THE BRODIE CLUB

Established 1921

Website: http://thebrodieclub.eeb.utoronto.ca/

THE 1,080th MEETING OF THE BRODIE CLUB

The 1,080th meeting of the Brodie Club was held on Tuesday, 20 January, 2015, in Room 432 of the Ramsay Wright Laboratories of the University of Toronto.

Chair: Bill Crins
Meeting Secretary: Trudy Rising
Editing Secretary: Ricky Dunn

The meeting was called to order at 7:30 pm and was attended by 16 members and 4 guests

Roll Call:

Present: E. Addison, R. Addison, Bertin, Bryant, Crins, A. Falls, B. Falls, J. Hussell, A. Juhola, H. Juhola, McAndrews, Reading, T. Rising, Seymour, Speakman, Sutherland Guests: P. Haist, T. Marescaux (guests of Bertin), S. Hick (McAndrews), Ken Yan (guest of speaker, Rob Cockcroft).

Regrets: Abraham, J. Bendell, Y. Bendell, Curry, Daniels, Dunham, Dunn, Eadie, D. Hussell, Iron, Lumsden, Machin, Martyn, Obbard, Peck, Pittaway, J. Rising, Slessor, Tomlinson, Zoladeski.

Minutes: Minutes of the December meeting were accepted with no revisions, following a motion made by Kevin Seymour and seconded by Oliver Bertin. (The secretary had already corrected the date of the meeting, as called in by Kevin Seymour.)

Committee Reports:

Program Committee: Bruce Falls announced speakers for the remainder of the year. February's speaker will be Spencer Barrett, whose title is Plant sex in the Wild. In March, Don Jackson will give a presentation on fish (title TBA), in April, Todd Morris will speak on Fresh Water Mollusks, and the May speaker is Shannon McCauley, who will be giving a presentation on Dragonfly Communities.

Announcements:

George Bryant provided a report on OnNature. He announced that a letter had been received from Melissa Striepe, thanking Brodie Club for a donation supporting the Annual OnNature Youth Summit. He also announced that Brodie Club's renewal of membership of $83 is now due.

Kevin Seymour announced that a new exhibit at the ROM on a new horned dinosaur would be open this coming weekend.

Sharon Hicks recommended the excellent wildlife photography exhibit that is also on at the ROM.

SPEAKER: Ed Addison introduced the speaker, Dr. Robert Cockcroft, presently a postdoctoral research fellow and lecturer at McMaster University, and also manager of the university's planetarium. Rob did his undergraduate degree at London University, then did both his Master's and PhD at McMaster University.

When the transit of Venus occurred in 2012, there was publicity about the historical context, which led Rob to do more research in the history of astronomy. Rob did his first post-doc, working under Professor Sarah Symons, in **Ancient Egyptian Astronomy** – the title of his talk tonight.

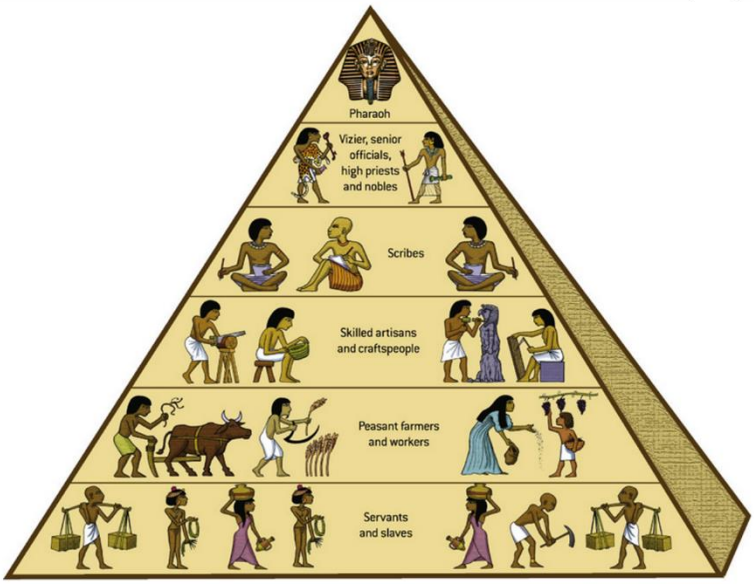
Rob focused on Diagonal Star Tables, most of which have been found painted on ancient Egyptian coffins. Rob and Prof. Symons took an expedition to Egypt in May-June, 2013, spending several days at the Cairo Museum but mostly at Luxor and environs, including the Valley of the Kings.

Why is it important to study star tables? The ancient Egyptian culture was the first to leave records of "doing science," actively observing and systematically recording what they saw. Symons and Cockcroft are curious to know when the observations were made, who made them, where, and how.

We cannot map ancient constellations from our own sky maps, nor can we definitively know what the Egyptians called their stars, because although we can calculate the changes in the night sky between that time and the present, there are no "instruction manuals" on how the diagonal star tables were created, and no documents similar to modern constellation maps.

The earliest work on star tables was done just over 100 years ago, but the most substantial work was done in the 1960s, by Neugebauer and Parker. That work is very technical, as the authors were both astronomers and fluent in hieroglyphics. To purchase one of their volumes on Amazon today—used—costs $2,100. Cockcroft and Symons were able to borrow and digitize a copy.

The structure of ancient Egyptian society can be pictured as a pyramid, with the Pharaoh at the top, senior officials below that, down to peasants and slaves at the bottom. One interpretation of Egyptian philosophy is that after death, important people became stars. Pharaohs would be circumpolar stars, such as Polaris (the North Star). Senior officials also became stars. Less is known for lower ranking people in society. However, instead of killing workers to have them buried with an official, images of them at their work would often be placed on objects to be buried with the official. Thus, we have an indication of their work/value.



Rob then introduced us to a timeline of Egyptian cultures:
Old Kingdom, 2600-2150 B.C.
Middle Kingdom, 1990-1690 B.C.
New Kingdom, 1300 - 1100 B.C.

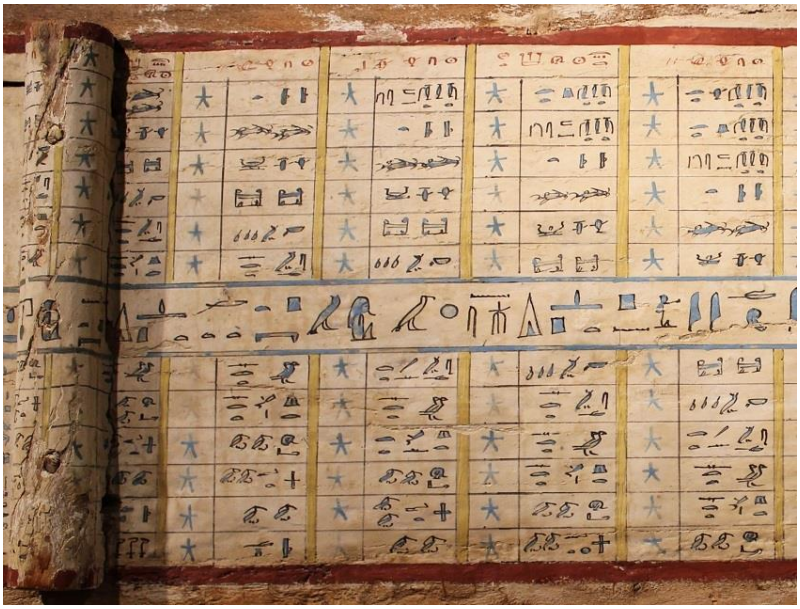
Diagonal star tables all date from the Middle Kingdom, except one example found in the "Osireion" symbolic funerary temple from the New Kingdom. There are two versions: T vs K tables, with slightly different designs.

There are only 25 extant tables, 24 on wooden (usually cedar) coffin lids or (often fragmentary) on battens, the cross structures that hold the wooden planks of a lid together. One anomalous example is in the ceiling of the Osireion passageway.

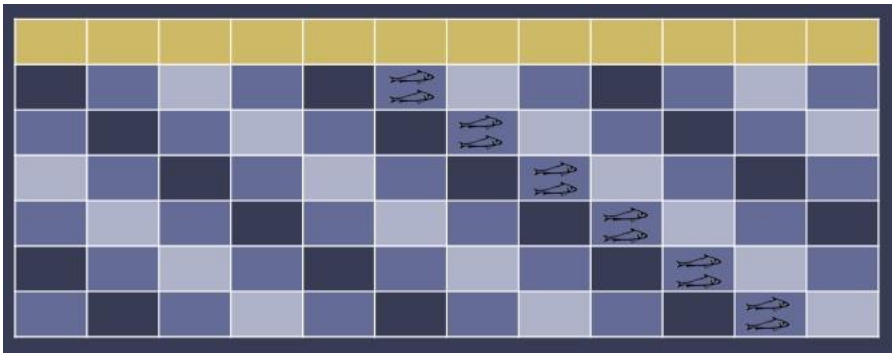
Why were these tables placed on coffins? Perhaps it was thought that when people died and became stars, they needed to know where to go and how to behave like all the other stars already in the sky.

The tables are split into four quadrants separated by a horizontal strip. The latter was not important astronomically, and simply had depictions of offerings, etc. The vertical strip separating the quadrants, however, had images of constellations. The tables are literally tables of stars, or possibly groups of stars.

Example of a star table, showing horizontal and vertical separations of quadrants. Detail (below) is from a different table.

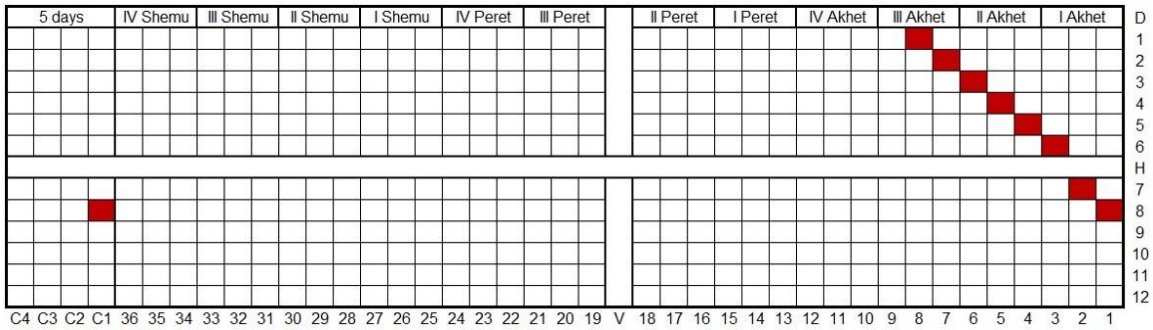


An Ideal Diagonal Star Table is shown below. It is thought that there must have been such an ideal template for all scribes to use in painting the star tables on coffins, since all that have been found use the same basic approach. Each row on the table represents a period of a night, split into different cells. Each column represents one of the 36 "decades" of the year (which, confusingly, is a period of ten DAYS and not ten years. Egyptians divided the year into 3 seasons, each with 4 months.)



Each cell within the four quadrants is filled with the name of a star or constellation. An Ideal Table contains 48 unique of these names. Translations of some of the hieroglyphs are known.

The star tables show how the visibility of each star (or group of stars) changes through the night and the year. As the Earth rotates, different stars are visible at a particular point in the sky as the night progresses (presumably in sequence from top to bottom of a column). As the year progresses, the pattern shifts, such that a given star does not appear at that point until later in the night. Across decans, then, a single star appears in a diagonal arrangement on the Diagonal Star Table as shown here:



Sometimes there's not enough space on the lid so there are only 39 columns (or fewer). In those cases, other stars are squeezed in at the end of the table on the left (since they read from right to left). The K tables are all cut short, so we don't have the most interesting section of the tables at the end.

The symbolic Tomb for Osiris, the "Osireion," is the only place where a diagonal table is found on a passage way instead of on the lid of a coffin. It dates to later in the New Kingdom, 1300-1100 B.C. The burial chamber here also has an astronomical ceiling, which includes how to build a sundial. However, Symons and Cockcroft could not get permission to enter to see either. The water table is now so high that it's flooded; Egyptian authorities have tried draining it, but the water flows back in.

Rob showed where all the extant tables are stored. Twenty are in Asyut, 8 in Cairo, and a few in other places in Egypt, including 1 in Mallawi, a small out-of-the-way city that Rob and Symons included in their expedition. All others are in museums in London (British Museum), Paris (Louvre), Vienna and elsewhere, and a few are in private collections.

One of the 3 coffins in Mallawi was known to have a star table on the underside of the lid, but of course Rob and Symons were not allowed to touch the lids. Fortunately the lid of that coffin was slightly elevated, and with flashlights (they had no permission to photograph) they were able to see and laboriously draw all the decans in the correct positions on the table.

They discovered that one of the three battens on another Mallawi coffin also had remnants of a star table. The remainder of the lid did not, however, so they surmised that the batten was not original to the lid. The lid from which it came may be in a private collection.

Unfortunately, just weeks after Rob and Symons left (June 3, 2013), the museum at Mallawi was vandalized, looted, and many artefacts burned. (Photographs of this can be seen on the Facebook page for the museum.) They do not know what happened to the coffin with the star map which they reproduced, but if it has been destroyed, their drawings provide the only evidence of what it showed.

Rob finished his presentation by noting that there are twice as many star tables known now as when Neugebauer and Parker produced their extensive work in the 1960s. More information on the Diagonal Star Tables which Rob and Symons are studying can be found at aea.physics.mcmaster.ca.

Questions:

Falls: Is one of the reasons that we can't map ancient Egyptian constellations onto our own constellations because we can't reproduce the sky from their period?

Answer: No; we can reproduce the ancient sky. Going back 5000 years, we can correct for the shift in the earth's axis, which meant there was a different pole star at that time. Also, the relative position of the stars changed, so the shapes of the constellations have shifted as well. For example, the Little Dipper would have looked more like a parallelogram. In a planetarium, we can reproduce what the sky probably looked like. The problem, though, is that we don't have any "instruction manuals" on how to use the tables, and we don't have any constellation maps from the ancient Egyptians.

Hicks: Is there a relationship among the different tables?

Answer: Yes. The Egyptians knew that there were 48 stars in an ideal table instead of 36

Addison: How many decans were there?

Answer: There are about 100 known decans; on the Diagonal Star Tables there are 70 or so. The decans also are shown on other edifices. Examples from the New Kingdom have a lot of Hellenistic motifs mixed in.

J. Hussell: what is the relationship between the two periods?

Answer: There are overlapping symbols between T and K, but it is still not clear exactly what the relationship may be.

Seymour: Has there been carbon dating of the coffins? And where were the observations made?

Answer: T and K are from similar time periods, and all are probably within 100 years of one another. We still don't when or where the observations were made, however. Toward the end of the making of these, scribes might have just copied the tables without really understanding the significance of what was being represented.

Bryant: How long has it been known that these lids relate to star motions? Some have a date row along the top.

Answer: Since their discovery, about 100 years ago. Three figures on the vertical strip of one coffin showed constellations that we're familiar with today (e.g., the belt of Orion was shown as a crown with 3 starts on the head of Sahu).

Falls: Did the people then have an understanding of the sky?

Answer: To some degree, yes. For example, they could tell stars from planets. But they didn't have a cosmology. They didn't try to understand WHY the motions happened – other than to assign them stories/myths).

Addison: Private collections that have tables -- is it known where they are?

Answer: No. Sometimes when a museum closed, items were sold and information on them disappeared.

Falls: Does the ROM have any?

Answer: Not that we know of.

George Bryant thanked the speaker.

OBSERVATIONS

Ken Yan brought photos of a bird he's had at his feeder: grey, white rump, blue beak. He passed around the photos to see if anyone could identify it. Concensus was that it was a cowbird.

G. Bryant: Noted a Globe & Mail article that gave evidence for it having been the hottest year in recorded history, even though that may not be obvious from a Toronto perspective.

E. Addison: He and Rose saw a Snowy Owl on a post south of Durham, toward London, and a 2nd one south of Clinton this last week.

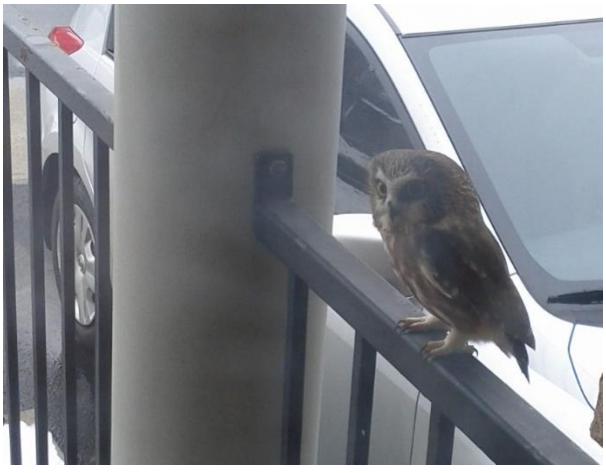
B. Crins: Says the huge majority of Snowy Owls people are seeing are young birds.

O. Bertin: Mentioned that Matt Galloway reported seeing a Cooper's Hawk in the city, near Dupont.

B. Falls: Reported that he and Ann had seen 14 Snowy Owls at Ravenshoe S. at Holland Marsh (twice, they saw large numbers).

The meeting was adjourned at 9:00 P.M.

NEXT MEETING: The next meeting will be on Tuesday, Feb. 17. Spenser Barrett will speak on Plant sex in the Wild.



Following adjournment, in the conversations that followed, the Dr. Cockcroft's guest, Ken Yan, mentioned seeing a Saw-Whet Owl on his balcony in Markham. His photograph of it is shown here.

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