



Ecology of Time: Calendar of the Human Body in the Pamir Mountains

Karim-Aly Kassam¹

Cornell University

Umed Bulbulshoev

University of Central Asia

Morgan Ruelle

Cornell University

Abstract

Villagers in the Pamir Mountains of Afghanistan and Tajikistan integrated the human body into the seasons and rhythms of their ecological relations to generate “calendars of the human body.” These calendars illustrate that culture does not exist outside of its ecological foundation (i.e. nature), but is firmly situated within it. Farmers undertook agro-pastoral and hunting activities using their own bodies not only for labor, but as a measure of the changing tempo of the seasons. Their bodies both interacted with life on the land and acted as organic clocks to mark the passage of time. While these calendars are no longer widely used, memory of their usage survives, and words from the calendars marking specific ecological events in local languages are still in use. This paper (1) investigates the historical presence and human ecological significance of a calendar of the human body; (2) illustrates the diversity of these calendars based on the specific context of their use from valley to valley in the region; (3) demonstrates the complex connectivity of the users (agro-pastoralists) within their habitat; and, (4) explores the efficacy of this calendar in developing anticipatory capacity among villagers in order to reduce anxiety associated with climate change. The calendar of the human body not only measures time, but gives it meaning.

Keywords

Ecology of time, Calendar of the human body, Human ecology, Indigenous knowledge, Phenology, Socio-cultural and ecological systems, Pamir Mountains, Afghanistan, Tajikistan

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Introduction

Perception of change is fundamental to the concept of time, leading to organization of observed patterns and perturbations in the ecological niche of human communities. While the notion of a calendar suggests specific and fixed measurement in terms of days, months, and years, the study of the anthropology of time aptly illustrates that calendars speak to ways of thinking and acting in the context of cycles of the human body and the environment it inhabits (Adam; Bourdieu; Evans-Pritchard; Forth 1982; Fox; Hoskins; McCaskie; Mondragón; Munn 1977, 1992). Conceptions of time convey socio-cultural and ecological values of the people that utilize a specific calendar system. Such calendars coordinate diverse socio-cultural and ecological processes. Given the decline of the command economy marked by the collapse of the Soviet Union and recent environmental transformation in mountainous regions, concerns for self-sufficiency in agriculture are re-asserting themselves and making keen observation of ecological change highly relevant for survival.

Human ecology describes the relationships between people and their environment, which includes relations between humans as well as human relations with other animals, plants, and their habitats (Kassam 2009a). Relations generate knowledge that is context-specific and nuanced by complex connectivity with the immediate environment. This indigenous ecological knowledge is heterogeneous, empirically dense, and has cumulative depth (Johnson; Agrawal; Kassam and Graham; Battiste and Henderson; Ellen et al.; Turnbull; Kassam et al.). Human ecological relations promote cultural systems that are vitally informed by their natural surroundings in a non-deterministic relationship (Kassam 2009a).

Historically, the Silk Road provided a nexus of exchange of goods and ideas in the Pamir Mountains. Hence, the people of the Pamirs came into contact with a variety of calendars and learned to use them as they engaged with different cultures, societies, and religions. Like the Chinese-Mongolian-Turkic and Zoroastrian calendars in Central Asia, the subsequent Muslim lunar and the secularized (albeit with Christian origins) Gregorian solar calendars are abstractions of time that do not convey the ecological character of the calendar of the human body. These calendars were external impositions by extra-local agents and institutions; though they were adapted into Pamiri conceptions of time through contact and exchange, they did not provide meaning to local “agro-cultural” realities.

The impetus for inquiry into calendars of the human body arose out of research conducted from 2006 to 2010 on socio-cultural and ecological

transformations in the Pamir Mountains of Afghanistan and Tajikistan. Specific references to these calendars were made when evidence of climatic variation was discussed with villagers. Depending upon ecological context and altitude, this research indicates dramatic evidence of climate change. Noted below is a summary of observations made by inhabitants of these mountainous regions (Kassam 2009b):

- Increasing water levels in rivers and lakes due to more rapid snow and glacial melt;
- Villages at lower elevations report the loss of valuable agricultural land to higher water levels and changing river-ways;
- Villages at higher elevations report increasing size of glacier-fed lakes;
- Increased intensity of rainfall in the spring, which is now concentrated within a few days rather than spread over a longer period, is affecting the physical integrity of structures;
- Villagers also identified growing problems with avalanches and rockslides due to rains;
- In some villages, ploughing and sowing begins 15 to 30 days earlier than a decade ago, and harvesting also takes place 15 to 30 days earlier;
- It became possible to grow regular crops of wheat without the risk of frost damage in villages at higher elevations;
- Villagers at lower elevations report change in the quality of, or inability to grow certain fruits because they require cold days in spring to produce fruit in the summer (i.e. vernalization); and
- Nomadic communities report that the spring season seems like a continuation of winter and in the summer, fodder in high altitude pastures is “burnt,” resulting in animals not gaining the necessary weight to sustain them through the winter.

These changes have interrelated ecological and socio-cultural consequences, such as timing of sowing and harvest festivals and agricultural activities, which have an immediate impact on people’s livelihoods. Farmers and herders complain equally that they can no longer predict the weather. The increasing anxiety levels resulting from dramatic environmental change will have psychological and other consequences that are unknown and yet to be explored. Given that this region of the Pamir Mountains has faced long-term war in Afghanistan and repeated prospects for food shortages in Tajikistan as well as Afghanistan, the potential for resilience and adaptation may be diminishing. Food sovereignty—that is, culturally relevant and ecologically sustainable choice of nutrition—is a key variable in the context of climatic change.

As a result of several references made by villagers during the applied research described above that attest to the values and predictive capacity of the calendar of the human body, the objectives of the paper are to: (1) investigate the historical presence and human ecological significance of a calendar of the human body; (2) illustrate the diversity of these calendars based on the context specificity of its use from valley to valley; (3) demonstrate the complex connectivity of the users (agro-pastoralists) within their habitat; and, (4) explore the efficacy of this calendar in developing anticipatory capacity among villagers in order to reduce anxieties associated with climate change.

Research Approach

Mention of the calendar of the human body occurred when Kassam began his research on human ecological relations in the Bartang Valley of the Pamir Mountains of Tajikistan in 2006 (see Figure 1).² These references to the calendar were echoed in the Rushan, Shugnan, and Wakhan regions of the Pamirs. In 2007, while continuing research in these villages, references were made to the calendar. In both 2006 and 2007, discussion of the calendar of the human body arose out of concern by villagers about changes in weather patterns. Individuals described the stress caused by the loss of the ability to predict seasonal change due to environmental uncertainty. They explained that with the imposition of the Soviet command economy and subsequently the Gregorian calendar, their forefathers had slowly lost their knowledge of the calendar of the human body. They linked their ancestors' ability to accurately predict seasonal change and meticulously mark timing of agricultural activity with their use of the calendar. Reference to the calendar was not only a nostalgic recollection of a historical past but reflected a real sense of loss resulting from both environmental and socio-cultural change. Their remarks were an expression of anxiety resulting from inability to anticipate the rhythms of the seasons in one's own habitat.

From 2008 to 2010, we became more attentive to these references to the calendar of the human body during interviews on food and livelihood security. However, the discussion of how the calendar worked was incomplete due

² Pisarchik, in Andreev's edited field notes, maintains that the calendar of the human body continued to be used in the Bartang Valley until the 1930s. Although Andreev did not make direct reference to a calendar from the Bartang Valley, we suspect that Pisarchik may be basing this on the work of other ethnographers who undertook research near the entrance of the valley.

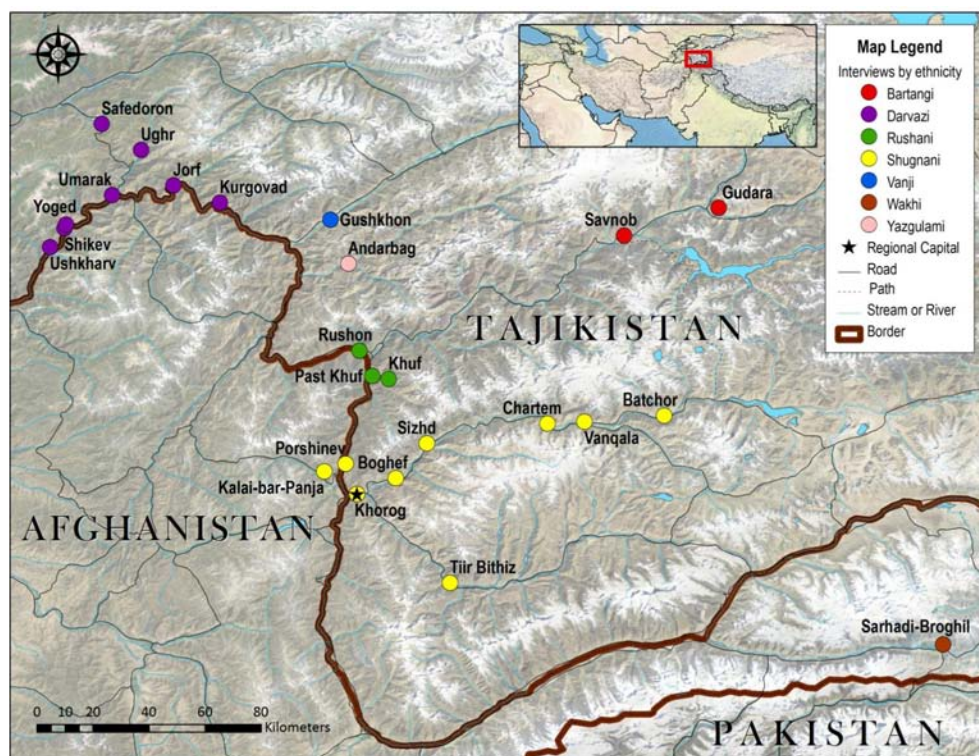


Fig. 1. Map of research area illustrating the ethnic diversity of use of the calendar of the human body (including all interview sites and villages where descriptions of the calendar of the human body were documented by Russian ethnographers and the authors)

to a lack of sustained use and a resulting loss of knowledge. Therefore an effort was made to explore texts in Persian written by *hisobdons* or those who calculate time (Pers. *Hesābdāns*)³ and Russian ethnographic sources that documented these calendars. Many of these ethnographic sources are not available in the libraries of Afghanistan due to continuous war. In Tajikistan, many books have been pilfered and/or the collections are in decay because of limited resources for upkeep during economic decline. Many of the texts in Persian

³ As John Mock notes in this issue, in the village of Yimit, Afghanistan, in the Wakhan region, the person responsible for observing the movement of the sun is called *hamal-bin* “person who identifies Hamal.” Hamal “Aries” is the first month of spring and the first day of Hamal is celebrated as Nowuz at the vernal equinox.

are owned by individuals or private institutions, making it difficult to access them. We have been able to access key archival sources in Russian and supplemented them with additional interviews specifically on the subject of the calendar of the human body.

It is noteworthy that during our interviews, reference to the calendar of the human body emerged from an anxiety resulting from climatic variation, whereas in ethnographic sources it arose from questions about festivals and celebrations related to solar and lunar calendars generally influenced by Islamic, Zoroastrian, and Chinese-Mongolian-Turkic calendars in Central Asia. All ethnographic sources commented on the calendar of the human body as being unique to the Pamir Mountains (Andreev; Kislyakov and Pisarchik). Noted below are the Russian ethnographic sources used to analyze the calendar of the human body:

- Bobrinsky interviewed individuals from villages in the upper Panj Valley about the calendar of the human body. He interpreted the differences in their descriptions of the calendar as inaccuracies and decided to publish only those components that were similar.
- Andreev traveled to the Pamirs in 1901, 1907, 1929, and 1943, but most of his field notes were edited and published posthumously by Pisarchik. He conducted his research in the Rushan, Shugnan, and Vanj (including the Yazgulum valley) regions of the Pamirs. To our knowledge, no other ethnographer has recorded as much information about the calendar of the human body, including variations between villages.
- Pisarchik in the same volume (Andreev), based on analysis of Andreev's notes and her own interviews in the Darvāz region of the Pamir Mountains, asserts that the calendar of the human body was an ancient and highly accurate system of marking the movement of the sun on the body. She also acknowledged diversity among the calendars of the human body between valleys of this mountainous area.
- Kislyakov and Pisarchik conducted further interviews with individuals and small groups in villages to the west of Andreev's and Pisarchik's previous research area. In this work, Kislyakov and Pisarchik recognize that variation in the calendars is related to the phenology of context-specific climatic conditions. The authors also attribute changes in the calendar to the influences of Islamic, Zoroastrian, and Chinese-Mongolian-Turkic calendars.

In addition to archival sources and interviews described previously (2006-08), we undertook supplementary interviews with two descendants of a *hisobdon*

to explore their knowledge of the use of the calendar (2009-10). While these two individuals are not *hisobdon*, one, Shohi-Kalon, is a *khalifa* (religious leader) and an elder with recognized authority in the region, and the other, Muhammadsherzodshoev, is a university-trained scholar.

We were able to locate and use an original copy of *Nojum* (Science of the Stars), a Persian manuscript by Shāhzāda Mohammad b. Farrokhsāh written in 1925 and translated into English by Bulbulshoev. Shāhzāda Mohammad (1870-1937) was a local scholar from the sub-village of Saroi Bahor (Sarā-ye bahār) in Porshinev, Shugnan District. This text was from an older manuscript copied and edited by Mirzā Mohammad Rushāni in 1912. The original treatise is from yet an older manuscript that was written by Ghiās al-Din ‘Ali Amirān Sayyed al-Hoseyni of Isfahan, who traveled to the mountainous regions of Badakhshān in the fifteenth century. Ghiās al-Din had devoted a chapter to the calendar of the human body utilized by local scholars in the Pamir Mountains (Muhammadsherzodshoev’s introduction to Ghiās al-Din’s *Nojum*). This documentary evidence validates the oral history that the calendar of the human body likely originated in the Pamirs and was in use for at least several hundred years. The relevant chapter in Ghiās al-Din’s manuscript is entitled, “On knowing the counting of the year, month and day by the method of the saints from mountains of Badakhshān, determined in ancient times” (Shāhzāda Mohammad, 56). Andreev included excerpts from a similar text in his work; however, there are slight variations between the Persian manuscript of Shāhzāda Mohammad and Andreev’s text that change calculations in the calendar by 5 days during autumn and winter *chillas* (standard Persian *chella*, a period of forty days).

Kassam’s research extends the known geographic range of use of the calendar of the human body in the Pamirs further northeast and southeast, hence including more cultural groups when compared to earlier Russian ethnographic information (see Figure 1 and Table 1). While this is relevant to making the case for widespread use of this calendar in the Pamirs and its adaptation to diverse ecological and ethnic contexts, for the people of the Pamirs this information is historical fact and nothing new.

In total, seventeen variants of the calendar of the human body were analyzed (see Table 1). After providing a generalized description of these calendars, we illustrate the diversity of calendars resulting from their context specificity, i.e. adaptation to ecological niche. We then discuss how complex connectivity arises from human relationships to the living (biotic) and non-living (abiotic) environment.

Table 1. Description of sources for analysis of the calendar of the human body (including documentation by Russian ethnographers and interviews conducted by the authors)

Village	Interview focus	Elevation (meters)	Ethnicity	Date of interview(s)	Researcher(s)	Days counting on body
Andarbag ¹	description of calendar	1900	Yazgulami	9/7/1925	Andreev (1958)	212
Banai (part of Khuf) ¹	description of calendar	2800	Rushani	7/12/1929	Andreev (1958)	174
Batchor ¹	lost Shugni words	3300	Shugnani	2007	Bulbulshoev	N/A
Boghef ¹	lost Shugni words	2300	Shugnani	2007	Bulbulshoev	N/A
Charrem ¹	description of calendar	3000	Shugnani	8/8/1902	Andreev (1958)	198
Gudara ¹	climatic variation	3000	Bartangi	2006, 2007, 2008	Kassam	N/A
Gushkhon ¹	description of calendar	1800	Vanji	9/3/1925	Andreev (1958)	200
Jorf ¹	description of calendar	1400	Darvazi	1956	Pisarchik in Andreev (1958)	84
Kalai-bar-Panja ¹	climatic variation	3500	Shugnani	2006, 2008	Kassam	N/A
Khorog	supplementary interview	2100	Shugnani	2009	Kassam	N/A
Khuf and Past Khuf ¹	description of calendar	2800/2000	Rushani	7/10/1929	Andreev (1958)	204
Khuf Valley	description of calendar	unspecific	Rushani	9/24/1943	Andreev (1958)	180
Kurgovad ¹	description of calendar	1500	Darvazi	11/13/1954	Kislyakov and Pisarchik (1966)	196
Porshinev ¹	description of calendar; lost Shugni words, supplementary interview	2100	Shugnani	9/18/1925, 2007, 2009	Andreev (1958), Bulbulshoev, Kassam	156
Rushon ¹	description of calendar	2000	Rushani	8/23/1923	Andreev (1958)	180
Safedoron ¹	description of calendar (incomplete)	2400	Darvazi	1948 to 1950	Kislyakov and Pisarchik (1966)	N/A
Sarhadi-Broghil ¹	climatic variation	3300	Wakhi	2006, 2008	Kassam	N/A
Savnob ¹	climatic variation	2700	Bartangi	2006, 2007, 2008	Kassam	N/A

Table 1 (*cont.*)

Village	Interview focus	Elevation (meters)	Ethnicity	Date of interview(s)	Researcher(s)	Days counting on body
Shikev ¹	description of calendar	1200	Darvazi	8/26/1954	Kislyakov and Pisarchik (1966)	178
Shugnan and Rushan ²	description of calendar	unspecific	Darvazi	1925	Pisarchikin Andreev (1958)	168
Sizhd ¹	lost Shugni words	2500	Shugnani	2007	Bulbulshoev	N/A
Tiir Bithiz ¹	lost Shugni words	2800	Shugnani	2007	Bulbulshoev	N/A
Ughr ¹	description of calendar	2900	Darvazi	8/9/1954	Kislyakov and Pisarchik (1966)	126
Umarak ¹	description of calendar	1300	Darvazi	8/15/1954	Kislyakov and Pisarchik (1966)	70
Upper Panj ²	description of calendar (common elements)	unspecific	unknown	1901	Bobrinsky (1908)	N/A
Upper Panj in Darvaz ²	description of calendar	unspecific	Darvazi	1902	Andreev (1958)	100
Ushkharv ¹	description of calendar	1500	Darvazi	10/21/1954	Kislyakov and Pisarchik (1966)	162
Vaqala ¹	description of calendar	3100	Shugnani	7/12/1929	Andreev (1958)	254
Yoged ¹	description of calendar (incomplete)	1200	Darvazi	c. 1954	Kislyakov and Pisarchik (1966)	N/A

¹ See location in Figure 1.² Location not specific.

The Calendar Described

Descriptions of the calendar of the human body suggest that it seeks to measure time with respect to ecological conditions as they relate to human experience and not presume to control or reckon with time as a commodity. Although the precise mechanisms remain a mystery, living organisms, from oysters (see Brown et al.) to humans, are able to harmonize physiological processes with celestial movements and other temporal patterns regardless of their location. Historically, Pamiri farmers, by perceiving these patterns in their habitat, developed systems to understand temporal relationships between ecological events and synchronize their own activity with complex seasonal rhythms. More recently, American and European scientists have developed “natural calendars” based on the same principle, to describe the seasonality of living and physical components of ecosystems according to phenological relationships (Ihne; Schnelle; Hopkins and Murray; Ahas et al.). These calendars are uniquely able to assess climate-organism interactions by referencing temporally variable ecosystem dynamics (Ahas et al.). In addition, these calendars identify key seasonal events in the life histories of indicator species that can be used to anticipate processes necessary for agriculture (Podolsky).

Before we discuss the diversity of calendars of the human body used in the Pamirs, it is important to describe their common elements and patterns. There are many exceptions to these commonalities, and we suspect those exceptions are informed by the ecology of specific human communities. For all calendars, certain parts of the year are counted with reference to human body parts. The other periods of the calendar are known as *chillas*.⁴ One annual cycle of the calendar usually includes two periods of counting on body parts and two periods of *chillas* (see Figure 2).

In the early spring, counting on the human body begins at the sole of the foot or the toenail and moves towards the head. Descriptions of calendars refer to these periods as times when “the sun is in” a particular body part. In addition to the toenail, almost all calendars include the ankle, shin, knee, thigh, and penis before reaching the heart. In many cases but not all, the heart is associated with the vernal equinox, the time when Pamiri villagers celebrate the Nowruz, marking the beginning of the year in the spring. Nowruz is a Persian word, but locally the word for the New Year is distinct to the diverse cultures of the Pamirs. In Yazgulam, for instance, it is called *Ghravash*, in

⁴ While in Sufism, the *chilla* refers to an exact period of forty days of seclusion and meditation, in the context of this calendar, forty days is more flexible and akin to the idea of many days. Nonetheless, the import of the term *chilla* retains its Sufi character when we consider forty days as a period of “being lost” in the desert (see page 11).

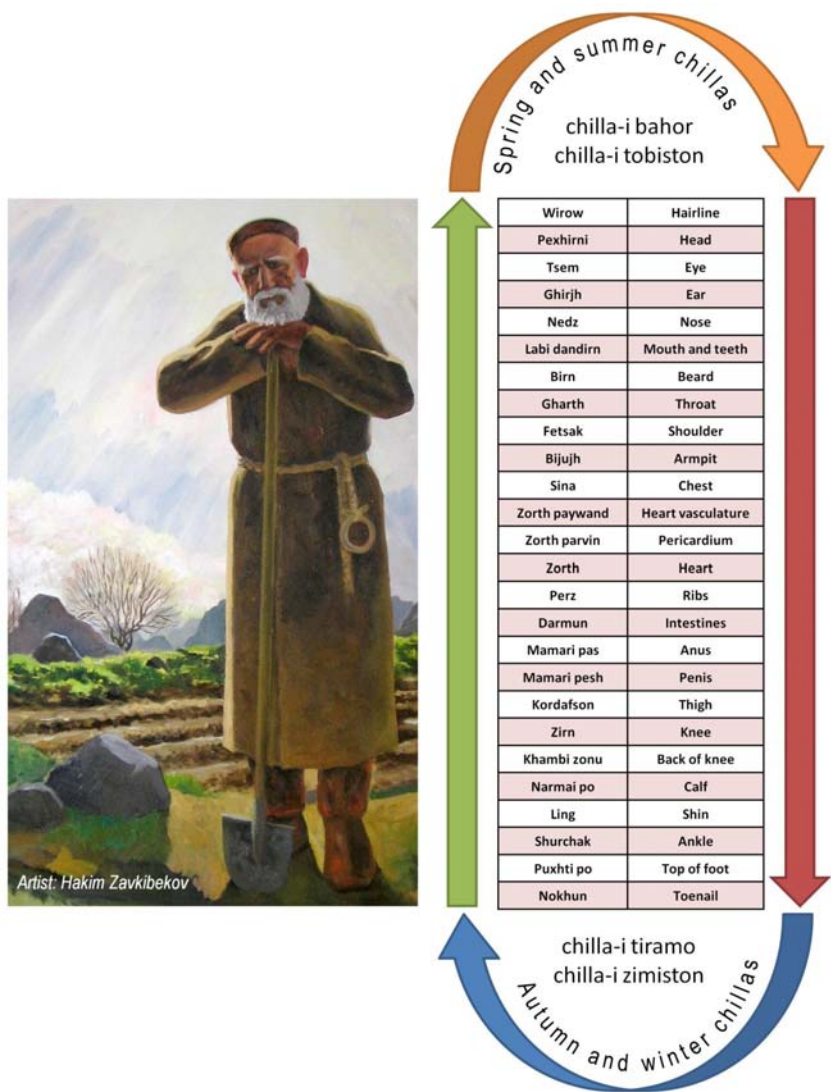


Fig. 2. Illustrative example of the calendar of the human body from the village of Chartem, as documented by Andreev in 1902

Rushan it is called *Zhamund*, and in Shugnan it has several names such as *Khidir ayom* (great celebration), *Shogun ayom* ("good omen" or "good sign" celebration), and *Baat* or *Boj ayom*.⁵ After the heart, almost all calendars include the chest and throat, followed by some designation of the head (often the forehead, crown, or brain). In addition to the head, some calendars include hats or headdress with plumes.

Once the first sequence of counting on the body is complete, most calendars move into a period of *chillas*. Some *hisobdons* describe a spring and summer *chilla*, each approximately 40 days in length, while others denote periods known as *biyabon* (Pers. *biābān* "desert"), a time when one is not conscious of the passage of days. In other calendars, *hisobdon* describes the comings and goings of the sun from his young wife's summer house.

After the end of these *chillas*, counting of the human body starts again at the head and moves toward the toes, using the same body parts and divisions of days that were used earlier. Counting passes back through the heart generally (but not always) at the time of the autumnal equinox (Andreev and Pisarchik, 318); during this period a second festival, smaller in scale, is celebrated. Counting returns to the toenail and enters another period of *chillas*. This period, similarly to the ones described previously, may be divided into autumn and winter *chillas*. They may also be described as a *biyabon* period, or the movement of the sun to and from his old wife's house.

One of the most interesting features of the calendar of the human body is that body parts are each counted twice. Counting on the body takes place in both directions, indicating not only biannual repetition, but also the sequential reversal of periods observed earlier in the year (see Figure 3). The anthropologist Edmund Leach has described conceptions of time as an oscillation among the ancient Greeks. Similarly, repetitions and reversals in the calendar of the human body indicate a conception of time as an annual oscillation, associated with bird migrations, activity and hibernation of animals, the emergence and senescence of plants, including crops, and the biological rhythms of the human body itself.

Most calendars make reference to celestial movements, presumably because movement of the sun and moon are the most consistent, and therefore reliable, observable patterns in nature. Interestingly, the calendar of the human body focuses on the sun, and while some variants make reference to stars, the calendars rarely mention phases or movement of the moon except when relating to the Muslim lunar calendar.

⁵ *Baat* is a porridge made from wheat flour and oil; *boj* is made from cracked wheat. Both dishes are prepared on the day of this celebration.

Moorings: Ecology of Time in the Pamirs

It is not possible to situate our findings related to the calendar of the human body without simultaneously describing the conceptual moorings upon which our analysis rests. The diversity of calendars, their context specificity, and complex connectivity to ecological niches are distinct but not mutually exclusive elements. Rather, complex connectivity, context specificity, and diversity are reciprocally reinforcing characteristics of the calendar (see Figure 3).

Diversity. Diversity is at the foundation of perception. Perception is achieved by recognition of difference. Sensory organs perceive “things” to be separate from other “things.” These “things” are made *real* by their relationship with other “things” (Bateson; Jacob; Kassam 2009a). Therefore a “thing” *is* in relation to a continuum of other “things.” A person’s sensory involvement in their environment is part of a process of being alive to the world (Ingold; Kassam 2009a). The calendar of the human body is less an “abstract” conception of time and more an immediate experience of “reality” as it is associated with being *in* the world. The calendar of the human body similarly represents diversity between calendars emerging from different ecological contexts.

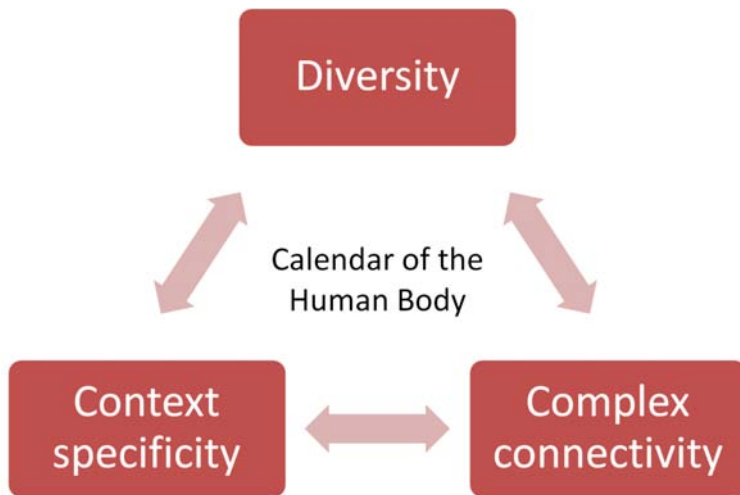


Fig. 3. Diagram of conceptual framework for human ecological analysis of the calendar of the human body

Bobrinsky, who interviewed Pamiris in 1898, mentions the calendar of the human body only in passing towards the end of his journey. He complained that he had difficulty understanding his sources ("senile old men") because each of them presented a different version of the calendar. The implication of Bobrinsky's observation is that by 1908 people were losing the know-how to use the calendar of the human body as there was no consensus between villagers from different ecological regions. We contend the opposite: that these men were hardly "senile," and rather described the calendar relevant to their ecological habitat. There would be no need for consensus because these ecological niches were different. Like Bobrinsky, Andreev also was looking for consensus, but was unable to find it because weather is a concrete event and its impact is context-specific. Both Kislyakov and Pisarchik confirm that calendars varied from valley to valley. This was also verified by our supplemental interviews in 2009.

There are major structural differences between calendars. Ten of the seventeen calendars analyzed follow the pattern described earlier, i.e. counting from the toenail to head followed by spring and summer *chillas*, then counting again from head to toenail followed by autumn and winter *chillas*. Two calendars (Porshinev and Andarbag) contain no references to autumn or winter *chillas*, and five (Porshinev, Andarbag, Upper Panj, Umarak, and Ughr) contain no reference to spring and summer *chillas*. In one calendar (Vanqala), the sequence of counting on the human body is reversed, so that counting before the spring and summer *chillas* starts at the head and proceeds to the toenail, and counting before the autumn and winter *chillas* begins at the toenail. In another calendar (Jorf), counting on the body proceeds in only one direction and therefore occurs only once per year.

The periods of counting on the body and the various *chillas* differ in length. Counting on the human body lasts between 35 and 142 days, referring to between 5 and 34 body parts. Where it is described, the period of spring and summer *chillas* lasts between 35 and 100 days, whereas the period of autumn and winter *chillas* lasts between 33 and 90 days. There is only one calendar of the human body that includes 365 days and can be said to correspond to a full solar cycle (Shāhzāda Mohammad; Andreev). This suggests that the calendars did not correspond to a fixed solar year. Instead, the calendars were likely used differently from year-to-year in response to variations in weather. Hence, counting helped anticipate significant ecological events that would trigger seasonal activities such as ploughing, sowing, and harvesting.

As in other calendars (Evans-Pritchard), the passage of time is meticulously counted only at certain times of year and receives less attention during other periods. Time is measured more carefully during periods of increased labor

when activities must be conducted according to weather conditions and patterns (Evans-Pritchard). Counting is less critical during periods of relative inactivity. In the Pamirs, counting on the human body began in anticipation of clearing and sowing fields, stopped during the growing season (the spring and summer *chillas*), began anew before the harvest, and was suspended in mid-winter (the autumn and winter *chillas*). While counting on the body is conducted in intervals of 3 to 7 days, the *chillas* are measured in periods of approximately 40 days. This pattern implies that farmers are more concerned about the timing of planting and harvesting than they are about events at other times of year. Furthermore, the *chillas* are sometimes associated with “being lost” in the desert, which may indicate that farmers are less concerned about counting the passage of time during ecologically consistent times of year. The period of *chillas* or *biyabon* (desert) may therefore represent temporary halting of measurement of seasonal time because it is not directly relevant to the ecology of the villager.

Transitions from one season to another are critical, and for many communities, the timing of these transitions is related to weather and might not be fixed according to the solar calendar. In other communities of agropastoralists, recognition that a seasonal transition has begun requires critical discussion within a community (Turton and Ruggles). In the Pamirs, it appears that the *hisobdon* played a key role in determining when counting on the human body would begin. The extent of his authority, and the means by which he made his decision, requires further investigation.

In most cases, each body part is associated with 3 or 7 days. In calendars where the number 3 is used, more complex organs or those with numerous parts (e.g. intestines and ribs) are associated with days in multiples of 3, usually 9 or 15. Less frequently, body parts are associated with 2, 4, 5, 8, or 10 days. Calendars that use the number 7 are mostly located in the north-western regions of the Pamir Mountains (Yazgulam, Vanj, and Darvāz valleys), while the use of 3s is common to the southeast (Shugnan and Rushan). The majority of the former are located at relatively lower elevations (1200-2900 meters above sea level) while the latter are in higher regions (2000-3300 meters above sea level). This suggests that calendars derived from higher ecological niches are more detailed in terms of usage of body parts. We are unable to explain why this is the case. Slight changes in weather can have striking consequences for communities living at higher elevations and, therefore, their calendar needs to be more precise. Alternatively, the centers of origin of the calendar may be at these high elevations, and thus they are more detailed. The Russian scientist Vavilov (1926, 1997, 1951, 1957, 1992) saw a correlation between the origins of fruits and grains (such as wheat, rye, and barley)

brought under cultivation in mountainous regions and the origins of human civilizations. He envisioned that these domesticated plants were ultimately taken from their mountainous origins to lower valleys, giving birth to human civilizations (Kassam 2009b; Nabhan). It is also possible to envisage the calendar of the human body developing in a similar manner in close phenological relation to the ecology of high mountain zones.

After the first period of counting on the body, seven calendars include periods associated with non-human animals, tools, and activities. These are part of spring and summer *chillas* and therefore counted once per year, except in one case where these intervals are considered a part of counting on the human body (and therefore counted twice per year). The references within these intervals reflect the ecological professions of calendar users; in some cases they refer to agricultural activities (e.g. counting intervals called “harvesting barley” or “ripening of apricots”) and in others to pastoralism, specifically sheep herding (e.g. counting intervals are called “ram,” “sheep,” “tent,” “steppe”). Similarly, some calendars contain elements collectively known as “hunting man” that fall within the autumn and winter *chillas*. These include specific intervals named after activities and tools associated with hunting, including “sitting,” “colt and peg,” “foal and nail,” “horse and saddle,” “dog,” “chain,” and “staff.”

In summary, the nature of difference varies between calendars of the human body. First, there are differences in the ordering of counting periods within the calendars. Second, there are differences in the number of days in each major period of the calendar, as well as the number and length of intervals associated with specific body parts, non-human animals, and activities. Finally, there are important differences in the ecological professions that some calendars represent.

Context-specificity. Human ecological knowledge is context-specific: it is related to, and contained within, a group of people who live in a defined geographic region. Knowledge in this context is derived fundamentally from the environment. It includes a web of interactions between humans, animals, plants, natural forces, and land forms. Therefore, social, ethical, and spiritual relationships also have an ecological foundation. Context provides the basis for explanation—a pattern which connects. These patterns are dynamic. Dynamic patterns illustrate relationships (Kassam, 2009a).

The calendar of the human body, by its context specific character, requires keen observation of the villager’s ecological niche. For instance, the vernal equinox is a celestial marker that triggers attentiveness to the ecological processes of spring. Local topography including mountain peaks and the behavior of biodiversity such as migratory birds and flowering plants are markers of

time that contribute to the specificity of the calendars to each valley. Emerging from a close connection to the land, festivals have ecological meaning and, therefore, their timing differs from context to context. Moreover, the same elements of the calendar were associated with different seasonal phenomena according to context. For instance, when the sun moves to the sole of the foot, in the village of Safedoron it is associated with frost, but in the villages of Yoged, Ushkharv, and Umarak, which are at lower elevations, it marks the time for preparation of the fields for agricultural activity (Kislyakov and Pisarchik).

The range of ecological zones that comprise the Pamir Mountains of Central Asia informs the cultural diversity in the region. The physical environment determines weather patterns and, therefore, the way in which the calendar of the human body is articulated with the immediate environment of the villagers. To a large degree, differences in elevation determine planting and harvesting times, as well as the specific crops that can be cultivated. In the Darvāz region (western Pamirs), for example, pomegranates are grown, whereas in Vanqala (central Pamirs) fruit orchards are not found.

In 2007, when Bulbulshoev and Kassam were investigating vanishing Shugni words related to climate, elders continued to use words associated with the calendar of the human body, including *chillai bāhor* (period of 40 days in spring), *chillai zimiston* (period of 40 days in winter), *hisoben* (calculations referring to three days of frost when the sun is in the heart), and *khirpichor* (festival marking the start of calculations on the human body). While this research indicates that these Shugni words are no longer widely used, it is noteworthy that the memory of patterns of ecological relations arising from a specific context expressed by the calendar are still encoded through local languages in peoples' minds.

Calendars of the human body are developed in specific ecological contexts, but villagers often move into new agro-ecological zones. For instance, one of the elders in Batchor (Davlatmamad Qurboniev, born in approximately 1928) used many words and phrases that are not ecologically appropriate for that area, including *kharbuza baz* (watermelon ripening), *tut baz* (mulberry ripening), *hama khombaz* (ripening of the remaining fruits). Batchor is located 3,330 meters above sea level where neither fruit trees nor watermelons can grow. Through discussion it became apparent that this elder belonged to a family from the Bartang Valley and his parents had moved to Batchor. This illustrates that the patterns that emerge and are communicated through words arising from a specific ecological niche may become irrelevant in another ecological context.

Unlike the Gregorian calendar, the calendar of the human body is not implemented in fixed relation to the solar year. Counting on the human body is initiated based on observations and analyses in each community. Based on documentary evidence, we infer the *hisobdon* decided when to begin counting, but he did not recommend planting times because these would vary based on the specific conditions of each field. Once counting began, farmers were able to count on their own and make decisions as to the planting and harvesting of crops based on their prior use of the calendar in close phenological relation to their own fields. Given the dramatic relief of the Pamir Region, farmers belonging to the same community often farm at a broad range of elevations on slopes of varying degree and aspect, so the optimal time to plant the same crop varies from field to field. Furthermore, the variability of environmental conditions on farms around the same communities makes it difficult to test correlations between village calendars and specific landscape variables.

Andreev (158-65) describes that even in the area of Khuf he found three variants of the calendar at different elevations. He notes that despite a short distance (approximately 1 km) between Khuf and Past Khuf (lower Khuf), climate conditions in these villages are quite different. The duration of winter in lower Khuf was only four months, whereas for Khuf, it was six to six and a half months. Wheat hardly ripens before frost damage in Khuf, whereas in lower Khuf apricot, apple, and peach trees flourish. The different ecological zones of mountainous regions enabled the people of Khuf to use the lands of lower Khuf, with its longer vegetation period as their gardens and fields, for sowing grains. Thus, these villagers had to develop different calendars in order to use all zones. The variety of ecological zones provided by the Pamir Mountains contributed a diversity of calendars that emerge from the specific context and relations villagers have with their habitat.

Complex Connectivity. Indigenous human ecological knowledge encompasses the interconnectedness within an ecological system and that system's relationships to a greater whole. It arises from closeness to the land and to living things. In this sense, it grows out of a connection to the natural surroundings. It is obtained by the labor of living and experiencing the context, and not through book learning (Kassam, 2009a). The calendar of the human body illustrates such intricate connectivity. The elements of the habitat marked the passage of time in relation to the human body. The sun not only marks the rise and fall of the day, but also key times of the year using the mountains as markers. Connectivity to habitat is illustrated in a conversation that Andreev had with a Rushan villager in 1923: "Counting can only be done in our mountains.

How can time be determined in a city, on a plain, where the rise of the sun and stars it is not visible at different times of the year, and where no markers can be seen? Where even one cannot see the time of appearance of the stars?" (Andreev, 162)

In the three calendars of the Khuf valley, the sun is described as a *person*, a being having a young wife with whom he spends time in the spring and summer *chillas* (Andreev: 159). Even the *chilla* is considered a being, whose death is marked by the coldest days at the end of the period (Andreev). The language used to describe the calendar of the human body in both archival and contemporary sources is not one of constructed metaphor of the environment but of active engagement with one's ecology. It is not taking a *view of* the world but taking a *view in* it. Among the Pamiris who describe the calendar, there is a sense of dwelling inside the world rather than building upon it. The calendar of the human body emerges out of relations of the Pamiri's body to the sun, the sun's relation to the mountains and the Pamiri house (see Figures 4a, 4b, and 4c from Andreev). In addition, there are biological markers such as the

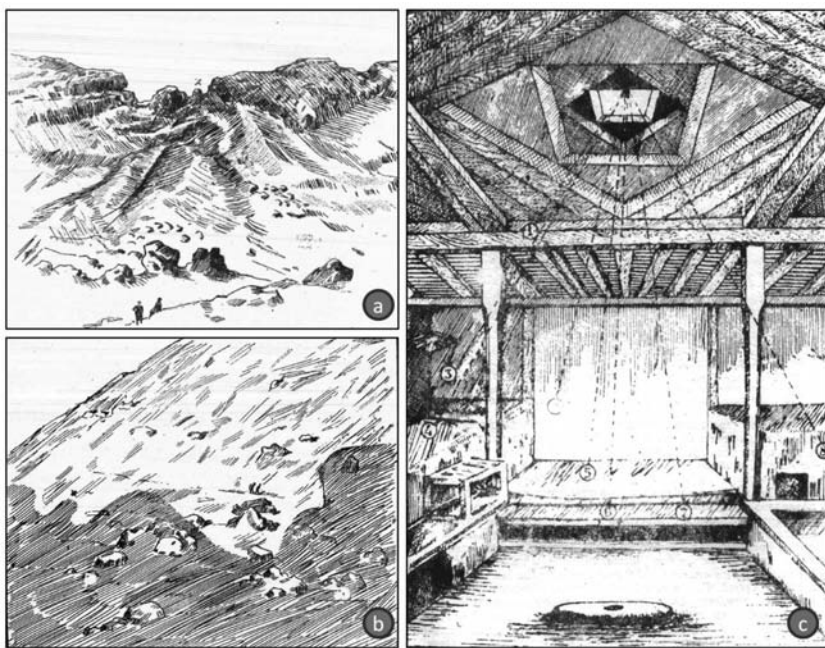


Fig. 4. Illustrations of marking time through the connectivity between the sun (a), mountains (b), and the Pamiri house (c) by Andreev, 162-64

appearance of worms, songbirds, and birds of prey that initiate agricultural activities such as ploughing. There is no separation between the biotic and abiotic, between the built and un-built environment, or between culture and nature; rather these are mutually reinforcing and informing.

Based on ethnographical research with Nuer people in Sudan, the social anthropologist Evans-Pritchard (1939) articulated a distinction between “ecological” and “structural” time. Ecological time is described as the basis for humans’ responses to changes in the environment, whereas structural time emerged from relations within social systems. Evans-Pritchard contends that ecological time is cyclical, whereas structural time is progressive (i.e. linear). The calendar of the human body integrates ecological and social relations and therefore does not suffer from this dualism. While ecological relations are key features of the calendar, it is also rooted in socio-cultural systems, as evidenced by its references to the New Year, harvest festivals, etc. Furthermore, ethnographic sources suggest that the introduction of the Muslim lunar calendar did not create a dualism between the structural and ecological among the Pamiris. However, the increasing influence of the Gregorian calendar and the command economy resulted in a conceptual separation of ecological from structural time. Hence, the calendar of the human body gradually lost its significance in the day-to-day activities of the Pamiris as they engaged in collectivized farming and industrialization. Once again, following the collapse of the Soviet Union, re-structuring of the economy, and experiences of climatic change, there is an opportunity to revitalize a calendar that is sensitive simultaneously to ecological and structural time.

In the calendar of the human body, there is no separation of the human from their habitat. This intimate relationship is even more forcefully conveyed by the Khalifa of Porshinev, Shohi-Kalon, who explains that the teachings of this calendar were “mixed with our skin, with our muscle, with our bone and our brain” (interview in 2009). Villagers specifically referred to a calendar that not only utilized parts of the human body as a mnemonic device to remember the passage of days, but also had the functions of these organs represent seasonal change and actual weather events. In some of the calendars, functions of specific organs of the body are directly associated with ecological events. For instance, villagers explained that in the spring, the sun is in the intestines, a time of changing precipitation and avalanches, much like the churning in the stomach. Similarly, when the shining sun is in “the smiling mouth” during the spring it is linked to the blossoming of the apricot. In another case, the presence of the sun in the eyes during the spring causes tears of laughter and weeping which are connected to rains (Andreev, 159). When the sun is the eyes, the act of staring at the sun produces tears. These are not metaphorical

references to the sun existing in the body part but representation of concrete experiences arising from specific bodily functions given meaning by the ecological niche the villagers inhabit. The light and heat of the sun therefore elicit simultaneous physiological responses from the human body and the larger ecosystem. As part of his or her habitat, the farmer is subjected to the same external forces, so human experience is indicative of broader ecological processes.

Phenological knowledge develops from long-term observations at particular locations, but requires some system of calibration to measure variability and account for change. A solar or lunar calendar enables its user to detect temporal changes relative to the movement of the sun and moon. An ecological calendar emphasizes the relative timing of environmental processes. The calendar of the human body seems to combine elements of both. The sun is understood as the agent of seasonal change. Although he follows a predictable annual pattern of existence, the personhood of the sun (and therefore his potential for inconsistency) may explain why the timings of specific events are not the same from year to year. The role of the ecological calendar is to anticipate seasonal events in relation to each other given the variable behavior of the sun.

Although the sun is used in counting, it is not the basis of the calendar of the human body as it is in the Gregorian calendar. The calendar of the human body should be understood with reference to the ecological setting where it is used, not only in terms of correspondence to celestial events such as the vernal equinox, which serve as convenient markers. This calendar is relational and ecological, rather than fixed and arithmetic. It demands keen observation of the landscape, whereas the Gregorian only demands counting of days. Bobrinski and Andreev found it difficult to understand the diversity of calendars because they evaluated each calendar with respect to the sun, as in the standardized Gregorian calendar. In fact, the calendar is used with reference to the human body, other living beings, and landforms (e.g. mountains). The diversity of calendars is therefore evidence that each demands context specificity and, therefore, requires modification in response to ecological change. This context specificity contributes to accuracy of these calendars where they are used.

Implications

Calendars of the human body may contribute to community adaptation in the context of climate change. Research from high altitudes and latitudes shows that the greatest challenges will be inability to anticipate context-specific seasonal changes (Akulki et al.; Kassam 2009a,b; Krupnik and Jolly; Orlove et al.). Pamiri villagers are already observing effects of climate change,

but are not yet fully able to anticipate or respond to its impacts. The calendar of the human body is a historical example of Pamiri people achieving a highly integrated, interconnected, and context-specific system to respond to ongoing changes in their habitats. Revitalizing calendars of the human body may help villagers understand and adapt to climate change in order to reduce their anxiety and enhance their livelihood security.

Renewed use of the calendar of the human body may contribute to adaptation in at least two ways. First, the calendar was historically modified to reflect different contexts, and similar modifications could be made in response to climate change. The diversity of calendars reflects keen observation of seasonal patterns and subsequent adaptation to context-specific phenologies, and is therefore evidence that further modification is possible to account for new conditions. Second, the calendar of the human body emphasizes temporal relations between social and ecological events and does not require that these events take place at the same time every year. This relationality enables flexibility in response to climate change, just as it allowed previous generations to cope with highly variable growing conditions throughout the Pamirs. Given the uncertainty of climate change, it makes sense to time agricultural activities in response to discrete idiosyncratic weather patterns rather than act on the basis of a typical standardized average year.

The magnitude and rate of change resulting from climatic variation cannot be solely addressed by revitalization of phenological calendars similar to the ones historically used in the Pamir Mountains. Climate modeling and other tools have an important role to play in adaption, but they need to be made relevant as predictive tools at the level of the village and valley. Current climate models predict trends at the global and regional scale but these models have limited utility for the farmer who experiences discrete weather events at the local scale. The historical sources of the calendar of the human body and its renewed application have the potential to make a contribution to understanding systemic change in the Pamir Mountains. It is not a question of “either/or”; rather, response and adaptation to climate change requires multiple lines of inquiry that are informed by the experiential validity of indigenous knowledge as well as innovative scientific applications working in tandem.

The calendar of the human body cannot be dismissed as a curious historical artifact that has grown irrelevant. In recent years, several European nations have invested in the development of similar calendars to be used by farmers and others who need to anticipate seasonal events in the context of climate change. For example, Ahas et al. have published a natural calendar for Estonia based on 52 phenological phases, including the pollination, foliation, and ripening of local plants. Documentation of these phases over the past fifty

years has allowed scientists to observe their sensitivity to weather variability and facilitate adaptation to climate change. In these cases, ecologists are developing new calendars for farmers based on the most precise ecological cues for favorable weather conditions. Even in Estonia, where climate is relatively homogenous, the need for context-specific phenological calendars is recognized (Ahas et al.). For mountainous regions such as Switzerland, useful phenological calendars must be developed from denser higher-quality data (Deflia). Indigenous ecological knowledge in the Pamirs is often context-specific, and is therefore the primary source for development of accurate ecological calendars.

The calendar of the human body is highly performative, and therefore required regular application in order for knowledge of its use to be effectively retained. Given consistent efforts to integrate Pamiris into empires by standardization, it is remarkable that any knowledge of the calendar of the human body has survived into the twenty-first century. This may attest to the ecological and socio-cultural significance of these calendars and the agency of the peoples of the Pamirs. In some societies, socio-cultural and ecological activities are determined by fixed time. By contrast, the calendar of the human body suggests that socio-cultural and ecological activities not only determine time, but also give it meaning.

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