The Sirius Problem

It has been long been argued that the ancient Egyptians used the heliacal rising of the star Sirius -- which they called "Sothis" -- to mark the beginning of their New Year and the timing of the annual inundation of the Nile; however, when one seeks to pin down the specific day of the year on which this occurred, a variety of different dates are encountered in the literature. Some sources state that it occurred on the summer solstice, i.e., June 22, while others say that it happened when both Sirius and the sun rose at the same place on the horizon. Yet other sources cite July 19th as the day on which this event took place.

One of the few first-hand sources to address this matter was the Roman praetor Censorius who claimed that the heliacal rising of Sirius and the beginning of the agricultural year coincided in the year 139 A.D. The fact that it did not do so every year was because the Egyptians used a value of 365 days for the length of their year, which resulted in a one-day advance of their civil calendar over the true length of the solar year every four years. Finally, after an interval of 1,461 of their years, the rising of Sirius once more occurred on the first day of the astronomical year, a period of time that the Egyptians came to call "the Sothic cycle." In other words, if Censorius was correct, then the same coincidence of events took place in the years -1322 and -2783.

Using Censorius as my guide, I investigated the Sirius problem by enlisting the aid of a computer program that allowed me to turn back the heavens to the way they appeared from the Nile valley just before dawn in the year 139. When I looked at the eastern horizon on the summer solstice, I found that the sun rose at an azimuth of 62° at 4:49 A.M., whereas Sirius did not rise until 6:00 A.M. at an azimuth of 109°; in other words, it was impossible for the summer solstice to have marked the beginning of the agricultural year, because Sirius did not rise until well over an hour after the sun!
Having also noted the wide difference in the azimuths of the rising sun and Sirius, I next decided to determine on which days in the year they would both rise at the same azimuth -- another of the explanations found in the literature. This proved to be on both November 8th, as the sun was on its way southward to the Tropic of Capricorn, and also on February 3rd, on its journey northward again. On the first occasion, the sun rose at 6:17 A.M., but Sirius did not rise until 8:50 P.M. -- certainly not a heliacal rising by any stretch of the imagination. On the latter occasion, the sun was up by 6:48 A.M., but Sirius was nowhere to be seen until 3:06 P.M., again proof positive that a common azimuth between the star's rising position and that of the sun had nothing to do with its astronomical significance.

Finally, I set out to establish on what day the two heavenly bodies rose together, for clearly if Sirius was to put in a heliacal appearance, it would have to do so on some date either soon before or soon thereafter. This turned out to be on July 9, when the sun rose at an azimuth of 63º at 4:55 A.M. and Sirius rose at an azimuth of 109º at virtually the same moment, i.e., 4:53 A.M. Because the sun was on its way southward at this time in the year, it continued to rise later each day, so by July 19th, one of the days mentioned in the literature as the beginning of the agricultural year, the sun rose at 5:00 A.M. -- now at an azimuth of nearly 65º -- while Sirius had already put in its appearance by 4:14 A.M. Obviously, this little exercise does not prove that July 19th was "the day" on which the Egyptian calendar began, but it certainly establishes it as the most likely candidate among those dates that have been put forth in earlier discussions of the subject.

- Two Sothic cycles before the year A.D. 139, in the year –2783, the sun rose at 4:45 A.M. on July 9 and Sirius rose at 4:31 A.M. at an azimuth of 117º -- giving the latter a “lead time” of 14 minutes. One Sothic cycle earlier, in –1322, the sun rose at 4:48 A.M. on July 9 and Sirius rose at 4:38 A.M. at an azimuth of 111º, and Sirius enjoyed a heliacal advantage of only 10 minutes. In A.D. 139, as we
have seen, Sirius’ advance over the sunrise had decreased to 2 minutes, and by one Sothic cycle later, in A.D. 1600, Sirius was rising a full 50 minutes after the sun. Thus, Censorius’ observation was made at about the last time such a heliacal rising of Sirius could have been witnessed.