

HAWAIIAN ASTRONOMICAL CONCEPTS II

By MAUD W. MAKEMSON

IN THE fragmentary astronomical tradition handed down from the ancient Hawaiians are found five distinct classifications of the heavenly bodies. The native authorities for these divisions are Kepelino, Kanalu, Kamohoula, Laukahikupua and Kupahu respectively.

There are two general types of "star" according to Kepelino,¹ the *fixed* and the *moving*. At first glance this resembles the division of the heavenly bodies by the ancient Greeks into (a) the fixed stars, which maintain their configurations, and (b) the planets, which wander among the constellations of the zodiac. The similarity, however, is only in the nomenclature.

Kepelino subdivides the fixed stars into three groups: (a) the *greater* stars which include the sun, moon and Venus; (b) the stars used as guides in navigation; and (c) the *lalani*, or "stars of heaven." The second large class he characterizes as negligible: "They are many in number and are scattered over the firmament and their only reason for existence is to give a little light to earth at night."

The sun is the chief star over all stars, the great star of the god Kane. Its rising gives the name *hikina* to the east and its setting the name *komo-hana* to the west. The moon is the "great whiteness created by Kane," called variously *malama*, "light," and *mahina*, "white." The moon was considered of great importance because its ever-changing phase gave names to the days of the month, and its monthly cycles provided a natural unit of time on which to base the calendar.

The third of the great stars, Hokulooa, is unmistakably Venus. This planet was variously called Hokulooa, "great star," Hoku-alii-wahina, "chiefess star," Ka'awela, "star close to the sun," Ka-eleele-o-ka-wanaoa, "messenger of day," and Ka-hoku-komohana, "star of the west." As morning star rising before dawn, Venus served as a clock to the agriculturist. "For," Kepelino continues, "it was customary to till the land in the early morning while it was yet cool, and when the cultivators saw the Great Star they went at once to their farming and other labor." As evening star, Hokulooa served as guide to fishermen, homeward bound after nightfall. The important dual role played by Venus and her unusual brilliance account for her inclusion in the class of great stars. That Hokulooa is Venus and not some other bright planet is evident from a further note that the Great Star is close to the sun and follows the same course.

¹ Kepelino: *Traditions of Hawaii*, edited by Martha Warren Beckwith (Bernice P. Bishop Museum Bulletin 95; Honolulu, H.I. 1932), pp. 78-82.

Kepelino's second subdivision of the *fixed* stars contains the navigating stars, *na hoku kiai aina*, "those stars which are suspended over certain lands, as Hokulei over Hawaii and Hokukea over Tahiti." Hokulei is probably a name for Arcturus which passes through the zenith of a place in latitude 19° north. Thus for a ship approaching the Hawaiian Islands from the south, Arcturus would appear to culminate higher and higher in the sky each night until it finally passed through the zenith. When this occurred, the navigator would know that he had reached the latitude of Hawaii.

Kepelino lists eight navigating stars, reputed to have been named in honor of the steersmen of Hawaii-nui, legendary discoverer of the islands, who came by canoe from Kahiki-honua-kele, "far land reached by sailing." The eight steersmen were skilled in observing the stars, the legend runs, and each called the star he steered by after his own name. They are: Makalii, usually interpreted as the Pleiades throughout Polynesia, although Kepelino remarks that this name was applied to more than one star and one authority identifies it with Gemini; Kiopa'a, "fixed immovable," i.e., the North Star or Polaris which has no diurnal motion; Hokuula, "red star," Mars or Aldebaran; Iao, usually identified with Jupiter; and Kahiki-nui, Maiao, Unulau and Polohilani. Of the last group, the first three are legendary geographical names as well as star names, and Polohilani was a king of Hawaii.

The third subdivision of the fixed stars, the *Lalani*, is described by Kepelino as containing "stars close to the heavens and extending from one side to the other of the heavens." They are called ruling stars. "There is a vast number of these stars, and they shine with a tiny, twinkling light, because of their great height. In the Hawaiian stories they are said to be close to the heavens." The name *Lalani* undoubtedly refers to the Milky Way.

Thus the first large class of heavenly bodies in Kepelino's astronomical education, acquired orally from the wise men of his community, includes the sun, moon, Milky Way, planets and those conspicuous stars which served a useful purpose in the Hawaiian economic life. There remain then for the second large division all those fainter stars which had no special value other than to "give a little light at night." To quote Kepelino: "O na hoku paa o na papa ekolu, a me na hoku lewa o na papa elua," which has been translated, "Of fixed stars there are three classes; the fixed and moving stars made two classes." The word *lewa*, here translated "moving," is used in the teachings of Kaneakahoowaha on astronomy as recorded by Kamakau² in the phrase *Na hoku o ka lewa*, translated, "the stars of space,"

² Kamakau, S. M.: *Instructions in ancient astronomy as taught by Kaneakahoowaha, one of the counselors of Kamehameha I.* (Thrum's Hawaiian Annual), pp. 142-3, 1891; transl. by W. D. Alexander from the Nupepa Kuokoa of Aug. 5, 1865.

or "foreign stars," to distinguish them from the navigation stars or stars ruling lands. *Lewa* may thus be interpreted as applying to those stars which disappear from sight when the moon is shining or in twilight, while the brighter stars and planets are still visible. In this sense they are "moving" stars. Such stars would be of no value to the steersman.

THE CLASSIFICATION OF KANALU

A second system of classifying the heavenly bodies is found in the genealogy or ancient history of Kanalu³ and consists of eight divisions, more than half of them obviously for astrological purposes:

1. hoku alii royal stars
2. hoku makaainana plebeian stars
3. hoku hoike prophetic stars
4. hoku kahuna stars for priests
5. hoku aina land stars
6. hoku no ke akua stars relating to the god
7. hoku no ka malama stars for every month of the year
8. hoku kilo stars usually observed by astrologers

No individual star names are given. Of the eight divisions, the class of royal stars is likewise found in the systems of Laukahikupua and Kupahu, and the former also lists "people's stars or stars ruling months" as a single division. Kanalu names fourteen months, instead of the usual twelve or thirteen, and states that a year consists of "hookahi puni me eha malama," or one round (puni) and four months (malama).

THE SYSTEM OF KAMOHOUA⁴

Although it is not stated explicitly, the three classes of heavenly bodies given in Kamohoula's *System of Astronomy and Astrology* appear to be based on a division of the sky into zones, northern, middle and southern, similar to those described by Collocott⁵ in his paper on Tongan stars and constellations. Thus there may be a connection between Kamohoula's three classes and the sky zones pictured by Malo and Kamakau and discussed in a previous paper.⁶

³ Kanalu: *Genealogy or Ancient History: Kuokoa Home Rula* (Chas. K. Notley and Joseph M. Poepoe, Ed. Honolulu, April 9, 1909).

⁴ *Kuokoa Home Rula*: Honolulu, April 9, 16 and 30, 1909.

⁵ Collocott: *Tongan Astronomy and Calendar* (Occasional Papers of the Bernice P. Bishop Museum Vol. VIII, No. 4, Honolulu, 1922), p. 158.

⁶ Makemson: *Hawaiian Astronomical Concepts* (American Anthropologist Vol. 40, No. 3, 1938), p. 379.

There are 18 names in Kamohoula's first class, five of which belong to planets. Andrews, Bishop and Alexander are quoted on the identification of these with the bright planets, Mars, Saturn, Jupiter and Venus, but with marked disagreement. Other constellations in this class are Na Hiku, "the seven," i.e., the Big Dipper, Na Huihui, "the cluster," or the Pleiades, and Na Hoku Humu Ma, Aquila. Na Kao, "the darts," universally identified as the Belt of Orion, is also included although it is situated on the celestial equator.

Na Hoku Pa, "the inclosure stars," is here said to be identical with Leo, no authority being given. From the accompanying sketch of Na Hoku Pa and the statement that this constellation is sometimes paralleled with the stars of Humu, Aquila, I am inclined to identify it with the head of Cetus. Humu, which is probably Altair and its two companions, lies between 6° and 10° declination north of the celestial equator, in approximately the same parallel as the northernmost stars of Cetus. They therefore follow the same diurnal path across the heavens, as the earth rotates, and are seen in the sky at the same time on fall evenings. It is furthermore stated in the *Home Rule* that the Pa stars are sometimes paralleled with Kukuiakona, Maukuku, Keoea, Kaulumohai and others of Kamohoula's first class. Other conspicuous stars lying along this belt of the sky include Bellatrix and Betelgeuse in Orion, Procyon, Epsilon Pegasi, Alpha Serpentis and Alpha Ophiuchi. Among these we would expect to find the Hawaiian stars named as paralleling the Pa stars, but a closer identification is impossible.

Five of the six star names listed in Kamohoula's second class are all interpreted by the editor as names for Sirius, the greatest of the navigation stars, which is 17° south of the celestial equator. One of these, Kauopae, is elsewhere cited as a name for Rigel (-10°). In the same sky zone as Sirius we should expect to find Alpha Hydrae, Spica, Deneb Kaitos and Rigel, to mention only the more conspicuous stars.

In Kamohoula's third class 22 stars are named. Of this number, Melemele and Polapola, said to be in the southern hemisphere and very close together, are well known Polynesian star names. This is likewise true of Makalii, of which a sketch is given, showing two triangles formed of three stars each with a bright star between them. Makalii is usually interpreted as the Pleiades, but this constellation has already appeared in class I under the name of Na Huihui. The drawing and description of Makalii fit equally well either Fomalhaut or Achernar with their neighboring fainter companions.

Among the stars of the third class are found several names of famous chiefs such as Iwikauikaua, Haloa, Keawe, Pao, Makuakaumana and

Aikanaka. The star Kane is said to have been held sacred by the old Hawaiian astrologers. The priests were the only ones who could see it, and its appearance foretold the death of a high chief. This description suggests an irregular, red variable star such as Mira, Omicron Ceti.⁷

THE SYSTEM OF LAUKAHIKUPUA⁸

In the fourth stellar classification, that of Laukahikupua, the astrologer, there are three divisions: (a) royal stars; (b) people's stars or stars ruling months; and (c) canoe-steerers' stars. No names are given in class (a) which may either be equivalent to Kepelino's "great stars," or comprise those bright stars which were ascendant in the east at the time of the birth of a chieftain's son and were thought to rule his destiny. Five "people's stars" are named together with the month during which they were conspicuous in the east just before dawn, at the time when the astrologers scanned the heavens for omens. To quote illustrative fragments from the teachings of Laukahikupua:

The astrologers were regular in their observations every morning for the well-being of the throne and of the people, because with them lay the question of right and wrong, of life and death, of the community. They announced the carrying out of things peaceful through their knowledge, by observation of war indications.

In our observations of Kaleikupua, the astrologer, and Kapapapa, the reliable watcher of population increase (census taker?), here they are observing the heavens as though they had the eyes of a fish-hawk. They separated properly the stars suitable for entering the uncounted stars of the astrologers, and the expert Kapapapa folk arranged certain stars for the benefit and prosperity of successive generations.

Pauloa, the people promoter, and Kawelolani, the astrologer, again chose from the remaining stars after the first selection, outside their bounds: Hokuula (Aldebaran) and Hokulei (Capella). Wives they are of Makalii (Pleiades). Kanoemakalii emerged from Hokuula and Makalii. Here are these stars set forth in their season, and when again the long year has passed, they return in the winter season.

Give strict attention to my teachings. That star standing at the east of Hokuuloa (Venus) is Kahela. It is a star of the people, observable during the month of Ikuwa, until its close. When Kahela disappears, Kumukoa arises, the star of Hilinehu (9th

⁷ I am greatly indebted to E. H. Bryan, Jr., curator of the Bernice P. Bishop Museum, for calling my attention to the newspaper accounts of the astronomical systems of Kanalu and Kamohoula and for giving me access to astronomical notes which he had collected from various sources, including a notebook compiled by Mary Pukui, member of the Museum staff. Mr. Bryan also kindly provided me with a book of constellation charts which he had arranged for the latitude of the Hawaiian islands, and with other valuable data, for which I am most grateful.

⁸ Laukahikupua: *Mookua uhaui elua, or Second Genealogy* (Nupepa Kuokoa, Honolulu, March 22, 1901).

month).” It should be pointed out that the stars do not *disappear* at the end of a month, but since each rises two hours earlier every month, they would be much higher in the sky at the end of that period. Suppose, for example, that a certain star rises in the east at 5 A.M., and is just visible above the horizon in the early morning twilight, at the beginning of the month. Rising four minutes a day earlier, it will come up at 3 A.M. by the end of the month, and will have ascended to nearly 30° above the horizon by the time the astrologers made their observations. Having thus “disappeared” from the eastern horizon, it will be replaced by another conspicuous star just rising at dawn at the beginning of the next month.

In the appearance of the morning star on the first day of the new moon, Kumukoa will travel its allotted time, when that people's star will disappear. Wehewehe is the people's star observable during the month of Hilinama (10th month), as is the regular course of the stars of the people, rising as the morning star. Wehewehe begins its regular course and disappears when the days of Hilinama end.

Olopana, a famous chief of Oahu who sailed southward with a large retinue and colonized one of the Society islands, appointed the astrologer Kawelolani as chief of the constellation Hakamoa, or “chicken roost.” According to the legend, “Certain of our people have observed this chicken roost in the heavens on the arrival of its nights, not, however, in the winter season.” Hakamoa may well be the Southern Cross which, when standing upright on the southern meridian during the nights of late spring, served as guide to mariners bound for Tahiti from the Hawaiian islands. Collocott⁹ lists Moa-a-mahe as a Tongan name for a star in the southern zone. He places the constellation of five stars which the Tongans called Tuula-lupe, “pigeon roost,” in the northern zone. According to the Tongan sailing directions, Tuula-lupe must not be used to steer by until it stands upright like a pigeon perch. Tuula-lupe may be Cygnus, sometimes called the Northern Cross, which would be seen upright in the northeast from the southern islands. The same name was applied to a constellation by the Samoans.¹⁰ Pratt also gives Moa as a name for the moon in the wet season among the Samoans.

Laukahikupua lists the names of 13 navigation stars, among which are Holoholopinaau, Mars, Hookelewa, Sirius, Kauopae, Regulus or Rigel, Ukaliarii, “following the chief,” Mercury, Kelalakea, “the shark,” Napehe, “the snares,” and others.

THE CLASSIFICATION OF KUPAHU¹¹

In the stellar classification of Kupahu the grouping is that of (a) royal stars; (b) canoe steerers' stars; and (c) 26 stars (or constellations) in the

⁹ Collocott, *op. cit.*

¹⁰ Pratt, *Grammar and Dictionary of the Samoan Language* (4th ed., Samoa, 1911).

¹¹ Kupahu in the *Nupepa Kuokoa*, Dec. 30, 1865.

Milky Way. Two royal stars are named: Kaukamalama, "suspended light," and Kamalama, "the light." the former is said to be the sign of rain, thunder, lightning, wind, high surf, storm and earthquake and is the cause for Ikuwa's being a "bursting contentious month." The latter is a sign that certain fish (nehu) are plentiful for net-catching.

The astronomical description of these stars must be completely discounted as impossible. Kaukamalama is said to rise at 9 p.m. in the northeast of the night of the new moon (Hilo) of the month Ikuwa and to set at 7 a.m. in the northwest, but on the last night of the month it "disappears and is not seen again for a whole year." Kamalama rises at 5 p.m. on the night Hilo in the month of Hilinehu and sets at 5 a.m. "during the thirty days of that month."

The canoe steerers' stars include Polaris, for which three names are given: Kiopaakai, Noholoa and Hokupaa, referring to its fixed position in the northern sky; and Na Hiku, "the seven," i.e., the Big Dipper, which tells the approach of dawn by encircling the North Star. It is a good sign for voyaging, if Na Hiku is above Kiopaakai in the evening. This occurs during the summer which was the most favorable time of year for long voyages.

The Milky Way, or Kuamoo, "highway" (Kepelino: Lalani), is described as "certain numerous stars, forming a circle. In some places the stars are many, scattering in others, and also singly." The names of 26 are listed.

The first is Ikaika, "brilliant," a name for the planet Jupiter. "This star, indeed, is one that revealed the voluntary submission of Kauai to Kamehameha I without war." The astrologer saw Ikaika and Kaumalii's star in conjunction and predicted the surrender of Kaumalii, King of Kauai, to Kamehameha I. The capitulation followed.

Second in Kuamoo is a group of three stars forming a small triangle, Mulehu, Polohilani and Poloula by name. Kupahu states that they are supposed to have been named for Polohilani, a blind king of Hawaii, who had to be led by two men. The group bears a strong resemblance to the triangle formed by Alpha, Beta and Gamma Cassiopeiae. Alpha is an orange-red star, a color sacred to royalty, and varies in brightness a half a magnitude, which may explain the "blindness."

Then follow Nanamua, "look at first," and Nanahope, "look at last," which may be Gemini, the Twins, Castor and Pollux. The 11th constellation is in the form of a V and is called Kanukuokauahi, "the snout of overhanging fire." It bears a strong resemblance to the Hyades, of which the brilliant red star, Aldebaran, is a member.

As a complete star list will be published at a later date, no further details will be given here.

In conclusion, the stellar classifications of Hawaiian astronomy can be summarized briefly as follows: With the exception of Kamohoula's division into three unspecified classes which appears to be on the basis of uranographic zones, all the systems contain a division of navigation stars, indicating the extreme importance of such stars to these maritime people.

A class of royal stars, apparently only of astrological significance is found in three of the systems, those of Kanalu, Laukahikupua and Kupahu. People's stars, or stars ruling months form a group in two systems, those of Kanalu and Laukahikupua. By the heliacal rising of such stars, the Hawaiian priests knew when to instruct the people as to the proper time to till the soil, to plant certain crops, to venture out in search of mullet, malolo and other fish, and to carry on various other activities upon which the entire structure of their economic life depended.

For while the revolution of the sun by day and the Milky Way and Big Dipper by night, provided a means for measuring brief passages of time, and the phases of the moon comprised a most dependable calendar within the month, the march of the months and their significant division into seasons were denoted by the annual march of the stars and constellations across the sky. The miraculous power of the astronomer-priest to predict the correct times for the multiform agricultural and maritime activities of the people invested him with supernatural power in their eyes, because with him, to quote once more from Laukahikupua, "lay the question of right and wrong, of life and death, of the community." Let us hope that the Hawaiian astronomer did not abuse this power.

VASSAR COLLEGE
POUGHKEEPSIE, N. Y.