

## Hawaiian Time

“HAWAIIAN TIME” is a popular Island expression suggesting a relaxed indifference to precise scheduling: 8 o’clock concerts start at 8:15, parties planned for 8:30 often begin at 9:30, the 10 o’clock newscast seldom appears before 10:10, and sports events may be televised with a three-hour tape delay. This account views the subject far more broadly, encompassing calendars and date lines, chronometers, clocks and watches, standard time and daylight saving time, and several types of time signals.

### TIME BEFORE CONTACT<sup>1</sup>

The Hawaiian language was rich in words referring to the concept of time and its passage: for example, *wā* (period of time, epoch, era, time, season, age); *manawa* (time, season, chronology); and *au* (passage of time, period of time, age, era). There were, in addition, words referring to the year: *makahiki* (referring also to an annual religious festival); *mahina* (to the month, and also to the moon); *malama* (to the moon); and *anahulu* (to a ten-day period). In post-contact Hawaiian, there are names for the days of the week starting with *pō‘akāhi* for Monday (literally, “first night”). The week, however, was not a unit of time used by Native Hawaiians before their contact with Europeans.<sup>2</sup>

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The months of the pre-contact Hawaiian were lunar months, each beginning with the appearance of a new moon and lasting 29 or 30 nights until the appearance of the next new moon. Each night of the month had its individual name. All authorities seem to agree that there were 12 named months. However, there is considerable disagreement as to their names, some disagreement as to their sequence, and evidence that the nomenclature both varied from island to island and was subject to change with time.

According to most authorities, the months were grouped into two seasons. There is, however, considerable disagreement as to the names of the seasons and the details of the grouping. Some, moreover, report three or four seasons.<sup>3</sup>

The lunar cycle was reconciled with the sidereal year by the insertion of an extra month about once in three years. The passage of sidereal was noted by the date on which the Pleiades were seen to rise just after sunset. However, the exact rule governing the insertion of the extra month, the point of its insertion in the sequence of the 12 named months, and the name given to the extra month have all been forgotten. There is very extensive disagreement among authorities as to the correspondence between the Hawaiian and Gregorian calendars, explicable only in part by the fact that there could be no constant correspondence between the Hawaiian lunar months and the months of the Gregorian calendar.<sup>4</sup>

As in English, there is in the Hawaiian language no term referring to the span of a day (24 hours) that is not used also to designate a major portion of the day. Whereas in English it is the term referring to the daylight portion, "day," that is used to refer also to the period of a day, in Hawaiian the period of a day might be referred to either by the term for the nighttime portion, *pō*, or one of two terms for the daylight portion, *lā* or *ao*. Indeed, the Hawaiians reckoned periods of more than one day by the nights lapsing rather than by the days.<sup>5</sup>

The Hawaiians had no watches or clocks before the arrival of European explorers, and we are unaware of any reference to their use of anything resembling a sundial to keep track of the time of day. Hence, Hawaiian words referring to precise times are presumably of post-contact origin. We suggest, for example, that the

word *hola*, now used for hour or o'clock, may have been derived from the English word "hour"; and Carol Silva has suggested to us that *uwaki*, now used for clock, may have been derived from the English word "watch." Iurii F. Lisianskii, who visited Hawai'i in 1804, wrote: "The days are divided . . . not into hours but into parts: sunrise, noon, sunset; the time between sunrise and noon is split into two, as is the time between noon and sunset."<sup>6</sup> However, Hawaiian time-of-day terminology suggests a less systematic division of the day, not unlike that permitted by English terminology stripped of references to hours, minutes, and seconds.

Hawaiian terms for times of day included in the Pukui and Elbert dictionary are listed with their English equivalents in Table 1, more or less in order of time of day starting with dawn.<sup>7</sup> As in English, some of the terms refer directly to phenomena rather than times: for example, the phenomenon of the setting of the sun. It appears, however, that, as in English, these terms might be used to refer to the times of day when these phenomena occurred.

TABLE 1  
HAWAIIAN TERMS FOR TIMES OF DAY  
AND THEIR ENGLISH EQUIVALENTS

HAWAIIAN	ENGLISH
Ao	Day, daylight, dawn
Lā	Day
Wana'ao	Dawn
Kaiao	Dawn
Moku ka pawa	Dawn (cut the darkness)
Puka 'ana o ka lā	Sunrise (exit of the sun [from night])
Pukana lā	Sunrise
Kakahiaka nui	Early morning
Kakahiaka	Morning
Kēia kakahiaka aku	Later this morning
Awakea	Noon, midday

*continued*

TABLE I *Continued*

HAWAIIAN	ENGLISH
Kau ka lā i ka lolo	It is noon (the sun rests on the brains)
Lolokū	Midday
Molokū	Midday
Wekea	Midday
Nauā, na‘uwā	Noon
Aluna awakea	Early afternoon
‘Auinalā	Afternoon (declining sun)
Napo‘o ‘ana o ka lā	Sunset
Ahiahi	Late afternoon, early evening
Āluna ahiahi	Late afternoon, early evening
Ho‘āhiāhi	Late afternoon, early evening
Pō	Night
Kihi o ka pō	Beginning of the night
Pili aumoe	Late night
Kuluaumoe	Late night
Aumoe	Late at night, as about midnight (time to sleep)
‘Auinapo	Late at night, midnight
Kau	Late night before dawn
Pilipuka	Period from midnight to dawn
Pawa	The darkness just before dawn
Moku ka pawa	The darkness just before dawn

## COOK AND HIS TIMEPIECES

The first timepieces seen by the Islanders were those brought in 1778-1779 by Captain James Cook and his officers. These instruments included “the same Watch Machine that was out with me last voyage,” “Another Watch Machine . . . put on board the *Discovery*,” an astronomical Clock,” an “*Alarum D<sup>o</sup>*,” and a “Pinchback pocket Watch with a second hand & Ruby Cylinder.”<sup>8</sup> The “watch machine,” or marine chronometer, was an

extremely accurate and sophisticated timepiece, essential for determining longitude, that had only recently been perfected by John Harrison; tested on Cook's second voyage, it had "performed magnificently."<sup>9</sup>

Time-keeping practices varied in the 18th century, depending on circumstances. Noon marked the beginning of the day in astronomical reckoning, the middle of the day in civil reckoning, and the end of the day in nautical reckoning. Logs were kept on ship's time but on entering a harbor reverted to civil time. "For example," wrote Derek Howse, "the historian of, say, Cook's voyages has to be careful today because the journals of Cook himself and of his astronomer William Wales each used a different reckoning for recording the same events, and these differed again at sea and in harbour." The nautical day was finally abandoned by the Royal Navy, in favor of the civil day, in 1805, but still was used by many merchant ships until the middle of the 19th century.<sup>10</sup>

#### THE INTERNATIONAL DATE LINE

The International Date Line creates a further complication. The Date Line is a zigzag line that generally follows the 180th meridian, on either side of which the date is different: at one particular instant, it will be Monday to the west of that line but Sunday to the east of it. The implicit existence of a date line had been recognized as early as the 16th century, but many years passed before any consensus emerged regarding the exact placement of such a line.<sup>11</sup>

The question is particularly pertinent to Hawaiian history, in view of the Islands' location just east of the 180th meridian (Honolulu Harbor lies at 157° 52' W. longitude, and Kure Atoll, at the western end of the archipelago, is 178° 25' W.). Cook crossed the 180th meridian soon after leaving New Zealand, but there is no indication in his journals, either then or later, of any adjustment in his dating.<sup>12</sup> This failure to recognize the Date Line, in combination with Cook's adherence to the nautical day, raises obvious questions regarding the dates cited by the great navigator. Did he really first step ashore on Kaua'i on January 21, 1778, or was the

date, by modern reckoning, actually January 20? Did his death at Kealakekua occur February 14, 1779, or February 13?

This confusion regarding dates continued into the 19th century. As late as December 1816, Adelbert von Chamisso, botanist aboard the *Rurik*, wrote:

I note in passing that the Europeans in the Sandwich Islands obtained their time-reckoning from west to east by way of Canton, so that we, who brought our time from east to west, reckoned the time a day ahead of them, as had been the case in Kamchatka and in the Russian settlements. This difference existed between neighbors, San Francisco and Port Bodega. When one has to cope with the old and the new calendar, the reckoning of time from the east and from the west, Greenwich time and ship's time, mean and real time, solar time and astral time, the astronomical day, etc., it is not easy to say what the time is.<sup>13</sup>

No record can be found as to when Hawai'i decided it was east rather than west of the International Date Line, but presumably this occurred not too many years after Chamisso's visit. Moreover, according to Howse, "The date line as originally drawn had a kink to the westward of the Hawaiian Islands to include Morrell and Byers islands which appeared on nineteenth-century charts at the western end of the Hawaiian chain. It was then proved that they did not exist, so the date line was straightened out."<sup>14</sup>

#### THE ADOPTION OF THE WESTERN CALENDAR

The Western calendar achieved only limited acceptance at first. Early *haole* (Caucasian) settlers, of course, used it regularly in their journals—John Young by 1808 and Don Francisco de Paula Marin by 1809, among others.<sup>15</sup> A letter dated "Island Woahoo March 3rd. 1810," probably drafted by Captain Spence of the *Duke of Portland* (see Frances Jackson's article in this *Journal*), was signed by Kamehameha I and sent to King George III of England.<sup>16</sup> But as late as 1819, when the overthrow of the *kapu* [sacred, taboo] system destroyed much of the rationale underlying the traditional Hawaiian calendar, most Islanders apparently continued to use it.<sup>17</sup>

After 1820, when the first Protestant Mission schools opened, the newly literate Hawaiians quickly adopted Western dating. Describing the “first correspondence in Hawaiian,” missionary Hiram Bingham wrote that on January 21, 1822, Governor Kua-kini . . .

sent for the lessons we had printed in his language, and was quickly master of them. But a few days passed before I received a letter from him, which I immediately answered in the Hawaiian, under date of Feb. 8th, 1822, one month from the first printing for the nation. Epistolary correspondence, thus commenced in that language, suddenly opened to the chiefs and people a new source of pleasure and advantage, of which hundreds soon availed themselves.”<sup>18</sup>

Even the King, Liholiho, “had become able to write a letter of business or of friendship;” one such letter, sent to Mahine, King of Huahine, was dated (in translation) “Hawaii, August 10th, 1822.”<sup>19</sup> All of the oldest surviving correspondence by commoners, going back as far as 1824, bears western dates.<sup>20</sup>

The first almanac published for Hawai‘i appeared in 1834, providing information for the the following year. Sixteen pages long and written entirely in Hawaiian, it contained dates for phases of the moon and daily listings for sunrise and sunset, moonrise and moonset, tides, and important historical dates, all based on the Western calendar and clock.<sup>21</sup>

#### EARLY ISLAND TIMEPIECES

Hawaiian royalty and *ali‘i* (chiefs, nobility) and early *haole* settlers apparently possessed timepieces soon after the beginning of the 19th century, but the evidence is indirect. In 1804, F. I. Shemélin observed that Kamehameha I, “thanks to the trade that he personally has conducted with foreigners for many years now, . . . has accumulated such quantities of various sorts of European goods that many such wares lie unused;” these wares could well have included clocks and watches.<sup>22</sup> Archibald Campbell, a resident in 1809–1810, noted the hours of various events, thus implying access to a timepiece.<sup>23</sup> In his journal, Don Francisco de Paula

Marin also suggests the availability of timepieces, reporting the exact hour of several events between 1812 and 1815, including a lunar eclipse “lasting from 1/2 past twelve to ten minutes past 4.”<sup>24</sup> In 1818, “the Indians of Prince Liholiho” stole a watch from Captain Carey—perhaps the earliest such crime report.<sup>25</sup>

The first direct evidence of a clock on Island soil appears in a list of goods received by Kamehameha I at Lahaina in 1812, in return for a shipload of sandalwood. Well down an accounting of such items as clothing, swords, mirrors, saddles, casks, lamps, fishing rods, and rockets appears the entry, “1 large clock for the house.”<sup>26</sup>

In 1819, while inspecting a house at Kealakekua belonging to Kalanimoku, “prime minister to the king,” Louis de Freycinet reported finding “navigation instruments such as compasses, sextants, thermometers, and watches, and even a chronometer was among them, something that I had surely not expected.”<sup>27</sup>

Earlier technology was sometimes evident. On the missionaries’ first night in Honolulu, April 19, 1920, Hiram Bingham recorded: “The heathen garrison, at the fort, some thirty rods distant, having an hour-glass for a time-keeper, about once an hour during the night, struck a bell, and gave a loud shout, in a mongrel dialect, signifying ‘All’s well!’ ”<sup>28</sup>

The missionaries themselves carried watches. In the Bingham’s first “apartment” in Honolulu, wrote Sybil, “On one side of the room hangs Mr. B.’s watch, measuring the pleasant hours as they pass.”<sup>29</sup> This was presumably the same instrument used by her husband in the classroom in 1822, “Laboring, occasionally, to teach by means of a watch, the divisions of hours, minutes, and seconds, and of days and weeks, by the artificial globe, using the common arguments for the globular figure and diurnal motions of the earth. . . .”<sup>30</sup> An 1834 statement by the Mission, recommending “articles necessary as an outfit in the Sandwich Islands . . . deemed a sufficient supply for three years,” included “1 good watch” and “1 clock (price ten dollars).”<sup>31</sup>

The earliest newspaper advertisements offering watches for sale appeared in 1840 when Henry Paty & Co. placed announcements in both the *Sandwich Island Mirror* and *The Polynesian*.<sup>32</sup> The following year an advertisement stated that “E. H. Boardman, Watchmaker and Jeweler, Having Recently established himself at

Honolulu . . . will be constantly supplied with watches of the best quality, and a choice assortment of jewelry."<sup>33</sup> Boardman was apparently Hawai'i's first watchmaker.

Several watches from this era are still to be found in Honolulu. The Bishop Museum, for example, possesses both a silver watch, presented to Mataio Kekūanaō'a by the British government in 1824, and a pocket watch described as "either the first or second brought to Hawaii for sale," bought by a Chinese and presented to Gorham D. Gilman.<sup>34</sup>

In 1846, Boardman imported a Molyneux astronomical clock and an astronomical transit for use in regulating chronometers, principally for the whaling fleet. Both instruments were purchased in 1886 by the Hawaiian Government Survey, which four years earlier had "[taken] charge of the Government time for the town," using a 12-inch theodolite and a chronometer.<sup>35</sup> The 1846 clock now stands in the State Survey Division office at 1151 Punchbowl Street, where it continues to keep accurate time.

Large public clocks first appeared in the 1840s and 1850s. In 1842, James Hunnewell presented Kawaiaha'o Church with "the large church clock on the gallery wall below the new organ."<sup>36</sup> On November 6, 1850, the Privy Council instructed the Governor of O'ahu "to cause to be put up in some conspicuous place [in the Honolulu Public Market], a Clock to mark the time. This was soon followed by Kawaiaha'o's large tower clock, hailed as "Honolulu's first town clock." The oldest tower clocks in Hawai'i, however, is the one installed in Cathedral of Our Lady of Peace around 1846.<sup>37</sup>

Although Hiram Bingham's original plans for the stone church at Kawaiaha'o provided for a tower clock, no such instrument was available when the church was dedicated on July 21, 1842, and parishioners had to wait another eight years for its arrival. This occurred on October 10, 1850, when E. H. Boardman returned from Boston with the large clock he had selected and purchased there for \$1,000. Installed and adjusted by Boardman, it commenced running January 10, 1851 (fig. 1).<sup>38</sup>

The first public building with a tower clock was Ali'iolani Hale on South King Street, Honolulu. Containing four dials, each six feet in diameter, the clock, manufactured by Howard & Co. of



FIG. 1. Tower clock, Kawaiahaʻo Church, Honolulu's first town clock, 1851. (AH.)

Boston and costing \$400, was installed by S. K. Rawson late in April 1874.<sup>39</sup>

The earliest large tower clock on a Neighbor Island church appears to have been the one added to Kaʻahumanu Church, Wailuku, Maui, in 1884.<sup>40</sup>

Perhaps the best known of Honolulu's public clocks is the four-faced instrument on the tenth floor of Aloha Tower (fig. 2), installed in May 1926. This clock, weighing seven tons, was built by the Howard Clock Company of Boston to specifications supplied by H. F. Wichman & Company of Honolulu. Its accuracy was guaranteed within 30 seconds per month.<sup>41</sup>



FIG. 2. The famous Aloha Tower clock, installed 1926, faces in four directions. (A.H.)

## STANDARD TIME

Throughout most of the 19th century, Hawai'i residents observed local solar time, which differed for almost every community in the Kingdom. In Honolulu, for example, midnight by Greenwich Mean Time (GMT) occurred locally at 1:28:33 p.m.<sup>42</sup> Hilo time ran 11 min. 20 sec. ahead of Honolulu time; Waimea, on the western side of Kaua'i, lagged Honolulu by 7 min. 36 sec.<sup>43</sup>

Both on the Mainland and worldwide, important changes in timekeeping practices took place in the 1880s. At the beginning of the decade, several large nations still recognized prime meridians other than the one through Greenwich, and some continued to differ on the definition of a "day." Except in Great Britain, noon occurred at a different time of day (GMT) in virtually every locality. These variations caused increasing inconvenience and confusion, as the means of transportation became ever faster. To simplify their scheduling, the American and Canadian railroads accordingly instituted standard time, effective November 18, 1883, dividing the continental United States into five (later four) time zones. By the following October, 85 percent of U.S. towns over 10,000 population had officially adopted the new system.<sup>44</sup> Both W. D. Alexander, Hawai'i's Surveyor-General, and Luther Aholo, Privy Counsellor, represented the Kingdom at the International Meridian Conference, held in Washington, D.C., in October 1884, and joined the majority of the delegates present in approving the adoption of a prime meridian through Greenwich and a universal day beginning at midnight.<sup>45</sup>

Hawai'i did not adopt standard time until 1896. A legal notice, dated January 8, 1896 and signed by J. A. King, Minister of the Interior, announced the changeover:

On and after MONDAY NOON, January 13, 1896, all public time pieces under control of this Department, shall be set in accordance with *Hawaiian Standard Time*, said standard time being that of the meridian 157° 30' West of Greenwich, that is to say Ten Hours and Thirty Minutes slow of Greenwich Mean Time, and the object of the change being to secure a uniform and convenient time system for the Hawaiian Group.<sup>46</sup>

The Hawaiian Standard Time adopted by the Republic continued in use after August 12, 1898, when Hawai'i was annexed by the United States, and after June 14, 1900 when it gained Territorial status. In 1918, an act of Congress ratified the standard time zones that had been in general (if unofficial) use since the 1880s, and in addition provided for nationwide daylight saving time from March through October. The daylight saving provision was repealed in 1919, leaving intact the standard time system. Neither the 1918 nor 1919 laws affected Hawai'i, however.<sup>47</sup>

In 1947, the Territorial Legislature permanently advanced Hawaiian Standard Time by 30 minutes, making it 10 (instead of 10-1/2) hours slower than Greenwich Mean Time, and thus two hours (not 2-1/2) behind Pacific Standard Time. Such a shift had previously (and unsuccessfully) been proposed by the Honolulu Board of Supervisors in a resolution adopted by a 4-3 vote on September 18, 1945, but to no effect. This change became effective the second Sunday of June, 1947.<sup>48</sup>

#### PLANTATION TIME<sup>49</sup>

Notwithstanding this official acceptance of standard time, many plantations persisted in the use of local time, or their own variations on it. Probably long before 1896, the individual plantations had elected to adopt time systems that varied somewhat from the local times pertinent to the meridians at their centers. The primary determinant of the difference between one of these plantation times and the pertinent local time was the local time of sunrise. Hence the plantation time systems were essentially daylight saving time systems. There was no requirement that the difference between a plantation time and either the normal local time of the plantation headquarters or standard time, when that was adopted, be an even half-hour or hour, or that there be but one advance and one retardation of time in a year. The time on a plantation was, indeed, more likely to be something like 11 minutes ahead or 14 minutes behind standard time, and changes of a few minutes might be made at intervals of only a few weeks. Standard time was kept in Honolulu, in non-plantation towns, and at ports serving more than one plantation; and social events involv-

ing people from more than one plantation were scheduled by what was known as "Honolulu time," "Hilo time," etc.

It was the prerogative of the plantation manager to decide when the time on a plantation should be changed and by how much. It was, indeed, a matter of principle that his plantation should not operate on the same time as the neighboring plantations, as the following anecdote indicates. When the author of this section, Cox, was a boy he lived at 'Ele'ele, Kaua'i, a town within the McBryde Sugar Co. plantation by whom his father was employed. The family kept what was known as either "McBryde time" or "'Ele'ele time." The time kept on the neighboring plantation to the west, Hawaiian Sugar Co., was called "Makaweli time" from the name of the town in which that plantation had its headquarters. (Both the town and the plantation now have the name Olokele.) Both plantations were served by Port Allen, and social events were scheduled by "Port Allen time." For both plantations the Honolulu factor was Alexander and Baldwin; the McBryde manager was an Alexander, and the Makaweli manager was a Baldwin. At some time around 1930, it happened that both plantations changed time on the same day and, by accident, to times differing from "Port Allen time" by the same amount. In spite of the close connections between the plantations, both managers felt impelled to change their respective times again the next day.

Separate plantation times apparently were discontinued in the early 1940s.

#### DAYLIGHT SAVING TIME AND WAR TIME

The Islands have experienced various kinds of daylight saving time, in addition to the plantation times, on several occasions, but never on a permanent basis. The first trial occurred in 1918: according to Thomas G. Thrum, "Daylight saving plan was again agitated for these islands the early part of this year, and, in April, on official orders from Washington, the navy department here set their clocks forward an hour, but it did not last long."<sup>50</sup> In 1933, the Legislature decreed daylight saving for the period between the last Sunday of each April and last Sunday of each September, but less than a month later repealed the act.<sup>51</sup>

Year-round daylight saving time, one hour ahead of Hawaiian Standard Time, was established in the Territory during World War II by General Order No. 66 of the military governor, taking effect on February 9, 1942. The new time quickly became known as "Hawaiian War Time." With the end of the war and the expiration of War Time on September 30, 1945, Hawai'i reverted (notwithstanding a good deal of debate) to the pre-war standard time; and it was not until 1947, as noted earlier, that the change was made to the present system of standard time.<sup>52</sup>

The issue resurfaced in 1966, when the Uniform Time Act of that year mandated daylight saving time during the spring and summer months nationwide unless State legislative bodies specifically exempted their jurisdictions. Reasoning that Hawai'i already had year-round partial DST—since 1947, Hawaiian Standard Time had been 31 minutes ahead of sun time in Honolulu—the 1967 Legislature voted to exempt the Islands.<sup>53</sup>

#### TIME SIGNALS

Time signals of one kind or another were already an Island tradition more than a century ago. Church bells and plantation whistles were probably the most common.<sup>54</sup> In 1883, the *Advertiser* reported that J. W. Robertson & Co. would drop a "time-ball" on the signal pole atop their building each day precisely at noon, by signal sent from the Survey Department.<sup>55</sup> Six years later, a news item announced that the Lucas Planing Mill whistle, in addition to its daily noontime blast, would thereafter also sound the Greenwich Mean Time "noon" (actually midnight), at 1:28:33 p.m. Honolulu time, adding, "Chronometers will no longer be rated at the Survey Office."<sup>56</sup>

Beginning in 1926, time signals emanated from Aloha Tower. A 40-foot mast on top of the Tower held a brass "time ball," four feet in diameter, which was dropped to the bottom of the mast at noon each day except Sunday. A siren blast from the Tower sounded weekdays at 7:00 and 11:59 a.m. and 4:00 p.m., until silenced by complaints from irate Islanders.<sup>57</sup>

About the same time, both radio and telephone service made time signals available even to residents of remote areas. The first commercial radio stations in Hawai'i began broadcasting in 1922,

and time announcements (not always scrupulously accurate) quickly became a feature of station breaks.<sup>58</sup> The Mutual Telephone Company further improved matters in 1935, when “an automatic time announcement that customers could dial was introduced.”<sup>59</sup>

The ultimate in accurate time signals is provided by the National Bureau of Standards radio station WWVH, established on Maui in November 1948 and moved to a 30-acre site near Kekaha, Kaua‘i, in July 1971. Broadcasting on four frequencies, the station reaches not only all Hawai‘i, but also the entire Pacific Basin. Its three “atomic clocks” are accurate to one millionth of a second per month.<sup>60</sup>

“Hawaiian time,” indeed!

## NOTES

- <sup>1</sup> The authors gratefully acknowledge suggestions for the improvement of this section received from Samuel H. Elbert and Rubellite Kawena Johnson, who reviewed an early draft, and from Carol Silva, who reviewed a later draft.
- <sup>2</sup> Harold Winfield Kent, *Treasury of Hawaiian Words in One Hundred and One Categories* (Honolulu: Masonic Public Library of Hawaii, 1986) 422–29; Mary Kawena Pukui and Samuel H. Elbert, *Hawaiian Dictionary* (Honolulu: U Hawaii P, 1986), hereinafter cited as Pukui and Elbert, *Hawaiian Dictionary*.
- <sup>3</sup> Martha Warren Beckwith, trans. and ed., *Kepelino’s Traditions of Hawaii*, BPBM Bulletin 95 (Honolulu: BPBM, 1978): 82–3; E. H. Bryan Jr., “Astronomy and the Calendar,” in E. S. Craighill Handy, et al., *Ancient Hawaiian Civilization* (1933; Rutland, Vt.: Charles E. Tuttle, 1965) 251–56; Dorothy Kahananui, trans. and ed., Sheldon Dibble and students, *Ka Mooolole Hawaii* (1838; Honolulu: Committee for The Preservation and Study of Hawaiian Language, Art, and Culture, U of Hawaii, 1984) 48–9 and 189–90; John Papa Ii, *Fragments of Hawaiian History*, trans. Mary Kawena Pukui, ed. Dorothy B. Barrere, BPBM Special Publication 70 (Honolulu: BPBM, 1983) 72; Kelou Kamakau, “No Na Oihana Kahuna Kahiko,” *Fornander Collection of Antiquities* (BPBM Memoirs, vol. 6, no. 1:1919–1920): 34–5; Samuel M. Kamakau, *The Works of the People of Old: Na Hana o ka Po’e Kahiko*, trans. Mary K. Pukui, ed. Dorothy B. Barrere, BPBM Special Publication 61 (Honolulu: BPBM, 1976): 19–20; David Malo, *Hawaiian Antiquities*, BPBM Special Pub. 2, trans. Nathaniel B. Emerson (1898; Honolulu, BPBM, 1951), 30–5, hereinafter cited as Malo, *Hawaiian Antiquities*; John F. Pogue, *Moolole of Ancient Hawaii*, trans. from 1878 ed. Charles W. Kenn (Honolulu: Topgallant, 1978) 30–2.
- <sup>4</sup> W. D. Alexander, *A Brief History of the Hawaiian People* (New York: American Book, 1891) 49.

- <sup>5</sup> Malo, *Hawaiian Antiquities* 31.
- <sup>6</sup> Glynn Barratt, *The Russian Discovery of Hawai'i* (Honolulu: Editions Limited, 1987) 42, hereinafter cited as Barratt, *Russian Discovery*.
- <sup>7</sup> Pukui and Elbert, *Hawaiian Dictionary*.
- <sup>8</sup> *The Journals of Captain James Cook . . .*, vol. 3, *The Voyage of the Resolution and Discovery, 1776-1780*, J. C. Beaglehole, ed. (Cambridge: for the Hakluyt Society at the U P, 1967), part one: 4, and part two: 1498-99, hereinafter cited as *Journals of Captain Cook*.
- <sup>9</sup> Derek Howse, *Greenwich Time and the Discovery of the Longitude* (Oxford: Oxford U P, 1980) 67-72, hereinafter cited as Howse, *Greenwich Time*.
- <sup>10</sup> Howse, *Greenwich Time* 149-50. Wales was the astronomer on Cook's second voyage, William Bayly on the third.
- <sup>11</sup> Howse, *Greenwich Time* 160-61.
- <sup>12</sup> *Journals of Captain James Cook . . .* vol. 3, part one: 75-6, and part two: 819-20 and 1002.
- <sup>13</sup> Adelbert von Chamisso, *A Voyage Around the World With the Romanzov Exploring Expedition in the Years 1815-1818*, trans. and ed. Henry Kratz (Honolulu: U Hawaii P, 1986): 126-27.
- <sup>14</sup> Howse, *Greenwich Time* 162.
- <sup>15</sup> John Young, Journal, 13 Apr. 1808, ms. FO & Ex, AH; Ross H. Gast and Agnes C. Conrad, *Don Francisco de Paula Marin: A Biography: The Letters and Journal of Francisco de Paula Marin* (Honolulu: U Hawaii P for HHS, 1973), entry 14 Nov. 1809:199, hereinafter cited as Gast and Conrad, *Don Francisco de Paula Marin*.
- <sup>16</sup> Rhoda E. A. Hackler, "Alliance or Cession? Missing Letter from Kamehameha I to King George III of England Casts Light on 1794 Agreement," *HJH* 20 (1986): 7-8.
- <sup>17</sup> Louis de Freycinet, *Hawaii in 1819: A Narrative Account by Louis Claude de Sauls de Freycinet*, trans. Ella L. Wiswell, ed. Marion Kelly (Honolulu: BPBM, Oct. 1978) 70, hereinafter cited as Freycinet, *Hawaii in 1819*.
- <sup>18</sup> Hiram Bingham, *A Residence of Twenty-One Years in the Sandwich Islands* (1847; Rutland, VT.: Charles E. Tuttle, 1981), 152 and 157, hereinafter cited as Bingham, *Residence*.
- <sup>19</sup> Bingham, *Residence* 171-72.
- <sup>20</sup> Richard Kalaaiouli, letters 9 Nov. 1824 and 17 June 1830; Kalaaulana (John E. Phelps), letters, 10 Jan. 1829 and 16 June 1831, HMCS.
- <sup>21</sup> *Alemanaka Hawaii, No Ka Makahiki o ko Kakou Haku o Iesu Kristo 1835* (Oahu: Na Na Misionari i Pai, 1834); Bernice Judd, Janet E. Bell, and Clare G. Murdoch, *Hawaiian Language Imprints, 1822-1899, A Bibliography* (Honolulu: HMCS and U P of Hawaii, 1978) 35-6.
- <sup>22</sup> Cited in Barratt, *Russian Discovery* 101.
- <sup>23</sup> Archibald Campbell, *A Voyage Round the World, from 1806 to 1812* (Honolulu: U Hawaii P for Friends of the Library of Hawaii, 1967) 92, 119, and 128.
- <sup>24</sup> Gast and Conrad, *Don Francisco de Paula Marin* 208, 213-14, and 219.
- <sup>25</sup> Gast and Conrad, *Don Francisco de Paula Marin* 170.

- <sup>26</sup> Account of what Kamehameha received from . . . [torn] off of Captain Winship in the year 1812 in the month of . . . torn in return for the sandal wood which he carried in the month of December 1811, FO & Ex 1810 and 1812-1814, AH.
- <sup>27</sup> Freycinet, *Hawaii in 1819* 8.
- <sup>28</sup> Bingham, *Residence* 96.
- <sup>29</sup> Bingham, *Residence* 117.
- <sup>30</sup> Bingham, *Residence* 171.
- <sup>31</sup> HMCS, *Missionary Album*, (Honolulu: HMCS, 1969) 2.
- <sup>32</sup> *Sandwich Island Mirror*, 15 Apr. 1840; *P*, 6 June 1840.
- <sup>33</sup> *P*, 12 June 1841:3.
- <sup>34</sup> Ozzie Kotani, Collection Technician, BPBM, interview, 17 Oct. 1991. Gilman lived in Hawai'i from 1841 to 1861: see "1848-Honolulu As It is. . .," by Gorham D. Gilman, *HJH* 4 (1970): 105.
- <sup>35</sup> Curtis J. Lyons, *A History of the Hawaiian Government Survey with Notes on Land Matters in Hawaii*, appendices 3 and 4 of *Surveyor's Report for 1902* (Honolulu: HG, 1903) 17.
- <sup>36</sup> Ethel M. Damon, *The Stone Church at Kawaiāhao 1820-1944* (Honolulu: Trustees of Kawaiāhao Church, 1945) 12 and 81, hereinafter Damon, *Stone Church*.
- <sup>37</sup> PCR, vol. 6A, 1 Oct. 1850-28 Mar. 1851:90-2, AH; Father Louis H. Yim, "A Brief History of The Cathedral of Our Lady of Peace," *Historic Hawai'i*, July/Aug. 1992: 4-7.
- <sup>38</sup> Damon, *Stone Church* 49, 72, 79, 80-81, and 84; "Town Clock," *P*, 11 Jan. 1851:138; *HAA* 1882:5.
- <sup>39</sup> Frost & Frost, AIA, *Ali'iolani Hale, A Century of Growth and Change, 1877-1977* (Honolulu: Hawaii State Department of Accounting and General Services, 1979?) 22 and 103.
- <sup>40</sup> *21st Annual Report of the Hawaiian Evangelical Association. June 1884* (Honolulu, 1884) 7.
- <sup>41</sup> Love Dean, *The Lighthouses of Hawai'i* (Honolulu: U Hawaii P, 1991) 13-4, hereinafter cited as Dean, *Lighthouses*; *HSB*, 29 May 1926:8; *HA*, 30 May 1926:8-9.
- <sup>42</sup> "Chronometer Time," *PCA*, 4, Dec. 1889:3.
- <sup>43</sup> *HAA* 1891:23
- <sup>44</sup> Howse, *Greenwich Time* 120-26 and 134.
- <sup>45</sup> Howse, *Greenwich Time* 138-52 and 229; *Report of the Minister [of] Foreign Affairs to the Legislative Assembly of 1886*, appendix A: iii-xii, AH.
- <sup>46</sup> *PCA*, 10 Jan. 1896:2. Howse incorrectly dated Hawai'i's adoption of standard time as 1912: Howse, *Greenwich Time* 154-55. For further discussion of standard time, see John Wesley Coulter, "Sun Time, Standard Time, and 'Radio' Time," U of Hawaii, Occasional Papers, no. 14 (1931?).
- <sup>47</sup> U.S. Dept. of Transportation, Office of the Secretary, *Standard Time in the United States* (GPO, July 1970) 5-6 and 9.
- <sup>48</sup> *Session Laws of Hawaii* 1947, Act. 161, hereinafter cited as *SLH*; "Board Proposes Half Hour Change in Hawaiian Time," *HSB*, 19 Sept. 1945:4.

- <sup>49</sup> No published sources on this subject have been found. This section is based entirely on first-hand knowledge of co-author Cox.
- <sup>50</sup> *HAA* 1919:157. See, also, *HAA* 1918:177; "Daylight Saving Up for Decision by Board Tonight," *PCA*, 9 Apr. 1918, sec. 2: 1; "Daylight Saving is Wildly Debated and Nothing Done," *PCA*, 10 Apr. 1918, sec. 2:1.
- <sup>51</sup> *SLH* 1933, Act. 90 (approved 26 Apr. 1933) and Act 163 (approved 21 May 1933).
- <sup>52</sup> "Hawaii Will Observe Daylight Saving Time," *HA*, 25 Jan. 1942:1; "'War Time' Hours Now Rule Hawaii," *HA*, 9 Feb. 1942:1; *SLH* 1943, JR 1; "Time Waits for No Man, Or—You Gained an Hour," *HA*, 30 Sept. 1945:1 and 3; "Hawaii Time Has Had Its Changes," *HSB*, 7 June 1947:1.
- <sup>53</sup> Public Law 89-387, 80 Stat 107; *SLH* 1967, Act 4.
- <sup>54</sup> See, for example, Ronald Takaki, *Pau Hana: Plantation Life and Labor in Hawaii, 1835-1920* (Honolulu: U Hawaii P, 1983) 57-8.
- <sup>55</sup> *PCA*, 20 Jan. 1883:5.
- <sup>56</sup> "Chronometer Time," *PCA*, 4 Dec. 1889:3.
- <sup>57</sup> Dean, *Lighthouses* 14; *HA*, 30 May 1926:9.
- <sup>58</sup> Robert C. Schmitt, "Some Firsts in Island Leisure," *HJH* 12 (1978): 107. Ron Jacobs, telephone interview, 25 Mar. 1991: radio veteran Jacobs has noted that during the 1940s and 1950s, local stations' time announcements were frequently in error by as much as several minutes. Another radio veteran, Ed Sheehan, interview, 14 Apr. 1991, disagrees.
- <sup>59</sup> Bud Bendix, *Serving Hawaii: The First 100 Years* (Honolulu: Hawaiian Telephone, 1983) 40.
- <sup>60</sup> U.S. Dept. of Commerce, National Bureau of Standards, Frequency-Time Broadcast Services, untitled brochure for NBS Radio Station WWVH (July 1980).

