WILL KYSELKA

On the Rising of the Pleiades

At the time when the sun became hot
At the time when the heavens turned about
At the time when the sun was darkened
To cause the moon to shine
The time of the rise of the Pleiades
The Kumulipo[1]

TRADITIONALLY, THE RISING of a faint group of blue-white stars, the Pleiades, marked the beginning of a four-month Makahiki season in ancient Hawai'i.

The Pleiades are of great significance not only in Hawai'i, where they pass directly overhead, but throughout Polynesia and the rest of the world as well. They are mentioned three times in the Bible and often in other literary works. Australians danced to the Pleiades. Greeks oriented temples to their rising, and Mexicans oriented cities to their setting. For Europeans, they were of calendrical importance.

Makahiki begins with the rising of the Pleiades, but just when *do* they rise? "Rising" is an ambiguous term yielding a wide range of possibilities. Here we look at historical descriptions and astronomical contexts in a search for the most plausible time for the event to begin and go back as far as A.D. 500.

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The Pleiades Cluster

> Swings the Pleiades, Makali'i, swings the Cluster, na Huihui
> *The Kumulipo*[2]

The Pleiades, *Na-huihui-o-makali'i,* "Cluster of Little Eyes" (also *Huhui*),[3] marks the shoulder of Taurus the Bull. Though small and dipper-shaped, it is not *the* Little Dipper, for that group is large and tethered to the North Star. The Pleiades cluster is large, about a half-degree in our sky, the size of the full moon. But it is faint—so faint that its total light output scarcely exceeds that of second-magnitude Polaris. Yet for all its modest illumination, it is a surprisingly conspicuous stellar object in a clear sky (fig. 1).

The Pleiades are also known as the "Seven Sisters," even though most people see only six stars. Binoculars reveal 50, and large telescopes photograph 3,000 stars, wrapped in faint nebulosity. It is a dusty region of space, 400 light-years distant, where stars are being born. So young is this stellar nursery that the birth cloud out of which they formed some 60 million years ago has not yet dispersed (fig. 2).

Cultural Response

The Pleiades occupy a small portion of the sky and a large place in human imagination.[4]

The first mention of the Pleiades is in the Chinese annals of

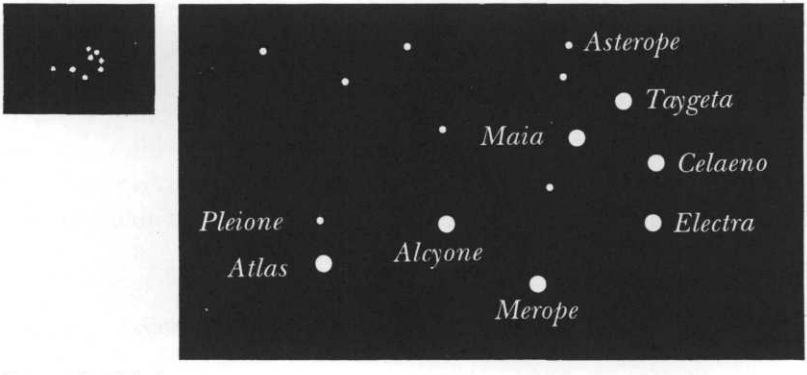

Fig. 1. The Pleiades.

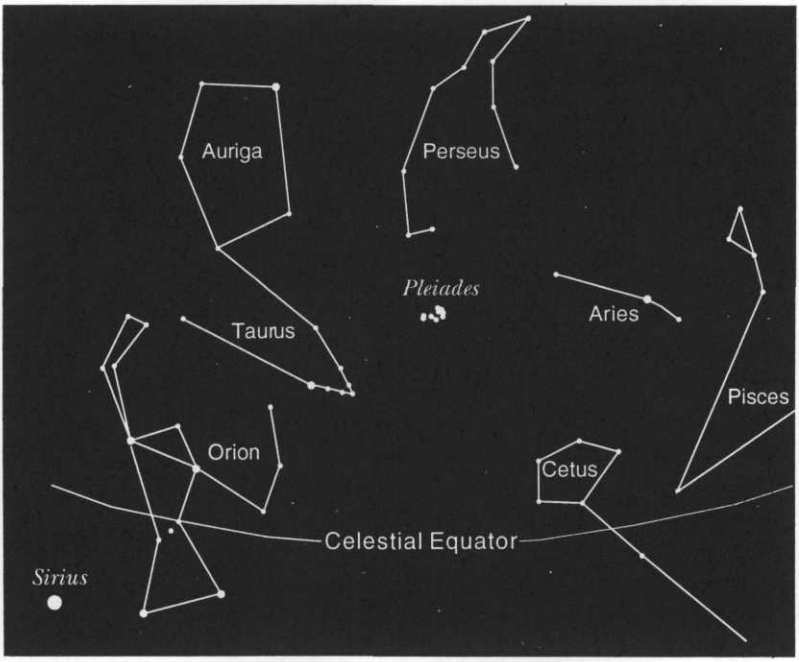

FIG. 2. A line extended through the three-in-a-row in Orion's belt comes to the Pleiades. In the opposite direction, the line comes to Sirius, the brightest star in the sky. Sirius travels over Tahiti just as the Pleiades travel over Hawai'i.

2357 B.C. Six centuries later in India, the Hindus put them in their zodiac. The Greeks oriented the Hecatompedon temple of 1150 B.C. and the Parthenon of 438 B.C. to their rising.

In sky lore, the Pleiades were the daughters of earth-shouldering Atlas and objects of Orion's affection. To divert Orion from his amorous pursuit, Atlas put Taurus the Bull in the way. Bull and Giant have been encountering each other for thousands of years, apparently not yet having done battle.

For Persians, the feast of Isis began with the midnight culmination of the Pleiades. Australian tribes danced in honor of the "Seven Stars," while Brazilian tribes regarded the group as their ancestors. In South Africa the Pleiades were of agricultural importance as the "hoeing stars."

For the Celts of northern Europe (fifth to first centuries B.C.), the Pleiades' rising with the sun marked Beltane, or May Day. Since stars cannot be *seen* rising with the sun, the timing of

Beltane implies they had an accurate calendar. The Druids' midnight rites on the first of November, with the Pleiades at the meridian, is recollected in three holy days of our time—All Hallow's Eve, All Saint's Day, and All Souls' Day.

The Mexican city of Teotihuacàn, built in the second century, was oriented to the setting of the Pleiades. The Navajos associated the Pleiades with their principal deity, Black God, creator of fire and light.

Three times the Pleiades are mentioned in the Bible. Amos uses them in extolling the power of the Creator.

> He who made the Pleiades and Orion,
> and turns deep darkness into the morning,
> and darkens the day into night. . . .[5]

To the Pleiades and Orion, Job adds the Bear (Ursa Major) and the "chambers of the south."

> . . . who alone stretched out the heavens,
> and trampled the waves of the sea;
> who made the Bear and Orion,
> the Pleiades and the chambers of the south. . . .[6]

The Bear and Orion are the two most brilliant star groups in the sky, each with seven bright stars. What contrast to such celestial ostentation are the "sweet influences of the Pleiades!"

> Canst thou bind the sweet influences of the Pleiades,
> or loose the bands of Orion
> . . . or guide Arcturus with his sons?[7]

The nineteenth-century poet Alfred Tennyson likens the Pleiades to fire-flies, the "silver braid" suggesting the faint nebulosity in which its stars are embedded.

> Many a night from yonder ivied casement, ere I went to rest,
> Did I look on great Orion sloping slowly to the West.
>
> Many a night I saw the Pleiads, rising thro' the mellow shade,
> Glitter like a swarm of fire-flies tangled in a silver braid.[8]

Alfred Housman, a twentieth-century English poet, makes a Pleiades-Orion connection:

> The rainy Pleiads wester,
> Orion plunges prone,
> The stroke of midnight ceases,
> And I lie down alone.[9]

The Pleiades Rising

The Pleiades can be seen sometime during the night throughout the year except in late April and May. Each day they rise and set four minutes earlier, so "Pleiades rising" yields a wide range of dates. Narrowing the range to "Pleiades rising in the evening sky," we find September and October to be in line with tradition.

The Pleiades are hard to see when at the horizon, even under the best of conditions, because of their faintness. An hour after they have left the horizon, they are 15° into the sky, then well

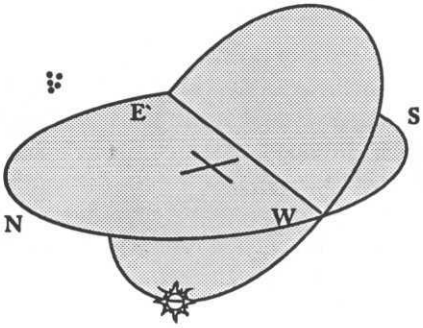

Fig. 3. The Pleiades are 15° above the eastern horizon on October 4. The sun is then 4° south of the equator and 3.5 hours beneath the western horizon.

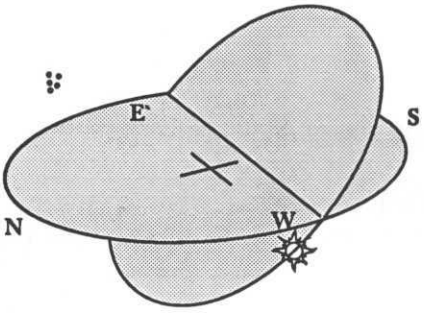

Fig. 4. The Pleiades are 15° above the eastern horizon at 7:30 P.M. on November 4. Since the sun moves 1° nearer to the Pleiades each day, soon they will be lost in the evening twilight.

placed for viewing. Figures 3 and 4 picture them in that 15° position.

In early October, the Pleiades are conspicuous in the eastern sky three hours after sunset. The last vestige of twilight has long since faded and the "Cluster of Little Eyes" appears in a completely darkened sky.

Rising four minutes earlier each day, the Pleiades are in the same place in the November sky that they were in October, but they are there two hours earlier. This is the latest they can be seen at sunset.

The sun continues moving eastward among the stars, one degree a day. At sunset in February, the Pleiades are overhead, and Makahiki ends. Two months later, they are close to the setting sun and soon lost in the evening twilight.

The Pleiades and Makahiki

William Ellis tells of calendrical systems of Tonga and the Society Islands based on the visibility of the Pleiades.

> They divided the year into two seasons, of the *Matarii,* or Pleiades. The first they called *Matarii i nia,* Pleiades above. It commenced when, in the evening, these stars appeared on or near the horizon; and the half year, during which, immediately after sunset, they were seen above the horizon, was called *Matarii i nia.* The other season commenced when, at sunset, the stars were invisible, and continued until at that hour they appeared again above the horizon. This season was called *Matarii i raro,* Pleiades below.[10]

Hawaiian historian David Malo related the Hawaiian calendar to the Pleiades. Like the Tongan and Samoan year, the Hawaiian year was divided into two seasons, *kau* and *hoʻoilo,* and each season had six months: "The months in Kau were Iki-iki, answering to May, at which time the constellation of the Pleiades, *huhui hoku,* set at sunrise."[11]

Here he is in error, though, for it is not in May but in November that the Pleiades set at sunrise. In May, the Pleiades are in *conjunction* with the sun, traveling with it all day (fig. 5). It is in November, the time of *opposition,* that the Pleiades set at sunrise.

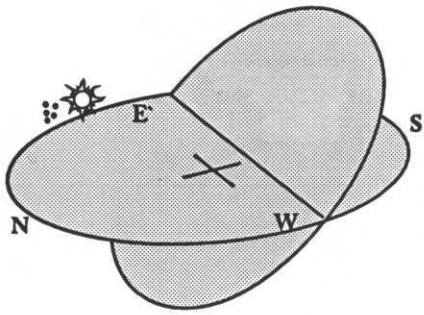

FIG. 5. The Pleiades, in conjunction with the sun in May, are rising 5° north of the sun.

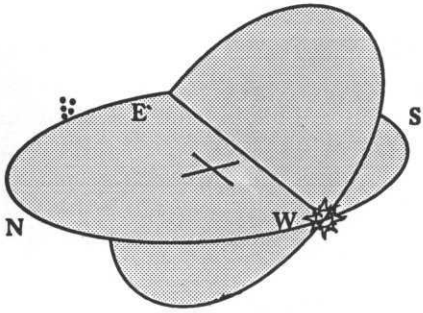

FIG. 6. The Pleiades are in opposition on November 18, rising at sunset, culminating at midnight, and setting at sunrise.

Malo reports that Makahiki begins with a signal, but he does not say what it was or who gave it.

> In the month of Ikuwa [October] the signal was given for the observance of Makahiki, at which time the people rested from their prescribed prayers and ceremonies to resume them in the month of Kau-lua [February].[12]

W. D. Alexander comments upon Malo's text. Their styles stand in interesting contrast, perhaps reflecting cultural tendencies. Malo's style is descriptive and tentative. For him, Makahiki begins sometime in October with a sign. Alexander's style is crisp and unequivocal, and for him Makahiki begins at the moment sun and moon are in opposition.

> The Polynesian year, as stated by Ellis, Fornander, Moerenhout and others, was regulated by the rising of the Pleiades, as the month of Makalii began when that constellation rose at sunset, *i.e.*, about November 20.[13]

On November 18, the Pleiades are in *opposition*—180° from the sun, rising at sunset, culminating at midnight, and setting at sunrise (fig. 6). It is of interest—perhaps significance—that culmination in Hawai'i occurs at the zenith.

But the Pleiades rising at opposition is a non-event; it cannot be seen. It can be predicted, though, and that requires a good calendar. Alexander implies that people of old had such a calendar since "[t]he approximate length of the solar year was also well known to the ancient Hawaiians."[14]

The Western obsession with precision is mirrored in the work of Handy and Handy:

> The *Makahiki* festival in honor of Lono commenced with the first rising of the constellation of the Pleiades over the horizon at sunset (as seen in Kona, presumably from Lono's temple Hiki'au at Kealakekua) in the month called *Ikuwa.*[15]

But in Kona you cannot see the Pleiades coming "over the horizon at sunset" for there is a fence of mountains. Besides, the Pleiades are too faint to be seen at sunset.

The Handys clarify the meaning of the words *ka hiki* and *Makahiki:*

> It is important to understand that *ka hiki,* when applied to the origin or source of an introduced plant or to a traditional figure, did not necessarily refer to the island named Tahiti. *Hiki* means "to get to or ready" a place, "come," "arrive," or "to fetch or carry." The original reference was probably to the coming or arriving of a plant or person, and perhaps the notion that the source referred to was specifically the island of Tahiti was an inference of foreigners who translated *Ka hiki* as Tahiti. Actually, the ancient name of the island now called Tahiti was *Hiti Nui.* The annual festival which celebrated the coming of the winter rains from the south and the traditional coming of Lono, the god of rain, was called *Makahiki.* This name most certainly has no reference to the island of Tahiti, but rather to the season or time or manner of coming or arrival *(Ma-ka-hiki-na)* of Lono.[16]

No mention is made of the relationship of the moon to Makahiki. Since moonlight washes stars right out of the sky, the best time to see the Pleiades is at the time of new moon.[17] If Makahiki

were tied to lunar phases, its beginning would vary from year to year, just as Easter does. Easter varies as much as five weeks, falling on the Sunday following the first full moon after the vernal equinox.

Makahiki in Ancient Times

When might Makahiki have been celebrated by the first settlers in Hawai'i 15 centuries ago?

The sky was different. The Pleiades were farther south, the Southern Cross was higher, and there was no "North Star."

In A.D. 500, the Pleiades were 5° closer to the equator than they are now and traveling a path across the sky that took them over Ka Lae (South Point) on the island of Hawai'i. Moving slowly northward over the centuries, they now pass over a point 120 miles north of Kaua'i (fig. 7).

Fifteen centuries ago, the Southern Cross was 5° higher than it is now. Then it could have been seen from a latitude of 33° N, about that of Los Angeles. Crux has moved closer to the horizon, and now Hawai'i is the only place in the United States where you can see both North Star and Southern Cross (fig. 8).

Most noticeable is a change in the sky that takes place in the region of the celestial pole—a change that periodically gives us a "North Star," then takes it away. In A.D. 500, the earth's axis was pointing to a place on the celestial sphere 9° from Polaris. Polaris traced a circle in the sky 18° in diameter. Now the distance has closed so that Polaris and the north celestial pole are less than a degree apart, and Polaris is *Hoku Pa'a,* "the Unmoving." Our moment in history is unique, for it is the time of the North Star (fig. 9).

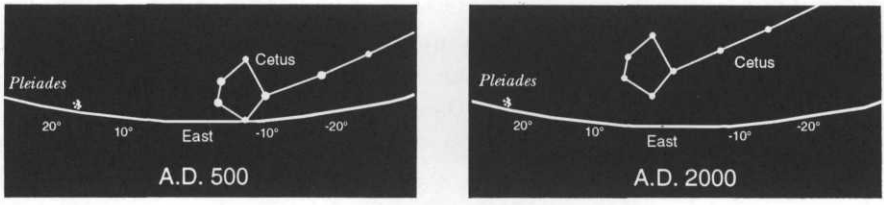

Fig. 7. Fifteen hundred years of precession. The Pleiades have moved 5° northward, the sky has tilted, and the head of Cetus has crossed the equator.

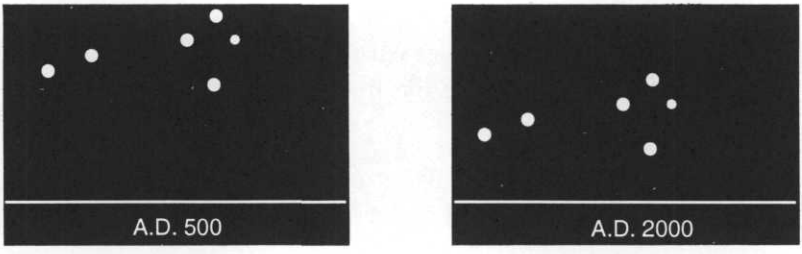

FIG. 8. Precession has lowered the Southern Cross 6° in 1,500 years.

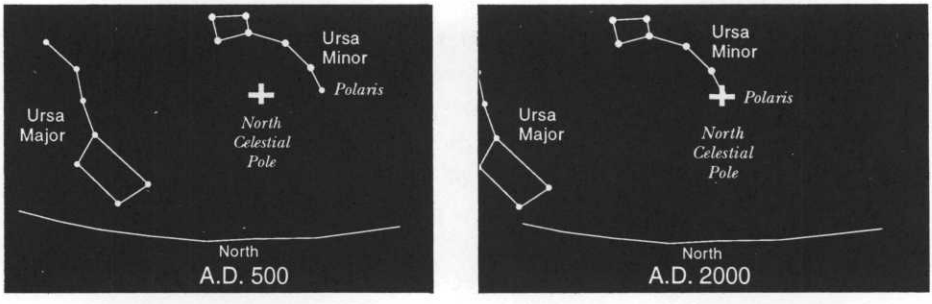

FIG. 9. Fifteen hundred years ago Polaris circled the northern sky. In our era, the north celestial pole is pointing to within three-quarters of a degree of Polaris, so for us Polaris is "unmoving," *Hoku Pa'a.*

The reason for the changing sky is *precession,* a wobbling motion of the earth much like that of a wobbling top. Next century—and for 130 centuries following—the celestial pole will drift farther and farther from Polaris until they are 47° apart. Then the star Vega will be the "North Star" but too far from the celestial pole to be a good one. Gradually precession will bring Polaris and the north celestial pole together, and 26,000 years from now the sky will again appear as it does today.

Precession also shifts the seasons. Spring comes 20 minutes earlier each year. In 13,000 years, winter will come in June; summer, in December. The shift amounts to 14 days in a thousand years. So in A.D. 1500, Makahiki would have been celebrated seven days earlier than it is now; 14 days earlier in A.D. 1000; and 21 days earlier in A.D. 500.

"Pleiades rising" is both a geometric happening and a visual event. If we accept "Pleiades rising at sunset"—an event that cannot be seen—for the beginning of Makahiki, then the date is

November 18. Tradition, though, favors October. And when, on a clear October evening, we see the Pleiades rising, we await a *signal* that this remarkable *sign* presages.

Notes

[1] Martha Beckwith, *The Kumulipo* (Honolulu: U of Hawaii P, 1972) 28.

[2] Beckwith, *The Kumulipo* 126.

[3] Rubellite Johnson and John Mahelona, *Na Inoa Hoku* (Honolulu: Topgallant, 1975) 18.

[4] This section is based on: Anthony F. Aveni, *Skywatchers of Ancient Mexico* (Austin: U of Texas P, 1980); James G. Frazer, *Aftermath: A Supplement to the Golden Bough* (New York: Macmillan, 1937); E. C. Krupp, *In Search of Ancient Astronomies* (New York: McGraw-Hill, 1978); and Maud W. Makemson, *The Morning Star Rises* (New Haven: Yale UP, 1941).

[5] Amos 5:8.

[6] Job 9:8.

[7] Job 38:31.

[8] Alfred Tennyson, *Locksley Hall,* in *Tennyson's Poetry* (New York: Norton, 1971) 95.

[9] A. E. Housman, *More Poems XI,* in *Collected Poems* (New York: Holt, Rinehart and Winston, 1965) 170.

[10] William Ellis, *Polynesian Researches: Polynesia* (Rutland, Vt.: Tuttle, 1969) 87.

[11] David Malo, *Hawaiian Antiquities* (Honolulu: Bishop Museum P, 1971) 30. Malcolm Chun says that the error is in Emerson's translation (personal communication).

[12] Malo, *Hawaiian Antiquities* 33.

[13] Malo, *Hawaiian Antiquities* 36. Alexander's commentary.

[14] Malo, *Hawaiian Antiquities* 36.

[15] E. S. Craighill Handy and E. G. Handy, *Native Planters in Old Hawaii.* Bishop Museum Bulletin 233. (Honolulu: Bishop Museum, 1978) 329.

[16] Handy and Handy, *Native Planters* 331.

[17] New moon occurs on the following dates over the next few years: October 15, 1993; October 5, 1994; October 24, 1995; October 12, 1996; October 31, 1997; October 20, 1998; October 9, 1999; October 21, 2000.