, nor did either give evidence of absorbing the literature then available about collective biography. If they had, this might have led them to more generally useful conclusions beyond the "anecdotal," to reflect on Marc's observation. Still, I found these articles helpful in better understanding issues like regionalism in astronomy, and the dynamic between an observatory-based

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discipline and a campus-based discipline. The 20th century saw a profound transition in astronomical practice, and Don's papers offer glimpses of how astronomers regarded and reacted to that transformation (Osterbrock 1976, 1978 and Dewhirst 1976).

But one might also argue that having a practitioner's knowledge of astronomy alone might render a writer insensitive to external perspectives that might prove useful in comprehending and rationalizing the behavior of individuals and institutions under the circumstances they find themselves in. For instance, practitioners strongly objected when Paul Forman (1971) argued that quantum physics in Weimar Germany reflected, and indeed was intimately influenced by, Weimar culture. This work sparked intense debate among historians of science and raised many new and helpful issues that practitioners have, oddly, generally ignored. It is my firm belief that, if practitioners had continued to engage Forman's message and the commentary that followed which generalized his arguments, this would have enhanced their ability to insure that their science was value free.

Indeed, for me, one of the purposes of researching and writing the history of astronomy is to provide practical and useful insights into the forces and drives that have shaped astronomy. This was certainly my original motivation, for as a high school student I wondered where all the physics came from: wasn't astronomy all about "minding the heavens" in the words of the Herschels? Looking through telescopes? Much of my historical effort has been devoted to answering that question.

Certainly it helps to have a certain familiarity with astronomy in order to intelligently frame questions that can be answered by studying its history. But it also requires a sensitivity to, and facility with, the broader history that encompasses astronomy, social and cultural. Further, this level of familiarity need not be practitioner knowledge, unless the primary focus of the study is internally directed to an autobiographical critique of the process of knowledge formation. But this gets uncomfortably close to philosophical speculation even if the arguments are firmly grounded in documentary evidence revealing the actual process of discovery. It's a question of how the quest for objectivity is influenced by belief systems.

I keenly recall a galaxy conference in 1977, when Spencer Weart and I passed out a questionnaire to the attending astronomers that included various questions, such as do they believe in the Big Bang, and if so why? One senior and highly respected astronomer from Princeton walked right up to me, poked his finger into my chest repeatedly, and proudly proclaimed that "Astronomers have no beliefs." He was quite serious.

One astronomer quite aware of the influence of beliefs and of the workings of the unconscious was Fred Whipple. Near the end of his long life, he prepared a talk for the venerable Examiner Club in Boston entitled "My

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conversion to Atheism."[5] A biting and somewhat superficial polemic, reflecting more on his personal life, which, underneath the spectacular accomplishments, had experienced considerable pain and doubt, Whipple equated the lure of religion to the unconscious mind. "My unconscious mind likes to please or amuse me." For this reason,

> *"I have to watch my unconscious very carefully when doing science. I have had what seemed like very bright ideas involving a number of uncertain numerical quantities poorly determined. In making up numbers the best I could for each of the combined quantities on two different occasions, I came out very close to the number that I wanted to get. Later on, I found that the numbers were really not at all right and that the brilliant ideas were absolutely wrong."* (Whipple 2000)

In his obituary of Whipple, Brian Marsden (2005, p. 1458) noted "Not only is this an interesting admission from one of the giants of 20th century astronomy, but it should surely be a lesson to us all."

The recognition of the role of belief systems and the workings of the unconscious have been the subject of debate for decades.[6] I do suspect that astronomers have beliefs, and I want to assume that they realize that they do, like Whipple, and are able to account for them when making assumptions or drawing conclusions about the physical universe. There is a literature on the subject well worth pursuing. The social historian Harry Collins wholly accepts that "for all its fallibility, science is the best institution for generating knowledge about the natural world that we have" (Collins 1985[7]). But he also shows how "our concepts and social conventions reinforce each other" and offers numerous examples of areas where fallibility lies, including the belief that experimentation can be exactly replicated.[8]

If senior astronomers wrote memoirs exploring their cultural views and their belief structure and how they overcame them in their work, or found that they had been misled by them in their scientific lives, then this might make it more acceptable to their younger colleagues to be more probing of their own personal equations. This is the first plea I make to astronomers: share your personal insights into the beliefs you harbored and how you overcame them. Also share the doubts you may have had about how to proceed with a problem, and the many challenges you faced, and your colleagues faced, in striving to make contributions to astronomical knowledge.

[5]One of the editors of the Unitarian periodical the Christian Examiner, Joseph Henry Allen, formed the Examiner Club in 1863 (Litton 1994 and Luther Mott 1957, Vol. 1, p. 287).

[6]See, for instance, Collins (1969).

[7]Quote from p. 185. I thank Teasel Muir-Harmony for this citation and its implications. A most perceptive work on the origins and history of experimentation in science that asks how experimentation became accepted as evidence is Shapin & Schaffer (1985).

[8]Teasel Muir-Harmony, working notes.

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4. "Why Be Interested in History?"

Don employed the Socratic method to explore "Why be Interested in History?" First he stated a thesis, then an antithesis, and finally his synthesis. Echoing the finest reforms of the French Annales School of the 1920s, Don quoted Herodotus. History should be embraced: "So that the memory of what men have done shall not perish from the world nor their achievement, whether of Greeks or barbarians." Don passionately expressed this point, that the "true aim of history" must be "what happened and what people did" no matter who they were, good or bad, famous, obscure, high or low. Annales School history, of course, is best known for incorporating social scientific methods into history.[9] It remains one of the core views of how history should be done today, a core view shared by most mainstream professional historians. It combines many disciplines, including geography, history, and the sociological approaches ranging widely from community studies to prosopography, or collective biography, that stimulates attention to the history of common folk, as distinct from the traditional focus on the elite, who had heretofore exemplified history – the politicians, kings and diplomats – those who won the wars. Followers of the Annales School and its methods looked for frameworks, or enabling or defining modes of thought, for trends, modes, what we today call "context" to appreciate the nature and cause of change in society. Some even refer to it as the psychology of an epoch, a collective consciousness.

Don probably did not think of what he was doing in these terms. But he practiced some of it, and set an example for those who have eagerly read his works. His study of the Yerkes Observatory demonstrated these qualities. Here, Don demonstrated that institutions are not permanent or foreordained, and that people of all backgrounds and talents contribute to their health and, indeed, to their erosion (Osterbrock 1997). But again, one can only imagine what additional insights Don might have gained if he had absorbed the substantial literature on institutional histories and their dynamics.

The first outward signs of Don's interest in the history of astronomy appeared after his move to Santa Cruz. It was there that he found what we refer to today as the Mary Lea Shane Archives of the Lick Observatory. There, in beautifully organized drawers and files on the second floor of the Dean McHenry Library, a treasure trove awaited him (Shane 1971). With all these riches at his fingertips, and with Mary Shane encouraging him, it is not surprising to read in Don's essay that: "The Shane Archives were and are a tremendous advantage for me. I can look up almost any astronomer since 1880 and find letters to him or her there, can take notes

[9]Among numerous sources, there is Wesseling (1978).

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on those letters, and if I need more details, go back and consult them easily" (Osterbrock 2002b, p. 206).

Don made good use of these archives, searching out, identifying and most definitely appreciating the first true astrophysicist to work at Lick, James Keeler. But Don also examined the extraordinary legacy of Holden's efforts at mounting and executing eclipse expeditions. He documented how these expeditions were planned and funded, and explored their professional and intellectual consequences. Unlike many astronomers before him, Don did not rely on the published scientific literature alone; he incorporated the archival record as well, as he found it in Mary Shane's file cabinets, and eventually in archives across the land. Would that there were more Mary Shanes at more observatories across this land stimulating more Don Osterbrocks to examine their legacies!

5. Is Living the History Important?

As already mentioned, throughout his Doggett Prize essay, Don stressed the importance of having lived the history one writes about. He argues that at the least, it is helpful to have brushed up against that history to sense its weight, warp and rush: as he wrote "You have a feel for the place, the people ... the concepts ... the problems ... the unspoken (or unwritten) thoughts" (Osterbrock 2002b, p. 207). All this is absolutely true. It is not the only way to write history, of course, but it enlivens and illuminates history, as well as the writers of history. I only wish he had done more of this sort of writing himself, to help preserve and illuminate the history he experienced firsthand.

This is my second plea to astronomers. Preserve and share your history. Take proactive steps to preserve your papers (these may be correspondence, proposals, funded and unfunded, proposals for observing time, manuscript drafts, editorial correspondence, etc) and, if you like, provide commentary on those parts of your life these records cover. Yours may well be the most intimate account of "what happened" in your life, and this perspective, while not the only one, is of great value to history. And, equally valuable, talk about the people you know and have had substantive relations with. This gets us to Don's next point.

Don also acknowledged that "human relationships are important." He more than demonstrated this conviction in his dual biography of Hale and Ritchey (Osterbrock 1993). The effort he made to resurrect Ritchey was, indeed, a laudable example of the teachings of the Annales School. Although I differed with Don's interpretation of Hale's motivations and behavior in managing, or attempting to manage, Ritchey, and also feel he needed to better appreciate Hale's progressive style as a observatory director at a time

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when most were uncompromising taskmasters, yet I feel Don performed a positive service in highlighting the importance of this passionate instrument designer and craftsman in the emergence of the great reflector era. Even more than that, Don explored the relationship between Ritchey and Hale, between builder and user, much in the tradition of the historian's exploration of the relationship of instrument users to their providers, and vice versa.[10] Don somehow felt, however, that Ritchey had been wronged by Hale and so his goal was to set the story straight. But in so doing, he did not reflect on previous studies of Hale which offered insights that might have benefitted his analysis, mainly the importance of considering both sides of the relationship equation, better appreciating the perception each person had of the other in terms of the norms of practice of the day. Historians I've consulted in preparing this essay strongly suggested this, referencing a fascinating essay by Roy Porter (1985[11]). Here, Porter argues that it is not sufficient that "the history of healing is par excellence the history of doctors." Medical history, he contends, is really about "the two-way encounters between doctors and patients." It is not only about inclusion, as important as that might be, but it is about the totality of the human experience.

6. Engaging History and Historians

My discussions with Don over the years frequently centered on his puzzlement over historians of astronomy who expressed disappointment with, and sometimes outright dismissal of, his work. Don, however, bluntly rejected the value of engaging their remarks, or even the extant historical literature. He was not writing, he said to me, for historians. Even so, when they critiqued his efforts, in book reviews in *Isis*, and sometimes even in the *Journal for the History of Astronomy (JHA)*, he sensed that he was being attacked. I tried to explain that his reviewers were trying to engage his work, to relate it to work they felt needed to be done, or, more often, to work that had been done.

We could have conversations like these because of an incident that arose when he submitted an article to the JHA in 1989 on W.W. Campbell's spectroscopic studies of Mars. The editor sent the manuscript to me for review. I remarked that I had covered almost exactly the same subject using the same materials in a paper published in the *Quarterly Journal of the Royal Astronomical Society (QJRAS)* over a decade prior. When Don learned this fact, he reacted positively and dutifully cited my paper, but changed nothing else. That was the extent of our interaction. It would have

[10] An early classic is Bedini (1975).
[11] With thanks to Robert Smith for pointing this paper out.

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been much more interesting if Don had engaged my original effort, which had a strong point of view, and reflected on areas where he thought more could be done or something needed correction. He had been stimulated to write the paper, he stated, because Mars had recently been at a favorable opposition, and apparently there was no further motivation. The editor also did not encourage Don to alter his manuscript, justifying his decision to me by saying that no one read the QJRAS anyway, which only meant that neither Don nor the editor read that central journal, unless they were pulling my leg. This episode, though, made it possible for me to engage Don when others raised issues with his work. One of my tactics was to suggest parallels between the disciplines.

Don accepted that there were "flavors of the month" and trends in modern astronomical research, but this view did not extend to history. Topics, techniques and tools in astronomy change constantly. And similarly, I argued, writing on the history of astronomy is ephemeral. The stuff of history, whatever that is, or whatever we think of it, doesn't necessarily change. But our perception of it and what we do with it certainly does. And so, accordingly, our writing of history changes. Biographies of Galileo in the 19th and early 20th centuries are distinctly different from those of the late 20th century. The act of biography has changed; the questions asked, the perspectives taken, the interpretive tools applied, all change, constantly. I think Don eventually accepted this, but was not comfortable with it, expressing at times his feeling that "history is what it is." He seemed to be less aware that a tendency to be trendy is even stronger in the social sciences than in the hard sciences. For instance, at one point in his essay he felt that "many academic historians of science automatically consider astronomers trying to publish in their field as "Whig historians." Don's take on "Whiggishness" was that it was a polite way of saying "no good!" Correctly citing Herbert Butterfield as the instigator of the term, but neglecting to say that Butterfield coined the term in the 1920s, it was, in fact, a simple way to say that when history is written only by the winners, everything seems to lead inevitably to the winners winning! Butterfield, in fact a distant member of the Annales School in mind and spirit, believed that history was true only in relative terms. And indeed, Don agreed with this, pointing out in very Butterfieldian terms in the same paragraph that "We can never write down all that happened in the past. There is no one correct way to look at the past."

Indeed, there are many ways to look at the past, but is it only a question of writing "down all that happened?" My colleagues constantly remind me, especially after they read my book drafts, that completeness is not necessarily a virtue. Completeness can lend veracity to anecdotal accounts, but it can also be an overpowering and ultimately futile goal. As Marc Rothen-

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berg observed, although his third group of writers definitely concentrate on anecdotal accounts, the first group ideally prefer to state a thesis and then apply just enough evidence to support it. The more evidence that is collected, the greater the chance of hitting the mark; but then not all that evidence needs to be displayed, and, more than often, it gets in the way.

And here we get to the crux of this present essay: another restatement of my plea to astronomers: collect and preserve the evidence, but also offer personal perspective on what it all means. Engage the historical literature, offering your insights into how well it reflects your experience, or differs from it. Don became interested in the history of the institutions he encountered during his career as astronomer, and set about preserving this history through writing about it. He also was not shy to present snippets of his personal experiences as an astronomer and of the astronomers he knew (Osterbrock 1999). I wish Don had done more of this, and had, as well, engaged the ideas presented in the writings of others. In my own experience, when I looked at Campbell's Mars work I was struck that there were few if any quantitative standards in astronomical spectroscopy in that day. Campbell in fact tried to create them in this work, and his failure haunted him until he took his own life. In writing about the same subject and same episode ten years later, Don could have engaged my observation and pointed out how it rationalized the great effort and expense Campbell went to forming an expedition to observe Mars from Mount Whitney.

I'm using this instance in my contact with Don to appeal to astronomers to continue his practice, but to do so taking in historians as partners. The partners Don did engage, of course, were all most worthy and helpful. Mary Shane was a trained astronomer, but in her day she could not practice as a married woman.[12] Yet she contributed in many ways, most recently initiating the preservation of the papers that were the legacy of her husband, Donald Shane, who had been associated with Lick Observatory since the 1920s and was singularly responsible for its modernization post World War II, having been sensitized to the possibilities of truly "big science" during his tour of duty as assistant manager first for the Radiation Laboratory in Berkeley and then for Los Alamos, under Oppenheimer. And once Osterbrock arrived at Lick he greatly facilitated her work. His wife, Irene Osterbrock, also participated substantially, assisting Shane in the identification and organization of the records that were streaming down from Mount Hamilton.

[12]Shane, Mary Lea Heger Oral History, American Institute of Physics. The AIP Center for History of Physics houses the bulk of known oral histories taken with astronomers. Many are now available on line.
See `http://www.aip.org/history/nbl/oralhistory.html` (accessed 4/13/12).

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Don's use of primary archival resources in his research, and his support of the archival efforts at Lick, strongly demonstrate the importance for going beyond a mere recycling of already published information. With the Keeler book, he had certainly made an important historical contribution, which happily continued on with the Lick history, in 1988, collaborating with John R. Gustafson and W.J. Shiloh Unruh, authoring Eye on the Sky: Lick Observatory's First Century.

When Don went beyond the history of his own institutions, as in his attention to Edwin Hubble at the centennial of his birth in 1989, he did so collaboratively. Teaming up with Joel Gwinn, a physicist at the University of Louisville who had turned up interesting information about Hubble's time in that city, and historian of science Ronald Brashear, then the curator of the Hubble Papers at the Huntington Library, they managed to show that Hubble's early years were often quite different than the stories that had been spread and printed about him after his death. Don's collaborations stand as some of his best efforts. They offer a good model to follow.

7. Astronomers Who Write History

Needless to say Don Osterbrock was not the first trained and practicing astronomer to contribute to the historical literature on astronomy. One of his primary influences, as he stated, was Owen Gingerich, well known among historians of science and astronomers. Gingerich had devoted his energies to stellar atmospheres research in the 1950s and early 1960s. But he also harbored deep interests in a broad swath of history contributing to computer-assisted planetary position tables and eclipse tables covering classical antiquity as well as to a thorough analysis of the accuracy of Kepler's Mars calculations (Gingerich 1967 and Stahlman & Gingerich 1963). Owen, along with Michael Hoskin, nurtured the specialty for years through their editorial roles for the *Journal for the History of Astronomy*, founded by Hoskin. They were following the example set by Arthur Beer, who in his founding of *Vistas in Astronomy* provided the first modern platform for history of astronomy. Beer had collaborated with F.J.M. Stratton, R.O. Redman, Z. Kopal and S. Chandrasekhar from the 1920s through the 1950s, contributing consistently to binary star research and stellar atmospheres. Then, in the first volume of *Vistas in Astronomy*, published in 1955, Beer organized a series of papers on the history and philosophy of science that brought together papers by pioneer historians of science, such as George Sarton, Otto Neugebauer, Joseph Needham, Willy Hartner and Derek Price. These were joined by papers from astronomers who wrote history and philosophy, such as Herbert Dingle, David Dewhirst and Anton Pannekoek. Those in this early generation of historians of science, indeed,

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were well versed in the sciences; Neugebauer in mathematics at the Courant Institute, where he turned to its history for his doctorate, and Hartner a professor of physics at Goethe University who founded the Institute for the History of Natural Sciences there.

One can name many others from this era, well before it (Agnes Clerke, of course) and more recently who have contributed mightily. Don, of course, has been one of the most visible contributors on the American scene in recent decades. He also was very active in the Historical Astronomy Division of the American Astronomical Society and in the history commission of the International Astronomical Union.

Don stands out among most of these scientists-turned-historians in one important way. He spent the majority of his career attaining visibility and considerable status as an astronomer, and only near the end of his career did he turn to history. And he chose to focus on an era, the late 19th century through the mid-20th century, that framed the nature of his own training and created the astronomical community as he found it. What's missing, save for the occasional talk on his own life experience noted above, is Don's sense of the nature of astronomy and astronomical practice in his day, that is to say, the latter half of the 20th century.

8. What Can You Do?

From our outline of Don's contributions we can list the ways astronomers can continue to aid history: In order of priority: preserve your historical record! There is no question that astronomers are major stakeholders in this area. As more than one historian and archivist has said in the past: the record that is preserved today becomes the history of tomorrow. So contact your campus archivist and ask what it would take to have them pay attention to your papers, or to preserve the work of your department. If you need a translator, a friendly campus historian might help out. If you are a member of the American Astronomical Society, for instance, you might consider searching for members of the Historical Astronomy Division on your campus. There are also national resources, like the American Institute of Physics Center for History of Physics that maintain services for the identification, collection and preservation of papers.

Beyond preserving papers, preserve your recollections, impressions, and indeed the assumptions you made and the beliefs you harbored at different times in your life via an autobiographical statement. These efforts have proven to be extremely valuable, helping future historians focus on issues that otherwise might not come to their attention. In the mid 1970s, Spencer Weart, then director of the American Institute of Physics' Center for History of Physics, organized and executed a series of oral history

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programs, one of which in the late 1970s and early 1980s concentrated on modern astronomy. I was hired to assist, and the AIP team conducted, as well as collected from other efforts, some 120 oral history interviews with astronomers (Weart & DeVorkin 1981 and DeVorkin 1990). In addition, the AIP encouraged physicists, astronomers and others in its member organizations to contribute biographical materials to the Center, and this practice continues today. During our survey in the 1970s, we made an effort to encourage individual astronomers and their institutions to preserve and organize their archival legacy. Some, like the Lowell and Lick Observatories, responded positively, accepting small grants-in-aid. The Center also maintained materials that would help to stimulate and to direct the collection of additional oral histories, including a "skeleton question list" that covers the sorts of things historians feel should be preserved.[13]

Among historians of physics and astronomy, primarily in his years as the Center Director, Spencer Weart thought more than most about ways to both stimulate and prepare practicing astronomers to contribute to their history. As I was preparing this essay, Spencer provided this cogent statement:

> *"History, alone among fields of scholarship, is both an art and a science. It is an art, because it necessarily involves a personal viewpoint and writing skills as good as a journeyman novelist's. It is a science, indeed an observational science like astronomy, because it aims rigorously to represent factual reality.*
> *Why writing skills? Admittedly, there are plenty of historical articles that are as turgid and jargon-laden as anything in ApJ. If you want to set down a bunch of facts in some kind of order, it will be useful raw data for future historians. But if you want to be actually read and understood by more than a handful of people, you'll have to write well. You'll have to be clear, which is hard, and well-organized, which is harder, and lively, which is hardest of all. You should dig out and review your old Strunk & White (you have read it, haven't you?). More, youll need to look carefully at the writings of authors you admire – historians, novelists, anyone – to see how they do it, from the overall structure of the work to the mechanics of commas. And if you have not yet put in the ten thousand hours of writing that's necessary to become fluent, you will need to draft, rewrite, submit to others for criticism, and rewrite again. Above all, remember the words of historian Marc Bloch: "The good historian resembles the legendary ogre. Where he smells human flesh, there he finds his prey." Tell interesting stories about people, and you will be a good historian.*

[13] `http://www.aip.org/history/oral_history/questions.html`

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But the stories must be true; that's where the science comes in. Of course you have your memory. But let us be guided by Nietzsche: "Memory says, 'I did that.' Pride replies, 'I could not have done that.' In the end-memory yields." Many studies have corroborated how poorly memory captures the past. The good historian therefore always checks a memory against a document from the time in question, such as a letter, a proposal, or a published scientific paper. Lacking these, it is well to check against other people's memories. Here is where practicing scientists can apply the skills of their own trade, skeptically inspecting every statement, and perhaps especially the ones that seem most innocent and plausible, testing them against new evidence. Imagine that your work will be peer-reviewed by all the people living or dead that you write about. You are satisfied as an astronomer when you have accurately described a celestial phenomenon; just so you will be satisfied as a historian when you have saved a true piece of the human past from the mangling jaws of time."

Spencer provides terrific advice, not only for scientists, but for historians. Another historian of science, Robert W. Smith, the author of an award-winning book on the Hubble Space Telescope (Smith 1989) – which relied heavily not only on the preserved record, but on the recollections of many dozens of participants – responded, when I inquired, that the most useful writings by astronomers for the historical record are the lengthy critical review essays for peers, such as in the *Annual Reviews of Astronomy and Astrophysics*. Understood as authoritative reviews of scientific subjects, *Annual Reviews* essays, and similar ones in many venues ranging from the *IAU Transactions* to encyclopedic entries, and the classic *Stars and Stellar Systems* volumes, all provide essential perspective on the science. But translating these efforts into a historical framework has had pitfalls, as Michael Hoskin and Owen Gingerich have advised. After an early round collecting essays from astronomers they had hoped would contribute to the IAU-endorsed General History of Astronomy they remarked "it is all too easy to find oneself writing not history, but modern science with historical references" (Hoskin & Gingerich 1980). They also wanted their authors to provide the General History something more than an uninterpretive narrative chronicle, which, they noted, could well be "grist for historical studies, [but] it is not by itself history."

Reflecting these sentiments, Robert Smith provided some general observations that bear on the issues we are addressing here:

"It seems to me that there is good history and bad history and all sorts of stuff in between. It is in principle very useful to address historical topics and themes from a range of perspectives. Who writes it does not matter. There are good histories by astronomers and bad histories by

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historians. But if someone writes history then they need to expect to be judged by appropriate historical standards."

It is just those "appropriate historical standards" that framed many of my conversations with Don and other astronomers. This leads to my last plea: directly engage what historians have written about the subjects that interest you; whether you agree or not, your additional insights are invaluable. You can either collaborate with historians, as Don did at least once or twice, or consult friendly historians of astronomy who may be only too eager to introduce you to the relevant literature. As far as gaining an awareness of the literature, there are powerful search engines available. You know of the Astrophysics Data System (ADS[14]), but there is also JSTOR[15] for the humanities. I find it great fun using either of them in their full text search modes seeking out literature that includes combinations of words like "astronomy," "funding," "competition," or "belief."

One collaboration I particularly enjoyed playing a role in was the occasion of the centenary of the American Astronomical Society (DeVorkin 1999). Historians of astronomy joined with astronomers to prepare this volume, sanctioned and supported by the Society. Don contributed chapters on the early Society, and I collaborated with Paul Routly to quantify its history. Paul, however, also provided many insights through oral history interviews as did Laurence Frederick and Arlo Landolt. They, along with Peter Boyce and some two dozen others also prepared chapters based upon personal experiences in various roles ranging from being officers of the Society to reminiscences on the changing structure of the Society by the creation of divisions, the publications of the Society, changing demographics, the role of the Society in the discipline, and commentary by recent AAS presidents.

The occasion of an anniversary is always a stimulus to historical reflection and there are many ways to do it. Helmut Abt, in particular, chose another equally helpful route, using the centennial to reprint some 53 papers from the *Astrophysical Journal* selected by a panel of astronomers nominated by the AAS Centennial Committee. The great value in this effort was that those who selected each article then wrote an extensive commentary, and many of them benefitted from direct experience. This is also very much the stuff of history (Abt 1999).

Finally, it should be obvious to readers of the volumes that have been organized by André Heck for more than a decade, such as the one now in your hands, that this forum has provided many astronomers, as well as historians and sociologists, the chance to reflect on the discipline of astronomy including its history, lore, organization, and dissemination. In

[14]`http://adsabs.harvard.edu/`
[15]`http://www.jstor.org/`

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addition, the *Publications of the Astronomical Society of the Pacific*, as well as the *Annual Reviews of Astronomy and Astrophysics*, have devoted considerable space to reflective memoirs that have provided useful insights into personal, institutional and disciplinary history. Some have been direct reflections on the nature of funding and the responsibilities of the offices that fund astronomy. Others have reflected on their duties as editors, as team leaders, as communicators, as organizers of meetings, or as scientists who are also clerics.[16]

Whatever your role has been in the discipline of astronomy, or relating to it, your reflections on your life and work are of value to history. However you choose to participate will be appreciated, especially if you choose to engage any of the questions historians of astronomy have been asking in their own contributions, as they strive for a deeper and more complete understanding of their subject and its place in culture.

9. In Summary

As valuable as Don's efforts have been to the specialty of the history of astronomy, I feel they could have been even more useful to historians had he engaged issues that historians of astronomy debate when they address episodes in the history of astronomy, or that mainstream historians utilize to make larger points about history. This does not mean that I wanted Don to be an historian; just to be sensitive to the issues they raise about his discipline. His contributions to history, as with other astronomers before him and since, have immensely enriched the literature and have provided much insight for historians who find, in the historical writings of astronomers, added insights into the state of the contemporary profession. As Robert Smith also observed:

> *"I fully agree that it would be a futile effort to try to turn working astronomers into historians. I further agree ... that it would be much more fruitful to get astronomers to think about their current activities such that later commentators on current astronomy could write accounts that would be more useful than might otherwise have been the case ... Often the astronomers think only about the science, but that is much too limiting."*

So with Robert, I encourage you to ask questions about your discipline, the community you work in, the overall nature of your practice, as you experienced it. This would include how problems are chosen, how support for the work was secured, and what compromises, if any, were made in

[16]To mention only a few: Friel (2002), McCrea (1987), Abt (1988), Steinberg (2001), Robinson (2002), Alexander (2003), and Coyne (2004).

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order to see the work to completion. Scientists who were diarists and who tended to include such information, recording most of all how they "felt" about the work of a single day or week, how they felt about their future, and the future steps they needed to take, are like angels to historians. If you want your contribution to be appreciated, give us as many hints as you can! These include, but are not limited to, the three requests made here, in summary:

1. Through formal or informal published memoirs, diaries, or autobiographical statements preserved in your personal records, share your personal insights into the beliefs you harbored and how you overcame them in the production of your science. Also share the doubts you may have had about how to proceed with a problem, and the many challenges you faced, and your colleagues faced, in striving to make contributions to astronomical knowledge.
2. Take the effort to preserve a core file of records, including your correspondence, minutes of meetings, formal directives, job applications, research proposals (funded and unfunded), proposals for observing time, manuscript drafts, editorial correspondence, and reprints. Recently astronomers have expressed concern for the preservation of the records of projects they have been involved in. Some have even gone to the trouble of having volumes of records scanned for preservation. A few have even budgeted for it! These are exemplars to follow, but be sure to make the files fully readable in a format that stands a chance to be readable in the future!
3. Provide commentary on why you are choosing these particular records to preserve, and not others. Seek out the advice and counsel of archivists at your institution, or historians of science, in what to preserve and how to preserve it. Most of all, be proactive to preserve your papers and provide commentary on those parts of your life these records cover.

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