

Addenda and Errata
to
Observational Astronomy at the University of Pennsylvania
1751 – 2007

By Robert H. Koch

2009

People

A certain amount of mostly negative, new information has been uncovered that possibly helps to constrain the background of Theophilus Grew.

Except for the last year, all the following dates are Old Style. On March 3, 1671, there was christened in the Walloon or Strangers Church, Canterbury, Kent, England Theophile le Grou, the son of Ignace le Grou and Susanne Bodele. Nothing more is known of these parents at present other than that the father's surname would have been pronounced (at least by the English) the same as Grew is in English. If either they or their son anglicized the surname for any reason, it would have been easy to turn it into Grew. Another record shows that Theophelus Growe married Rebecca Rogers on December 26, 1696 at Saint Dunstan's in the East, Stepney, London, England. The time interval between 1671 and 1696 permits the baby and the groom to be the same person. On October 18, 1711 Theophilus Grew married Elizabeth Barrine in the same London church. Almost certainly, Rebecca had died and the now Theophilus was marrying again. (In other records, the bride's surname is Barron illustrating how labile spelling was in those days.) On February 9, 1735 Theophilus Grew married Elizabeth Cosins in Christ Church and Saint Peter's, Philadelphia, PA. This Theophilus is the first mathematics professor at Franklin's College of Philadelphia and he had been in town since at least 1729. The same Theophilus married Frances Bowen in the same Philadelphia church on March 5, 1739. It would seem that these incidents cannot all refer to one man since he would have been 64 when he married Elizabeth and 68 when he married Frances and 88 when he died in 1759. This set of intervals could be consistent with the Philadelphia Theophilus being the son or grandson of the French/English baby. That remains a speculation at present.

Lifelines

Life years, previously unknown, have been found for the following people:

R. Stanley Alexander (1909-2004) P. G. Crout (1898-1977) Alan E. Gee (1916-1991) Edith D. Kast (1880-1967) Sam Seeleman (1914-1995) A. M. Skellett (1901-1991) Paul S. Watson (1905-1986) Joseph L. Woods (1890-1963)

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2010

People

From 1696 through 1783 the current St. John's College in Annapolis, MD functioned as a prep school, King William's School. The surviving records of this institution give no indication of Theophilus Grew as a matriculated student. Similarly, he does not appear in the records of Marischal and King's Colleges of Aberdeen, Scotland, which eventually amalgamated to become the University of Aberdeen. Of the European and North American English-language institutions of learning open around the turn into the 18th century, these are the last ones to be checked. One must begin to consider that Grew could be an autodidact in celestial phenomena and time matters.

The American Genealogical-Biographical Index 67, 509 says that Grew was born in 1710 and on the same page that he was born in 1720. The earlier year is suspect because two women with the Grew surname are given the same birth year. The later year is not consistent with his marriage to Elizabeth Cozins at Christ Church, Philadelphia in 1735. Along with Rev. George Thorald and Raphael Neale he was a witness to the will of William Boarman drawn up on 02/26/1728(Julian)1729(Gregorian) in St. Mary's Co. of the Maryland Colony. This association might be taken to imply that he came to PA from that location or that his family had been established there. Neither possibility can be verified and it is certain that no will with the Grew surname was filed in MD between 1634 and 1759. From another source he is recorded as arriving in Philadelphia in 1742. This year is also likely too late for he was already a widower once and had married Frances Bowen in the same church in 1739. The only way to salvage 1742 is to imagine that the couple moved out of Philadelphia after their marriage. The only inferences that can be drawn from the small amount of certain information is that Grew was an Anglican and neither a Catholic nor a Puritan immigrant to MD or PA. His origin remains unknown.

The online Minutes of the Trustees prepared by the University Archives contain the following entry on page 109 pertaining to the meeting of the Trustees on Tuesday the 13th November 1759:
“Then the Trustees returned to the Apparatus Room and considered a petition presented by the Widow of the late Professor Grew deceased setting forth that she was very poor and had a large family and prayed their Charitable assistance. It was agreed that as M^r Grew dyed in the middle of a quarter the full quarters Wage should be paid to her agreeable to what had usually been done on the like occasion and that over and above this she should receive a present of Twenty pounds, and the Treasurer was ordered to settle with her accordingly.”

The Chairman and the 13 Trustees present passed the motion. Grew was therefore still a faculty member when he died 08/30/1759 during the August/September break of that year. From 1750 through 1759 Trustee Minutes refer to teachers who were sick and temporarily unable to perform for at least a month. Grew is not among them so his final illness must have lasted during the last part of the year's first term that ran from 05/15/1759 to 08/15/1759.

According to William Playfair's *The Noble Families of England*, William, Duke of Normandy, was attended by a baron Hugh in 1066. Because of his handsome countenance and his vigor in battle, he was Hugh la Fleur – something like Fanfan la Tulipe of that eponymous movie. Over the centuries this became anglicized to the Flower surname. There seem to be almost no politically or militarily prominent

Flowers in their home counties of Wiltshire, Gloucestershire and Somerset, and it might be that the families were consistently in trade. If interest is restricted to “recent” times, it is not difficult to find Flowers older than those in the main narrative, as is indicated by the partial pedigree on the next line:

Charles (~1652-?) → John (~1678-1738) → Richard (1724-1762) → Richard (1759-1843).

The older Richard had married Hannah Grubb (1728-1810) in 1746 and they had several children: Mary (~1748-?), Rachel (~1751-1822), John (1750-1825), Jemmie Edwards (1752-?) and the younger Richard. All of these generations lived in the vicinity of Chester, PA, which had previously been called Upland and which name still survives slightly to the northwest of the present Chester. Hannah’s one grandfather, Emanuel Grubb (1678-1767), was born in a cave on the banks of the Delaware River and is said to have been the first English baby in the colony. It is possible to trace the Grubb line to Emanuel’s father John (1652-1707), who was born in Cornwall and brought his wife (Frances Vane (1660-1712)) and family to the New World, and even earlier to John Grubb’s father, Henry, who had married a woman with the last name of Wilmot and died in England. The older John Flower may or may not have been born in North America but the likelihood is that Charles Flower had been born in England. The very first settlers along the Delaware River had been Swedes who established several settlements. Civil authority passed to the Dutch and then back to the Swedes before England was able to claim the territory definitively. The earliest Flower in North America may have been motivated to emigrate because the English Civil Wars ended in defeat for the Royalist cause or because his own grass was no longer so green.

The youngest and long-lived Richard was apparently the first Flower to move some distance from the close Chester environs. Living in Ridley about 8 miles NNW of Upland, in 1785 he bought a half-interest in the nearby and substantial grist mill *Lapidea* (originally *Phipps’s* and sometime *Lapidia*) and its tract along Crum Creek. Richard employed a miller to do the actual work at least part of the time. Then, in 1793 he sold his half-share in the property and business to John Wall, Sr. (~1710-1771), a Philadelphia merchant who became the step-grandfather of Reese Wall Flower, the UP benefactor. John Wall, Sr. and his wife, the widow of the elder Richard, eventually sold their interest in the property for \$8,500[\$116,000] – an almost unbelievable sum. This may be an indication that John Wall, Sr. was very well-to-do.

This same younger Richard Flower married Henrietta Graham (1768-1841) and they had the following children: Jeremiah E., Zedekiah Wyatt, William Graham, Mary Ann (Hubbell), Reese Wall (hereafter called RWF in this and later paragraphs), Jemima Edwards (Flickwire and Hickson) and Henrietta G. (Ashmead). All these people are familiar from assorted legal documents including the trying of RWF’s will. In sum, his lineage is known through 4 and 6 previous generations on his paternal and maternal grandfathers’ sides, respectively.

Some inferences about RWF’s existence can be pulled together from census records. For instance, when he was 53 in 1860, in his Upper Darby home there also lived Ellen Jones(25, his Housekeeper), Emma Jones(8), Anne Kelly(18), Daniel McClaren(60) and Patrick Morris(28). Ten years later the record (which misspells his given name) shows Ellen Janer(36 now and still his Housekeeper), Emma Janer(18) and Charles Williams(23) at the same residence. In both records he identified himself as a farmer. The two females are the same people and it may have been that Ellen had married a Mr. Janer in the 10-year interval and he was no longer in the picture. It may be noticed that Reese Wall Flower Jr. was not living with his father at either of these times and Ellen Jones was certainly not the son’s mother.

The acrimony at the time of settling RWF's estate is inconsistent with the harmonious past history of these families. For instance, the younger Richard and Henrietta lived with stepfather John Wall, Sr. at his Leiper's Mill residence for some time. Later, the younger Richard, his brother John, their half-brother Reese Wall (~1765-<1800) (a son of John Wall, Sr. by Hannah Grubb Flower, his second wife) and a brother-in-law Capt. John McKeever were all amicable 1790s partners in exporting grain and milled products to Europe before losing 3 vessels to seizure by French warships and having their cargoes condemned as war prizes in La Rochelle. (In the 1870s their descendants were still futilely trying to get compensation from the Third Republic for these losses.)

My reconstruction of the family anger with RWF begins with a tragedy: Reese Wall, the child of John Wall, Sr. and Hannah Grubb Flower Wall, drowned in Delaware Bay shortly before 1800. On their mother's behalf, the children of Hannah must have felt this keenly for the boys born to two of her children at the beginning of the new century were named Reese (McKeever) and RWF, memorializing the dead youth. RWF's sisters later complained that John Wall favored their brother over his siblings and this may well have been true two centuries ago when personalized associations were considered important. This John Wall, however, was not the step-grandfather who had died before RWF was born. It was rather his first son by his first marriage in 1740 to Phebe Buffington (1714-?). The second son of this marriage was confusingly Reece Wall (1745-?). So seemingly John Wall, Jr. (1741-1816) showed some favoritism to his step nephew if RWF's sisters are to be believed. A second element in the family friction appears in the summary of the will of John Flower (1753-1825), the only paternal uncle of RWF, who died childless October 14, 1825. The two executors were the brothers William Graham Flower (1794-1865) and RWF and not their father Richard who was very much alive in that year. RWF was only 18 at the time. John Flower's estate included 8 individual properties – not an insignificant estate. When later his own mother and father died, RWF was the executor of those wills too – leading to complaints that he had given short shrift to his sisters. When one remembers that an executor is entitled to a significant minor percentage of the assets of an estate, it is clear that RWF need never have lacked for money even if he hadn't been successful as a lumber merchant and broker. My belief is that the challenge to the will was founded in the sisters' belief that RWF had been too much of a favorite of the previous generation and that he was ungenerous in sharing wealth and possessions that should have been widely distributed among family members. The sisters would, of course, have read *A Christmas Carol* and could have decided that their brother was an incarnation of Ebenezer Scrooge.

It could be imagined that RWF acquired the FO property itself as a result of his share in the real property portion of the estates of his uncle or father. This is not so. The Sheriff's Deed Book of Delaware County shows that he picked up 86 acres of it on November 29, 1831 at a sheriff's sale, and he bought 14.5 more acres from George P. Snyder and his wife on October 5, 1850.

It has always been amusing to confound the name of Reese Wall Flower with the common noun of the same pronunciation indicating a very shy or socially inept person. This association was partly entwined with the uncommon name Reese simply because previously there had been no Flower known with that given name. This present text shows the provenance of the name to have arisen from the Wall relations by marriage and now one can also see that it had still further use. In 2004 Bruce Holenstein found the will of Reese Wall Flower, deceased about 1:45 PM on Thursday July 9, 1891 so there were actually 3 people of the identical, uncommon name alive at the same time in the 1870s in a small area of PA. This youngest man described himself as an edge tool maker from Ashbourne Village in Cheltenham Township

and there was a factory making such tools in that locale at that time. The will names his wife (Helen), daughter (Netty) and brother (Richard), and the inventory of his effects is attached to it. He was worth about \$119 [\$2,300] in material possessions and had some property as well. He was a grandson of Zedekiah Flower and a grand nephew of the subject of this essay. It is not impossible that there is at least one Reese Wall Flower alive today but he is not to be found in southeastern PA. Notes were sent to the 26 Flowers in this area who have listed land phone line numbers to see if any of them had knowledge of 19th century ancestors. The few answers led to no new information.

None of the relationships described above leads one to imagine that RWF learned any astronomical knowledge from a family member and he is not known to have had significant higher education. Either he set up his will to spite family members or he composed it on the basis of some self-gained knowledge. I offer a speculation to show that the latter is not unthinkable. When the man was young, the eastern U.S. was treated to the hitherto unknown spectacle of the Leonid meteor shower of 1833. He lived long enough to know of and possibly witness the somewhat diminished display of November 13, 1866 and to be aware of the association of the shower with Comet Temple-Tuttle. Such spectacular naked-eye events may have impressed him sufficiently to cause him to think that he could advance scientific knowledge with a proper distribution of his assets.

Some mostly incidental (*i.e.*, non-astronomical) information has been uncovered pertaining to other personalities in the main file.

The career of Reese Wall Flower, Jr. has been filled out a bit. At the 1880 census he and his wife Annie E. had 2 daughters (Marion E. and Edith) and a son (Harry E.). The children were minors at the time. His parents are not named but their nationalities are given as U.S. for the father and English for the mother. So RWF, the bachelor benefactor of the FO, had possibly exploited his English servant. As it happened, at the time of the 1880 tally the Flower, Jr. household also included live-in female servants – a Philadelphia girl and a Scottish one.

Dr. Charles A. Young came from an academic family and after 9 years of service at Western Reserve College (including guard duty during the Civil War) was appointed astronomer at Dartmouth College without an advanced degree. Within 4 years he had become an expert on solar phenomena because of his reports of direct imaging and spectroscopy of chromospheric and coronal features. His several books carry his academic honors of LLD and PhD. The former was awarded by Princeton College on his retirement and the latter *honoris causa* by UP at the 1870 commencement. By that year, he was recognized as a solar astrophysicist but was hardly the leading observational astronomer of the country. The possibility of the UP degree was placed before the Trustees at their meeting of December 7, 1869 and was referred to the Faculty of Arts for an opinion. A favorable opinion came back at the January 4, 1870 meeting. At the previous meeting, there had also been considered the possibility of establishing a PhD degree and this too was confirmed subsequently. In fact, then, Young's is the first such degree awarded by the school and therefore G. W. Cook is not the first essentially self-educated person to receive such an award. Perhaps E. Otis Kendall lobbied for Young but the language in the minutes suggests that the resolution was framed by a Trustee rather than by a faculty member. Finally, it was decided at the March 1, 1870 meeting to award a DD to Rev. Beale Melancthon Schmucker (1827-1888) at the ceremony when Young would receive his award. This man was a pastoral clergyman, a scholar of the development of Evangelical Lutheranism in North America and Pennsylvania in particular, and a fervent supporter of

recovering and putting into current practice the 17th century Lutheran liturgies, presumably in German. Who knows what prompted these awards at a school with very bounded astronomical competence and with no obvious reason to recognize Lutheran activity.

Dr. Joseph Wharton's title is an honorary ScD from 1902 given by UP. He was a successful metallurgical and chemical industrialist who made his first fortune by smelting zinc and nickel ores and refining the metals to unprecedented purities. He also made his mark in academic and research matters. For instance, he endowed the Wharton School of Finance and Economy (later renamed more than once) and was one of the founders of Swarthmore College. Exactly how he came to fund Doolittle's Reflex Zenith Tube is not known now but perhaps he was intrigued by an unconventional use of a liquid metal.

G. W. Cook's given names are uncommon but have an easy understanding. A bachelor uncle, Gustavus Benson Cook, died less than two years before his birth. The family is in the line of Dr. Thomas Wynne (1627-1691), Welsh physician to William Penn, an original colonist having arrived on the ship *Welcome*, and the first Speaker of the Pennsylvania Assembly. The RHO was just inside a segment of the southeastern perimeter of Wynnewood, the suburban village named for Dr. Wynne.

Dr. Edgar N. Fought (1878-1944) and Dr. Charles L. Mitchell (~1855-?) took numerous panoramic and detailed inside photos of the RHO. They were friends of G. W. Cook, perhaps because he shared their interests in photography. These men had taken their medical degrees at the Thomas Jefferson Medical School, Fought in 1905 and Mitchell in 1880. In their own rights, they had significant careers. Fought was apparently the official photographer for Jeff as well as an accomplished performing organist. Mitchell was a published force in art photography around the turn of the century in the Philadelphia area. He was dead set against any kind of impressionistic darkroom or printing technique that shaded or smeared a line or edge that was sharp in nature.

With the assistance of Nancy Miller, UP Archivist, it has been determined that the following were never matriculated UP students: Robert D. Armstrong, Ralph B. Baldwin, R. A. Binkley, Thomas Finletter, John B. Gest, A. E. Hayes, Harry S. Jacobs, Ross P. Marsteller, Isaac Ray, J. S. Stevenson, James Thompson, Nancy Weber, E. E. Whelder and Doris M. Wills. A few of these are surprising: Ray because one thinks that all physicians practicing in Philadelphia in the 19th century had been students of the UP Medical School and Thompson because Blitzstein had been heard to say that this man was an unreliable student and part-time worker from the EE School. Pauline W. Jacobs could not be checked because her maiden name is unknown.

Martin E. Nason, awarded an MA in 1951, was a BS graduate of Washburn University in Topeka, KS in 1949. This is the institution where R. Stanley Alexander spent his entire academic career. It may have been he who pointed Nason to UP. Nason's middle name was Elinor, perhaps his mother's maiden name but surely a source of anxiety for a growing boy. He appears in the Shawnee County, KS list of World War II army enlistees in 1942 and it is not impossible that he profited from the GI Bill of Rights to finance his education after the war.

William Blitzstein's given name at home was Velvel-a not uncommon Yiddish name meaning "wolf". "William" itself stands for "protector of the kingdom" or something like that. Blitzstein chose it or it was chosen for him by the family after he had been in school a brief time. He believed that his mother was a Ukrainian wetback but his details of her entry into the U.S. changed from time to time. His father,

supposedly from the same village that was razed to the ground during World War II, was said to be a “parlor pink”. The star of the family, as it were, was a paternal aunt, a woman so far left and so out of control that the Philadelphia branch of the Communist Party barred her from their meetings. Bill’s political opinions were those of an observant Democrat but were mostly unemotional. On the other hand, his attitudes toward musical performances and compositions were more fervent. Vladimir Horowitz (1903-1989), for instance, was disdained for his recital showmanship and hand technique and for his manipulations of the works of older composers.

After Benjamin S. P. Shen’s French *lycée* training in Shanghai, he passed on to his Paris degree under Pierre V. Auger (1899-1993) in cosmic-ray physics. He was the 6th Flower Professor and departmental chairman from 1973-1979. [B. D. Holenstein 2010 note: Before his passing, RHK authorized the updating of Shen’s biography in the main narrative text. The updated text and additions are indicated in blue.]

Scientific matters

The UP library contains 29 scientific publications of Theophilus Grew in a total of 68 copies. Publication dates span the interval from 1735 into 1766. He was, therefore, a known scientist before being appointed to the staff of the College of Philadelphia. One publication, *Description and Use of the Globes, celestial and terrestrial* (with still more verbiage in the title) dates from 1753 and is basically a teaching tool. All the rest of the published works are almanacs and are specific for a variety of stations: Barbados, New York, Philadelphia and Virginia. The last two locations are the most numerous and refer to individual years. The publications nominally for Philadelphia are entitled with the latitude and time difference from Greenwich. A supplementary remark “but may without sensible error serve all adjacent places, even from Newfoundland to South-Carolina” shows the real limitations of the calculations. Sometimes the remark is limited to “all the northern colonies”. In a way, Grew’s career resembles that of E. Otis Kendall who contributed more than 25 years of entries in *The American Ephemeris* for the ephemerides of Jupiter and Neptune and their satellites. Grew died in 1759 so some of his almanacs are posthumous. He was able to calculate the entries ahead of time because essentially no new solar system objects – plants or satellites – were discovered during his lifetime. His was a completely stable universe.

After the failure to mount the 18-in Brashear/Flower refractor in New Zealand for more than 40 years, there is currently a new initiative to install it in a more generalized public astronomical facility near Lake Tekapo at the foot of Mt. John.

Sometime after 2000 UP decided to give the Cook spectrohelioscope system to Matt Considine, a Bucks County amateur astronomer. It was removed from the DRL Students’ Observatory and was to be installed on Considine’s home property but this never happened. Instead, Considine has now given the hardware to the Springfield Telescope Makers of Stellafane, VT to be installed on the famous property which is the site of the annual ATM conventions. The condition of this donation is that the system be restored, put back into service and be available for visitors to use. In 2010 the 8-in refractor originally from the RHO also passed into private hands by a donation from UP: Bart Fried intends to have it re-erected in the Vanderbilt Museum and Planetarium in Suffolk Co., NY. He and Considine have a testable hypothesis of the origin of this instrument. The FO visual photometer has also passed into Fried’s hands for possible rehabbing.

A troubling scientific incident emerged in very early 2010 from some correspondence regarding the lunar occultations of stars observed with the 38-cm siderostat and the Pierce-Blitzstein photometer. The FCO station coordinates are given in the 1964 *AENA* as:

N39 59.95, W75 28.6 (509 feet)

and are footnoted to say that the coordinates refer to the “equatorial reflector”. From personal recollection, I know that the station position was measured in 1955 by Blitzstein (then not a full-time faculty member), Frank Bradshaw Wood (then Observatory Director) and Leendert Binnendijk (a UP faculty member) working together, and a surviving handwritten sheet actually shows some of their calculations. Each of these men was well-trained in fundamental astronomy and would have had no doubts about how to lay off a meridian and how to determine latitude although they had never done so.

While searching the old files, I discovered other information. In April, 1976 P. Kenneth Seidelmann, Director of the Nautical Almanac Office at the USNO, had requested that observatories update their entries in the *AENA*, which updating would first appear publicly in the 1981 issue of the *AENA*. This request was apparently unanswered on behalf of the FCO for a follow-up letter from Seidelmann is dated January, 1977. Amid the station property drawings I found a form response to the second request in Blitzstein’s (by then Associate Observatory Director) hand dated 6/27/1977. The reflector’s coordinates are given thereon as:

N39 59 57, W75 29 37 (509 feet) = N39 59.95, W75 29.61(509 feet).

An asterisk attached to the longitude value leads to a note at the bottom of the page: “PREVIOUS TABULATIONS OF THE LONGITUDE IN THE A.E. + N.A. WERE IN ERROR BY ABOUT 1 MINUTE OF ARC”. Other notations on the form say that the coordinates are geodetic (datum 1927 N. American) and that their source is the U.S. Geological Survey, scale 1:24000 of 1966. The *AENA* entries did change in 1981. It has to be accepted, therefore, that the published station coordinates were in error from 1955 through 1980 and that they were corrected not by new observations but by map scaling and interpolation. There are also preserved some calculations in Blitzstein’s hand bearing dates in 1991 and 1992 in which he was looking at the coordinates again and these suggest that some of this scrutiny was also done by Howard Poss, a Physics Professor of Temple University who was interested in determining a diameter of Antares from lunar occultations observed with the reflector at the FCO.

There seem to be 3 possible explanations for the original positional error.

- (1) There was an unacknowledged clerical error of 1' made in 1955 and discovered in 1977.
- (2) The second interpretation is based on pencil calculations in Wood’s hand that can be interpreted to mean that the station coordinates were determined by temporarily setting up the 2.5-in Cook broken-transit in the reflector’s dome and observing Polaris with it. This is not explicitly stated but there are two notes about reversing and not reversing some instrument. This broken-transit eventually was set up for many years in the Students Observatory on the UP campus as an instructional instrument. It would have been perfectly serviceable for the task if it were properly mounted and aligned but perhaps this wasn’t done. There is no indication that observations were made of numerous stars over a large range of declination as would have been necessary to evaluate all the instrumental errors. It is also not impossible that an error of about 4 s in setting a sidereal clock was the fundamental fault. A variant of this possibility would speculate that the instrument used in the reflector’s dome was the Cook meridian circle but this instrument was more cumbersome to use than the broken-transit and seems a less likely possibility.
- (3) The last interpretation of the 1955 error that can be suggested now is that the erroneous FCO position was determined with the coordinate circles on the Fecker reflector. Although fairly evenly engraved,

these circles were coarse (broad tickmarks every 2.5 minutes in hour angle and every 5° in declination) and it is possible that “large” errors made when reading them would not have been noticed by the observers. Because the collimation of the reflector was always difficult to preserve and because no optical reticle other than unilluminated crosshairs was ever available, it is certain that the three observers could have made a systematic error of about 4 s and been unaware of it until Blitzstein did his map interpolation in 1977. A sidereal clock error could also be implicated in this possible explanation. In view of Wood’s notes, this third possibility appears the least likely of the three.

In 2010 and with all the 1955 parties dead, it is impossible to know if any of these explanations is credible. Neither R. J. Mitchell nor I remembers internal observatory or departmental notice being given of the station coordinate change, but this must have been done because Mitchell was responsible for developing and maintaining the data acquisition and reduction codes and I was a frequent user of the photometric system.

During the FCO’s existence, the major observational program was differential and “absolute” photometry. It must be true, therefore, that hour angles were systematically in error by about 4 s until 1977 and that there resulted systematic errors in calculated airmasses for all program and reference stars. The downstream errors in extinction corrections for either type of photometry are, however, exceedingly small in the visible and within the errors of the shot and scintillation noises that dominated the measures. Although coordinate errors surely remained until the station’s end, they were likely smaller than those which have just been described.

This is not the end of the story, however, for the 1977 coordinates do not agree with those that can be determined from a *GoogleEarth* image. The tools available for analysis of such images permit one to determine geographical coordinates and elevation above sea level for any image. B. D. Holenstein, Mitchell and I did this with the help of the original FCO architect’s blueprints that I have preserved. It was possible to locate each telescope accurately on the space image because the 3 people knew the dimensions of the dome and the room housing the instruments and the location of each within its shelter. The results are:

Reflector – N39 59 55.33, W75 29 35.78

Siderostat – N39 59 55.49, W75 29 36.73.

The separation of the two telescopes agrees within 0.05” with the separation that can be calculated from the 1955 blueprints. It can be seen that neither of these agrees well with the 1977 redetermination, disagreement being obvious in longitude.

To try to resolve this bust, Holenstein used his Garmin GPSMAP 60CSx receiver to make 12 stationary repetitions of the coordinates at the top of the driveway into the FCO property. This location is the only ground feature still surviving on the razed and re-planted property and it is now impossible to enter the rest of the privately-held property. The internal precision of his means is close to $\pm 0.06''$ and ± 0.3 feet. From the surviving property survey map it was possible to determine the linear separations between the telescopes and Holenstein’s position and then to convert these differences into angular separations and finally into geographical coordinates, of course referred to the GPS position. These results are:

Reflector – N39 59 55.54, W75 29 35.80

Siderostat – N39 59 55.66, W75 29 36.72.

There still remains a bust for the longitude of the reflector compared to the 1977 value from Blitzstein’s

map interpolation. Comparison of GPS results with the astronomical and map coordinates is problematical for a fundamental reason: the geocentric coordinate frames are not the same. GPS determinations are referred to the WGS (World Geodetic System)⁸⁴ frame while Blitzstein's calculations refer explicitly to the 1926 NAD (North American Datum). The Royal Observatory Greenwich Learning Team has published more than one memo on the differences among coordinate frames for continents and sub-continental areas as well as their understanding of the reasons for the frame differences. For the present case, their latest memo asserts differences of -8m(-0.34"), +160m(+5.19") and +176m(+577ft) for 1926NAD against the WGS84 system for longitude, latitude and altitude above sea level, respectively.

The isotope in the Serge Korff entry should be C¹⁴.

Lifelines

For context or reference the names of many people appear in the main narrative but many of them were not considered central enough to it to warrant giving therein the years of their lives. I decided to change this somewhat uncharitable attitude in large part because the Name Index is incomplete. Many more than half of these missing names and dates have now been found and appear in the following summary; a fraction of them were contributed by other unnamed third parties. Misspellings and mistakes of names and initials have been corrected but aren't flagged. UP students whose degrees date from 1960 and later are typically not listed unless they appear in the narrative or have died. Because of modern privacy restrictions, institutional files that potentially contain many useful dates are not available. A few notes appear at the end of the listing.

George O. Abell (1927-1983) G. W. Airy (1801-1892) Henrietta G. Ashmead (1809-1879)^a John N. Bahcall (1935-2005) William Barrie (1905-1986) A. Henri Becquerel (1852-1908) Hans Bethe (1906-2005) Harold H. Borders (1956-) Pierre Bouguer (1698-1758) Nathaniel Bowditch (1773-1838) James Bradley (1693-1762) S. W. Burnham (1838-1921) Charles the Bold (1433-1477) Seth Chandler (1846-1913) Charlie Chaplin (1889-1977) Kyong C. Chou (1929-2010) Alvan G. Clark (1832-1897) Gustavus Wynne Cook (1868-1940)^b Lavinia Borden Cook (~1849-?) Mrs. G. W. (Nannie M. Bright) Cook (1877-?) Richard Y. Cook (1845-1917) Nicolaus Copernicus (1473-1543) Gen. Charles Cornwallis (1738-1805) George L. Crawford, Esq. (1832-1908) Paul Cret (1876-1945) Sybil Csigi (1950-) Rev. John T. Desaguiliers (1683-1744) Edward J. Deviney (1940-) Raymond S. Dugan (1878-1940) Noel A. Doughty (1939-2001) William H. DuBarry (1894-1958) Maurice Dubin (1926-) A. Felix DuPont (1879-1948) Albert Einstein (1879-1955) Kenneth Edgeworth (1880-1972) W. Lewis Elkin (1855-1933) C. T. Elvey (1899-1970) Isadore Epstein (1919-1995) The Hon. Thomas K. Finletter (1820-1907) Wilmot Fleming (1916-1978) John Flower (1817-?) Thomas B. Flower (>1811-?) Richard Flower (~1815-?) Zedekiah W. Flower (1788-1846) Dave Garroway (1913-1982) Carl Friedrich Gauss (1777-1855) John B. Gest, Esq. (1823-1907) Riccardo Giacconi (1931-) Alan C. Gilmore (1944-) Curvin V. Gingerich (1880-1951) John Goodricke (1764-1786) Abigail Graham (1780-~1845) Albert M. Greenfield (1887-1967) Edward F. Guinan (1942-) Hans Haffner (1912-1977) Edmund Halley (1656-1742) Carl Hammer (1914-2004) Oliver Hardy (1892-1957) Gaylord P. Harnwell (1903-1982) John Harrison (1693-1776) Leon W. Hartman (1876-?) John Hearnshaw (1948-) Robert Hee (1954-) Henry III (1207-1272) William Herschel (1738-1822) Ejnar Hertzsprung (1873-1967) G. W. Hill (1838-1914) Dorrit Hoffleit (1907-2007) Cuno Hoffmeister (1892-1968) Jeremiah Horrocks (1618-1641) Gen. William Howe (1729-1814) Thomas Jefferson (1743-1826) Harold L. Johnson (1921-1980) Kenneth Johnston (1941-) James E. Keeler (1857-

1900) James C. Kemp (1927-1988) Mabel L. Kent (1885-1970) Johannes Kepler (1571-1630) Pamela J. Kilmartin (1949-) Chun-Hwey Kim (1954-) Philander C. Knox (1853-1921) Ulrich Köhler (1939 -) Masatoshi Koshiba (1926-) Hans Krebs (1900-1981) G. P. Kuiper (1905-1973) F. Kustner (1856-1936) Lincoln LaPaz (1897-1985) Daile La (1958-1996) Stan Laurel (1890-1965) Adrien Marie Legendre (1752-1833) David Levy (1948-) Meriwether Lewis (1774-1809) Willard Libby (1908-1980) Gordon L. Locher (1904-1964) Percival Lowell (1855-1916) Carl A. R. Lundin (1880-1962) C. Roger Lynds (1928-) Bernard Lyot (1897-1952) Walter Marsteller (1898-1987) or (1914-1975)^c Pierre de Maupertuis (1698-1759) Maximilian II (1527-1576) James Clerk Maxwell (1831-1879) Andrew McKellar (1910-1960) Robert R. McMath (1891-1962) David D. Meisel (1940-) Milton Merker (1941-) A. A. Michelson (1852-1931) M. Minnaert (1893-1970) David Mkrtychian (1956-) E. W. Morley (1838-1923) Michael J. Mumma (1941-) Homer Newell (1915-1983) Isaac Newton (1643-1727) Il-Seong Nha (1932-) Sir Theophilus Oglethorpe (1650-1702) Michael Opendak (1953-) Donald Osterbrock (1924-2007) Empress Farah Pahlavi (1938-) Mohammed Reza Pahlavi (1919-1980) Maxfield Parrish (1870-1966) Thomas Penn (1702-1775) William Penn (1644-1718) Edison Pettit (1889-1962) Alan F. Petty (1926-2010) E. C. Pickering (1846-1919) Plutarch (~46-120) Richard W. Pogge (1961-) Daniel M. Popper (1913-1999) Russell W. Porter (1871-1949) Ezra Pound (1885-1972) Mary Proctor (1862-1957) Alfred W. Putnam (1895-1971) Richard C. Putnam (1926-2002) Dr. Isaac Ray (1807-1881) George E. Reahm (1921-2001) Elizabeth Rhoads (1797-1881) Franklin Roach (1905-1993) Hal Roach (1892-1992) Ernest Robson (1902-1988) Judith Rodin (1944-) Wilhelm Röntgen (1845-1923) Benjamin Rush (1745-1813) Henry Norris Russell (1877-1957) Frank Schlesinger (1871-1943) C. D. Shane (1895-1983) Harlow Shapley (1885-1972) Eugene M. Shoemaker (1928-1997) Abe Silverstine (1909-2001) Edward M. Sion (1946-) Arne Slettebak (1925-1999) W. M. Smart (1889-1975) Robert E. Smith (1944-) Willibrord Snell (1580-1626) Stanley J. Sobieski (1937-) Yousef Sobouti (1932-) Lyman Spitzer (1914-1997) Harold E. Stassen (1907-2001) Joel Stebbins (1878-1966) David J. Stickland (1946-) Wolfgang Strohmeier (1913-2004) Bengt Strömgren (1908-1987) Richard M. Sutton (1900-1966) W. F. G. Swann (1884-1962) Alan J. Thomas (1944-) James K. Thorpe (1906-1976) Peter Usher (1935-) Joseph von Fraunhofer (1787-1826) William Thaw, Sr. (1818-1889) Max Waldmeier (1812-2000) Claire F. Weaver (1899-1980) Dr. Joseph Wharton (1826-1909) Fred Whipple (1906-2004) A. E. Whitford (1905-2002) John Greenleaf Whittier (1807-1892) Paul Wiita (1953-) Thomas R. Williams (1934-) Robert E. Wilson (1937-) William Carlos Williams (1883-1963) Elizabeth H. Wood (1917-1998) Edith J. Woodward (1914-1995) Charles A. Young (1834-1908)

^a If this birth year is correct, Henrietta was a younger sister of Reese Wall Flower, rather than an older one, as is asserted in the main document.

^b The birth year of G. W. Cook is given incorrectly in the main document and in some other published sources. His parents were married 03/10/1868 and he was born 12/12/1868. The years 1867, 1868 and 1869 can be found in published sources but 1868 is attested in a genealogical document that his father wrote.

^c I can't tell which of these men was a FO volunteer photometric observer of variable stars but my guess is that it was the younger one

Neither birth nor death years are presently known for about 40 individuals who appear in the main narrative.

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Robert H. Koch

1929 - 2010

Robert H. Koch, emeritus professor of astronomy and astrophysics at the University of Pennsylvania, passed away at his home in Ardmore, Pennsylvania on 11 October 2010 after a brief illness. Bob was 80 years old and remained sharp and intellectually engaged with the astronomical community up until the onset of complications from a brain tumor.

Bob was born in York, Pennsylvania on 19 December 1929, and graduated from York Catholic High School in 1947. He attended the University of Pennsylvania on a senatorial scholarship, graduating in 1951. After two years in the United States Army, he enrolled in graduate school at the University of Pennsylvania, doing his doctoral research on the photoelectric photometry of R CMa, AO Cas, AS Eri, and XY Leo at the Steward Observatory, University of Arizona in Tucson. Bob would continue this exploration of close binary stars, their atmospheres and interactions, for the rest of his career. Bob met his future spouse, Joanne C. Underwood, while in graduate school in 1957 and they were married in 1959. Bob received his PhD in astronomy in 1959 and moved to Amherst, Massachusetts where he taught as a member of the Four College Astronomy Department until 1966.

Following a year at the University of New Mexico in Albuquerque, Bob joined the Astronomy Department at Penn, teaching and doing research there until his retirement in 1996. Bob's main interests were the study of close and eclipsing binary stars, stellar envelopes and winds, intrinsic variables, transits and occultations, and the Milky Way Galaxy, producing well over 100 refereed publications. Bob was partial to photoelectric photometry and polarimetry, conducting most of his observational research at the University of Pennsylvania Flower and Cook Observatory, and at other ground- and space-based observatories. As an international figure in the area of binary stars, Bob had widespread collaborations with scientists at other institutions, in the US and throughout the world, and made significant contributions to the understanding of the process of mass transfer and accretion in close binary star systems and in developing stellar polarization standards. A number of astronomers were the recipients of his inspiration and mentorship as doctoral students at Penn.

Bob was a polymath who was able to expound eloquently on the intricacies of observational polarization measures or the various dealings of notable figures of the High Middle Ages with no advance notice. Along with his friend, biochemist Dr. Robert E. Davies, Bob helped establish at Penn one of the first courses to examine the astrophysical and biological implications for life beyond earth, long before NASA's own focus on the subject took shape. Bob was active in the astronomical community and served as president of IAU Commission 42 (close binaries).

A life-long love of astronomy led Bob to continue pursuing many areas of astronomical research during retirement. As an emeritus professor, he made important contributions to the detection of exoplanets by the eclipse-timing method, and explored the development of large, lightweight telescope mirrors for ground- and space-based observatories.

In his retirement, Bob also researched and wrote a history of observational astronomy at the University of Pennsylvania. He also was an active gardener and a talented musician, and learned to play the mandolin when he was 77. In addition, Bob and Joanne both loved traveling and bird watching, visiting nearly 30 countries during his retirement years. Besides Joanne, Bob's survivors include sons Thomas and James (Dana), daughters Elizabeth (Murray) and Patricia Budlong (Steven), seven grandchildren, a brother and a sister. Bob once wrote that he long ago decided "to control my career so as to have as much fun as grief"; in this he was successful beyond his dreams.

Joanne Koch
Michael Corcoran
Bruce Holenstein
Edward Sion

Additional information

<http://www.legacy.com/obituaries/mainlinemedianews/obituary.aspx?n=robert-h-koch&pid=146110910>

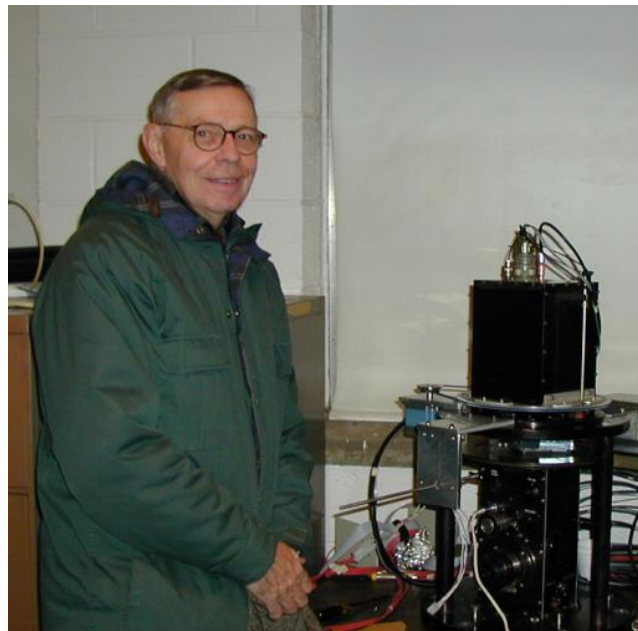
<http://www.upenn.edu/almanac/volumes/v57/n08/obit.html#koch>

Facebook page

http://www.facebook.com/pages/Robert-H-Koch-Astronomer/166544633365581?v=wall&fb_noscript=1

Memorial Conference

A number of Bob's former students and colleagues are planning a conference in his honor entitled "Stars, Companions, and their Interactions: A Memorial to Robert H. Koch" for the summer of 2011. The conference website may be accessed here: <http://www.gravic.com/RHKochConference>.



Robert H. Koch at Flower and Cook Observatory in December 2000. He is standing by the final generation PEM polarimeter.

R. H. Koch wrote in 2008 the following text about himself for the narrative web site:
<http://www.gravic.com/about/RHK-Observational-Astronomy-UP/index.html>.

Author's Background

I held academic appointments at Amherst and Mt. Holyoke Colleges and the Universities of Massachusetts, New Mexico and Pennsylvania. For essentially all of this time there were grant funds to support my observational research locally, at Kitt Peak, remotely in New Zealand, and in Earth orbit with the *International Ultraviolet Explorer* spacecraft.

I retired from teaching in 1996, none too soon in the opinion of numerous people. This permitted me to continue astronomical research, mostly on close binary stars; travel to Europe, Central America, Korea, Canada and across the U.S.; admire many species of birds; enjoy varieties of foods; compose a family history that goes back to the end of the 18th century; read; attend the Chicago Lyric Opera repeatedly; and work endlessly on our house and property.