H•A•D NEWS

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Regime Change in Seattle

Jarita Holbrook, University of Arizona, took over the reins of HAD at the close of the annual business meeting on 10 January in Seattle. The image shows her accepting the gavel and the "Ich bin HAD" plaque from Thomas Hockey, University of Northern Iowa, who is now Past Chair, which makes him chair of the HAD Prize Committee.

The new Vice Chair is Jay Pasachoff, Williams College. His duties include soliciting and editing the AAS obituaries. The new members of the HAD Committee are Richard Jarrell, York University, and Wayne Osborn, Central Michigan University. The sixth member of the HAD Committee is continuing Secretary-Treasurer Joe Tenn, Sonoma State University.

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History of Variable Stars in Boston

Thomas R. Williams

On Sunday, 22 May 2011, The Historical Astronomy Division will hold an unusual second meeting for 2011. This will be a part of a joint meeting of the AAS and the American Association of Variable Star Observers (AAVSO) in Boston. Now celebrating its centennial, the AAVSO was founded in Norwich, Connecticut in October, 1911 by attorney and writer William Tyler Olcott. During its first decade the AAVSO received support from E.C. Pickering and the staff of Harvard College Observatory and from 1919 to 1954 it had its headquarters at the HCO.

The HAD sessions will feature historical papers relevant to variable star astronomy. Ten invited papers have been scheduled in two topical sessions: I. Women in the History of Variable Star Astronomy, and II. Variable Star Astronomy in Theory and Practice. Organized by former HAD Chair Tom Williams, these two sessions will be informative to historians and astronomers from AAVSO as well as the AAS.

Session I, chaired by historian and former HAD chair Sara Schechner, offers the first of two installments of papers on women astronomers important

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Nathan Sivin (right) at the presentation of the first Osterbrock Prize with HAD Prize Committee Chair Sara Schechner (left) and Irene Osterbrock.

The Osterbrock Prize Lecture

Nathan Sivin, University of Pennsylvania

Editor's Note: Professor Sivin has generously provided *HAD News* with a copy of the remarks he made upon receiving the Donald E. Osterbrock Book Prize in Seattle. As reported in our last issue, the prize was awarded to him for *Granting the Seasons: The Chinese Astronomical Reform of 1280, With a Study of Its Many Dimensions and an Annotated Translation of Its Records* (New York: Springer, 2009).

When I was a graduate student in the history of science, it was a straightforward field. There was one single history of astronomy, which began with Babylonian clay tablets and Greek geniuses, and progressed to the present day. Every year or two or three there would be an article about the exotic astronomy of somewhere else, but astronomers who lacked a taste for the exotic had no reason to read them. We divided the actors on the historical stage into Great Men and losers. Everyone—or almost everyone—assumed that there was no point in learning about anything but right answers.

We learned that the main line had an odd discontinuity in the middle, since between about A.D. 200 and 600 Europeans pretty much lost their ability to make exact observations, keep elaborate technical records, and do complex calculations. They needed the better part of a thousand years to recover. Luckily, the story went, the Middle East preserved the European records intact until the time came to hand them back. We thought of the Islamic world as a kind of faithful custodial sidekick, more or less a Tonto to Europe's Lone Ranger.

As more and more historians became fascinated by traditions outside Europe, and learned the languages needed to study them, the picture came to look very different. The long evolution of occidental astronomy, far from being the norm, was the odd one out, ideal for studying dysfunction. That was because of that mass rejection of classical learning in the middle of it, and, later, the West's extreme dependence, first on Islamic learning for over 400 years and then on documents from Byzantium, as it slowly regained the world level, and after that the great speed with which it accelerated to the forefront.

A little over twenty years ago, I pestered my colleagues in various parts of the world to find out how many specialists there were on the history of Chinese science and medicine, defined as people who published research using primary sources or artifacts. It turned out that in 1988 there were roughly a thousand, and that number has been growing since. What they study is the record of nearly 2500 years' uninterrupted work in computational astronomy, cosmology, and (rarely) astrology. There in China, in other words, not in Western Europe, is the long unbroken sweep of history. A thousand, or by now perhaps 1500, researchers have more than enough to do. But given the cascade of publications on this tradition from China, Japan, Europe, and North America since 1980, we finally have a defensible idea of what that evolution was like. Chen Meidong's three ingenious surveys of astronomical history published between 1995 and 2003 have replaced the 50-year-old tentative exploration by Joseph Needham.

There are also many historians of Islamic astronomy, a number who study Japan and Korea, and a handful who have worked on India. Their writings give us a very rough sketch of an overall picture. In that picture, the beginnings lie in the Babylonian world, the Greek achievements were an important but transitory phase, and the focus then shifted for centuries back to the Middle East. It served as a melting pot not only for its own ancient traditions and innovations from Persia and elsewhere, but for new understandings and techniques from India, China, and early Europe. Then from about the year 1000 on, Europeans learned about the intellectual riches of the Muslim world. It was the cosmopolitan mixture in Islam of methods and ideas that made possible the studies of European scholastics, those of the table-makers, and then those of the mathematical cosmologists from Copernicus on. In other words, the history of astronomy has turned out to be as pan-Eurasian as that of the other sciences.

Not only is the Chinese side of the story uninterrupted, but it turns out to be based on a different set of choices from all the possible ways of thinking quantitatively about the sky. For example, its degrees were each based on one day's mean solar motion, so there were 365¼ of them, rather than 360, in a circle. Some historians have fixed ideas about the superiority of 360, but over many centuries the Chinese choice turned out to be just as convenient. Their approach to quantification was numerical rather than geometrical, closer to the design of present-day computer programs than to Ptolemy's approach. Still, from the 11th century on, some Chinese astronomers began developing their tools in the direction of spherical trigonometry.

Their numerical approach led to many concepts not at all like those of Europe. For instance, since they had no reason to picture a precession of the equinoxes, or a rotation of the equatorial pole around the pole of the ecliptic, they accounted for the same phenomena with a concept they called the Annual Difference (*suicha*). This quantity was the difference between the sun's position at the end of a sidereal year and a tropical year. And, since there were 365¼ degrees in a circle, this was a gap in time as well as in space. The numerical results, and the rigor of the model, were the same as with the Western approach.

Over more than two millennia, many documents were naturally lost, but what survives is still extremely rich. There is hardly a question you can ask that you can't find an answer to. The Chinese records are exactly dated and fully set out, precise when there is a reason for them to be, and—when there isn't—often discursive and reflective.

In the third century B.C., China became a centrally governed empire, and soon became larger than all of Europe. One of the cornerstones of imperial ritual was the issuance of an ephemeris, an almanac that predicted the year's celestial phenomena. That act of "granting the seasons" quickly reached an exactitude that far surpassed the needs of agriculture and bureaucracy. But because its main purpose was to show symbolically the state's control of time, alongside its dominion of space, there was always motivation to improve.

For well over 2000 years the state maintained a technical bureaucracy to observe and record the phenomena, work out ways to predict them, interpret the astrological meaning of unpredictable events, write the annual almanacs, and publish them. Its astronomical bureau accumulated records of observations that became an increasingly powerful collection of data for improving prediction. For instance, the system of computation adopted for official use in the year 1280 tested its method of solar eclipse prediction against, among other data, records of 71 eclipses observed from 720 B.C. on.

Each system was a series of steps that a low-level official with no expertise in astronomy could follow to compute an annual ephemeris. The ephemerides were somewhat like Ptolemy's Handy Tables, or the handbooks just beginning to be printed in Renaissance Europe, or the *zij* of the Muslim world. The historical record was so voluminous because it was normal, when important predictions failed, to replace the whole system of prediction instead of mending it. In some dynasties it became usual to order up a new system to mark the reign of a new emperor, or to advertise a political new deal. Over 2500 years, we have records of roughly 200 astronomical systems, and reasonably meaty information about half that many. The government officially adopted roughly fifty of them.

Compared with the lonely efforts of Copernicus or the difficulties of the noble Tycho Brahe in meeting the payroll of his small technical staff, this was a large-scale enterprise with a large budget. Seven civil servants of substantial rank planned the project of 1280. It also included 16 administrators, 13 observers, 14 human computers, 4 timekeepers, 2 instructors, 2 editors, 15 printers, 11 clerks, and 44 students. On top of that there were consultants, and platoons of artisans who built the new buildings and instruments for the project. The fact that there were so many administrators tells us that China was a true bureaucracy long before Westerners even dreamt of that organizational form.

Another sign of a civil-service mentality is the great detail of the records that the government kept. The final report of the 1280 project submitted to the throne and archived in the astronomical bureau amounted to 105 chapters. A chapter was no more precise a measure in China than in the West, but 105 of them could easily amount to over 2000 pages. Nearly half of that was a detailed empirical study of the apparent motions of the five planets. What survived the wars, cataclysms, and revolutions to the present day are a summary in four chapters published, as usual, in the dynastic history. That was an enormous loss, but the fact remains that the four chapters themselves are a highly detailed account of the system of prediction and the methods used to test its accuracy. They amount to 300 pages in English translation.

In addition to computational astronomy, the standard histories included observations of phenomena that were difficult or impossible to forecast. For instance, a recent compilation of comet observations drawn from these sources includes every return of Halley's comet for more than 2000 years. The observers didn't know that they were all the same comet, but neither did anyone else before the 17th century. Datings of supernovas and the decay of their bright light have made it possible to identify their remaining radiation today. Many of you are familiar with the registers of solar and lunar eclipse records from the same sources and those of other civilizations by Richard Stephenson, John Steele, and others. Some of the early records went far beyond astronomy; for example, over the same period we know the dates of a great many large-magnitude earthquakes at many locations.

Acquaintance with the history of non-Western astronomy can also help us in thinking about what originally filled what are now blanks in European history. For instance, my colleague Christopher Cullen has pointed out that Ptolemy's approach to computation was so comprehensive and sophisticated that the detailed work of most of his predecessors in the Greek-speaking world is lost. Nor do we know the circumstances of Ptolemy's work.

On the other hand, if we look at the comparably innovative Zhang Heng (78-139), who died about the time the Almagest was written, we can trace in detail what circumstances led to change. This is because of the minute documentation customary for affairs of the imperial court, and because, given the nature of the bureaucracy, people who proposed change of any kind had to argue for it, normally in writing.

My examples come from China, but they could just as well have come from other astronomical traditions. Being a specialist makes it possible to achieve understanding in depth, but it can also encourage ignorance about the rest of human endeavor. If we want to get away from the worn-out myth of a pure European tradition of science and learn more about how astronomical actually evolved; if instead of idly speculating about the possibilities of astronomy we want to know the full range of what did happen; if we want to take advantage of the widest range of ancient records to solve current problems, it isn't a bad idea to take the world as our unit of exploration.

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First observation of the transit of Venus by William Crabtree in 1639. From a 19th century mural by Ford Madox Brown.

Transits of Venus Papers Sought

Hilmar W. Duerbeck, James Cook University
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The IAU Commission 41 Transits of Venus Working Group (http://www.historyofastronomy.org) is pleased to announce that the March 2012 issue of the *Journal of Astronomical History and Heritage* will be a special issue devoted to papers on historical Venus transits. Interested authors should contact editor Wayne Orchiston (wayne.orchiston@jcu.edu.au), associate editor Hilmar Duerbeck (hilmar@uni-muenster.de), or associate editor Joseph Tenn (joe.tenn@sonoma.edu); manuscripts will be due in October, 2011. See the journal's website at http://www.jcu.edu.au/school/mathphys/astronomy/jah2/index.shtml for more about the *JAHH.* Note: starting in 2012 the journal will be published online, and it will be free via ADS.

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Austin Meeting Next January

The Historical Astronomy Division will meet once in 2012, as part of the AAS meeting in Austin 8–12 January. There will be two HAD Special Sessions.

Jay Pasachoff and William Sheehan are organizing a session on "Transits of Venus: Looking Forward, Looking Back." They point out that the 6 June 2012 transit of Venus will represent the last chance to observe one of these rare events from Earth until the next pair starts in 2117. This year's transit will be extremely advantageous as almost all of the most populated areas of the Earth will be able to view at least some of it.

This session is devoted to some aspects of the history of transits, but especially those phenomena significant for current astronomical and astrophysical research.

Historically, the transits of Venus were singular important both in astronomy and in the geographical exploration of the Earth. This importance was reflected in the massive preparations and far flung expeditions in the 18th century to better measure the solar parallax. The 19th century transits played out against a background of rivalries among the great European powers, which were then at their height but sliding toward the Great War of 1914–1918. The 2012 transit offers an opportunity to revisit the important expeditions of the past and to engage in "experimental archaeology," the reconstruction of past observations to the extent possible using historical instruments and techniques and/or observing from the same locations used by earlier observers.

However, the main topic of this session is to review through the history of the transits a number of critical problems that remain relevant and can be addressed by modern high-resolution observations from Earth and space. One of these is the detailed profiling of the atmosphere of Venus. Another is the unique opportunity transits of Venus (and Mercury) afford as local analogues to exoplanet transits across their parent stars, which are the focus of many contemporary astrophysical investigations and space missions whose goals are to understand the prevalence and structure of planetary systems very different from our own solar system. In short, though transits are often said to be of strictly historical interest, since the Halleyan solar parallax method has long since been superseded, we hope to show that transits of Venus continue to be of great importance to astronomers and astrophysicists working at the cutting edge of important problems of today.

Marc Rotenberg is organizing a session on "Funding Astronomy post-World War II." He summarizes the session:

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