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THE PLEASURES OF THE VAULT

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Abstract: Lick Observatory's photographic plate archive is among the world's most extensive. Its value lies both in its scientific potential and in the history it preserves. Its direct and spectrographic plates constitute a hundred years of data, valuable for a variety of investigations, especially those concerned with time-varying phenomena. Its historical importance lies in a wealth of material illuminating the life and work of Lick astronomers. Don Osterbrock, more than any other Lick astronomer, recognized and exploited the Plate Vault's historical potential, however many more treasures await discovery.

Keywords: Lick Observatory, photographic plate archives; history of astronomy; time-varying phenomena

1 INTRODUCTION

Behind an inconspicuous door off the rear courtyard of the Main Building of the University of California's Lick Observatory, on Mt. Hamilton, lie four rooms in which are housed the labors of a century. The Plate Vault is the Observatory's mass storage for the terabytes of data collected in its first century of operation. But instead of ones and zeroes on disks and tapes, these data are locked in uncountable grains of silver-on-glass plates, and in tens of thousands of pages of logbook entries.

2 THE LICK OBSERVATORY PLATE VAULT

2.1 Contents of the Vault

Lick Observatory has one of the world's major stores of astronomical plates, and on a conservative estimate contains ~150,000 individual pieces of glass. They range from a vast collection of low-resolution spectra on plates no larger than a stick of gum—compiled by the Mills spectrograph on the 36-inch refractor and by the Crocker Southern Expedition in Chile, for the purpose of a massive survey of radial velocities (Figure 1)—to the high-resolution coudé plates made with the Shane 3-meter reflector, where the dispersion could be so high that the spectrum had to be recorded on two 10-inch-wide plates butted end to end. They include drawer after drawer and shelf after shelf of direct images taken with the 12-inch and 36-inch refractors, the famous Willard lens, the 36-inch Crossley Reflector, the 20-inch dual astrograph, and the 3-meter prime focus (Figure 2).[1]

Figure 1: One of dozens of drawers in which are stored the low-resolution stellar spectra taken during the first few decades of the 20th century on Mt. Hamilton and at the Mills Southern Station in Chile, as part of Lick's massive radial velocity survey.

Figure 2: Cabinets in the Plate Vault's north room contain direct images taken with the 36-inch refractor, the 20-inch twin astrograph, and a variety of other instruments. Here are found E.E. Barnard's epoch-making images of the Milky Way, an extensive collection of photographs of the Moon, planets, comets, and asteroids, and the many plates produced by 40 years of Lick Observatory solar eclipse expeditions.

One room is devoted to the written observing records, put down in hundreds of logbooks, in the hands of some of the finest astronomers of the twentieth century (Figure 3). There you will find the handwritten observing notes of Barnard, Keeler, Trumpler, Curtis, Campbell, Wright, Herbig, Stebbins, Whitford, Kron, and others.

2.2 Research Potential

The Plate Vault has indisputable scientific value, and over the last twenty years it has done a slow but steady business fulfilling requests for archival data. Two recent examples illustrate the nature and diversity of the requests for historical data. One was from an astronomer at Cambridge who, in improving the orbital elements of the spectroscopic binary Beta Scuti, found that several of the velocities for this star published by Lick Observatory in the 1920s were wildly out of keeping with his orbital solution. The original plates, combined with the written observing records, revealed that at least one of the published velocities was derived from an observation of the wrong star!

The second request originated with a researcher who was trying to provide a date for a young supernova remnant in a nearby galaxy, discovered on a Lick plate that had been published in the 1960s but without a recorded date for the observation. The date of

the discovery plate, along with four others in the collection—one dating back to 1917—allowed the researcher to place a minimum age on the SNR.

Such requests are typical, and underscore the particular importance of historical data to time-varying phenomena. The eventual aim is to make these data available to today's—and tomorrow's—researchers: a first volume of observations, seamless and continuous with modern digital data. Digitization and distribution on the worldwide web make this an attainable goal. We must begin with cataloging the most fruitful plates in order to make their existence known to the wider community, and then reduce them to a format that is indistinguishable from modern, digital observations.

But the Plate Vault's scientific usefulness represents only part of its value. The archive is a place where science and history of astronomy intersect. Everywhere along its shelves, in its drawers and cabinets, one encounters a past intimately tied to the fascinating, sometimes turbulent history of the Observatory, and to the extraordinary scientists who advanced it (e.g. see Osterbrock et al., 1987). The remainder of this note will focus on those historical treasures and the aesthetic delights waiting behind the door of the Plate Vault.

3 HISTORICAL TREASURES OF THE PLATE VAULT

I was hired by Lick in 1987 in anticipation of the retirement of a mountain legend and one of its most memorable characters, Gene Harlan. Gene, whose art was direct and spectrographic photography, and who knew the workings of the Great Refractor, the Crossley, and the 3-meter coudé like no other, patiently, if sometimes grumpily, initiated me into the arcana of cutting, sensitizing, and preflashing plates, of finding guide stars and estimating exposure times, of safely loading and unloading the sensitive glass, and the mysteries of the dark room. Both of us knew that he was handing down a skill that was already disappearing from astronomy, already nearly obsolete, but neither of us ever spoke of that. Just before Gene left the mountain for the last time, he unceremoniously handed me the key to the Plate Vault, informing me that those four rooms—and the task of fulfilling requests for plates—were now my responsibility

I was given that key not because of any special qualification but because no one else wanted it! The Plate Vault at Lick Observatory—and I suspect at other observatories, too—occupies a peculiar place: it is simultaneously venerated and neglected. The key to its door is perhaps the most closely guarded on the mountain (except for the one that unlocks the freezer in the diner where the cookies are kept!), but for all the reverence it is accorded, almost everybody is, quite understandably, too busy with the work of the present and with plans for the future to have much time for the past. One person, however, most notably did not neglect the Plate Vault. That person was Don Osterbrock.

When I would pick up my telephone to find Don at the other end odds were better than even that he was going to ask me to look for something in the Plate Vault. Whether his request was for the spectra that brought Fath so close to announcing the true nature of the spiral nebulae ten years before Hubble, for the observing book in which Barnard had noted his discovery of the fifth moon of Jupiter, or to locate the huge glass eclipse plates with their displaced stars corroborating the proof of General Relativity, it was always a delight and an honor to be part of the treasure hunt.

Thanks to Gene, Don and my own ramblings through the archive (born of nosiness and a librarian's heart), I have had the good fortune to unearth and study some of the Plate Vault's treasures.

On the eve of the 2004 transit of Venus, the Vault yielded 140 plates made at the last transit, in 1882. With the collaboration of William Sheehan, the plates ignited an exciting investigation into the fascinating story of the eccentric astronomer David Todd, and his expedition to Mt. Hamilton to photograph the transit (see Misch and Sheehan, 2005).[2] As a prelude to the 2004 event, the rediscovered plates were assembled into a time-lapse movie showing Venus 120 years ago, in her stately crossing of the photosphere (Misch and Sheehan, 2004). The movie stands as one of the earliest events to be reanimated as a motion picture.[3]

Figure 3: The Plate Vault's south room is devoted to written records that provide invaluable documentation supporting the plate collection. These shelves hold some of the observing logs kept by individual staff members.

For several years in the 1990s, the plate vault was the catalyst for a happy and fruitful association with internationally-known photographer Linda Connor, who spent many days on Mt. Hamilton, using sunlight to print Lick plates, which she then paired with her own photographs to great critical acclaim. Linda's work with the Lick images was widely exhibited, culminating in a limited edition fine press book published by the Whitney Museum of American Art (Connor and Simac, 1996).

Edward Emerson Barnard's extraordinary drawings made at the eyepiece of the 36-inch Refractor during the 1894 opposition of Mars, stored in the Plate Vault, inspired a collaborative exploration with Sheehan and others of the roles of hand, eye, and brain as they interact under the conditions unique to the astronomer at the eyepiece. The investigation culminated in a memorable two-week project of drawing Mars during the 2003 opposition, using the 36-inch Refractor under conditions similar to those encountered by Barnard (see Misch, Sheehan, Stone and Hatch, 2003).

Rediscovered in the Plate Vault were more than 200 plates, made between 1889 and 1934, documenting 17 expeditions by Lick astronomers to observe total

eclipses of the Sun on five continents—often in remote places and under difficult conditions (see Osterbrock, 1980). These extraordinary images have inspired new historical research (e.g. Pearson and Orchiston, 2008) and provided the author with material for presentations from the Griffith Observatory to the British Museum.

4 CONCLUDING REMARKS

The Plate Vault amply demonstrates its depth and importance—assets that Don Osterbrock never lost sight of. Recently, action has begun to improve the environmental conditions in which the plates are stored, ensuring their lasting preservation. There is every reason to hope that the Lick Observatory Plate Vault will continue to provide pleasures to curious investigators and yield undiscovered surprises, both scientific and historical.

5 NOTES

1. The 3-meter prime focus collection is among the smallest of the individual collections, the days of the photographic plate's supremacy being already numbered by the time the 3-meter telescope went into service.
2. It was during this expedition, while his wife remained in Amherst, that Todd was famously cuckolded by Emily Dickinson's brother, Austin (see Sheehan and Misch, 2004).
3. To see the movie go to the following web site: http://www.skyandtelescope.com/observing/objects/daylightphenomena/3308756.html

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Anthony Misch was Support Astronomer at Lick Observatory for twenty years, where, among other duties, he served as Curator of the Plate Vault. He now works for Lick part time, and continues his connection with the archive and pursues his interest in the Observatory's history.