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Building an Open-Source Nanakshahi Calendar:
Identity and a Spiritual and Computational Journey

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Abstract

Until the late twentieth century, Sikhs continued to use multiple calendars, mostly the Bikrami calendar, for determining dates for important Sikh events. The Bikrami calendar is longer than the tropical year and has issues such as a shifting relationship with seasons. Pal Singh Purewal proposed the Nanakshahi calendar in 1992. It was adopted by the Shiromani Gurdwara Prabandhak Committee (SGPC) in 1998, but has since diverged from the original proposal and its intent. As the debate about Sikhs observing their community occasions according to the "reformed" Nanakshahi Calendar or "mool" Nanakshahi calendar continues, the difference is not apparent to many Sikhs.

This paper explores the questions, research, and workings of the original(ਮੂਲ) Nanakshahi calendar.

An open-source programming library was built to encourage the adoption of the Nanakshahi calendar in software. Further, this paper proposes new terms based on Gurbani and Panjabi language etymology that were left open in the original Nanakshahi calendar.

Keywords: Nanakshahi calendar, Bikrami calendar, open source calendar

Introduction

For social groups, calendars play an essential role in cultural and religious identity. According to Zerubavel, they act "as a symbolic system that is commonly shared by a group of people and is unique to them, the calendar accentuates the similitude among group members–thus solidifying their ingroup sentiments–while, at the same time, contributing to the establishment of intergroup boundaries that distinguish, as well as separate, group members from outsiders." (Zerubavel, 1982).

For the last 500 years, Sikhs have continued to use Bikrami calendar-based almanacs for observing *gurpurabs*[1] and *sangrands*.[2] One of the first recorded attempts to create a new calendar comes from a letter, written by Banda Singh Bahadur to the *Sangat*[3] of Jaunpur (Deol, 2001) and dated "Poh 12 the first year," likely after the conquest of Sarhind in 1710 CE. According to Dilgir (1997), Banda Singh "... continued adopting the months and the days of the months according to the Bikrami calendar." Founding a sovereign Sikh state that eventually extended between the rivers *Yamuna* and *Raavi*, Banda Singh minted coins in the name of the Sikh Gurus, called *Nanakshahi* coins. Maharaja Ranjit Singh also followed this tradition of coinage (SikhMuseum.com, 2013).

Moving to the modern era, after five decades of development, the Nanakshahi calendar was proposed by Pal Singh Purewal in 1992, to replace the Bikrami calendar used to observe Sikh events (Purewal, undated).[4] The Nanakshahi calendar starts in 1469 CE with the birth year of Guru Nanak, the founder of the Sikh faith, as its epoch year. Nanakshahi months have seasonal connections to months in Bara Maha[5], as observed in the region of Punjab.

Purewal has stated three objectives to develop and standardize the Nanakshahi calendar:

1. To have a calendar that has a permanent relationship with seasons, as mentioned in Gurbani.

2. To have an independent Sikh calendar as part of the identity of a nation.

3. To remediate issues of the lunisolar sidereal Bikrami calendar by basing the Nanakshahi calendar on the tropical solar year.

After consultations, the amended Nanakshahi calendar was adopted in 1998 (McLeod and Fenech, 2014) by the Shiromani Gurdwara Prabandhak Committee

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[1] These are events commemorating important incidents in the lives of the Sikh Gurus, literally meaning "Guru's days."

[2] Sangrand is the first day of the month in Indian usage.

[3] This is a Sikh congregation.

[4] The use of the dating from Guru Nanak's birth is, of course, older Purewal's specific proposal, and can be found in older documents from Sikh sources. As clarified in this paper, this is only one aspect of a "true" Nanakshahi calendar.

[5] Bara Maha is a form of folk poetry expressing human yearnings and connection with changing seasons of twelve months of the year. Guru Nanak's Bara Maha transforms this love theme into a spiritual realm.

(SGPC), the Sikh organization in India responsible for the management of gurdwaras in Punjab, Haryana, and Himachal Pradesh and Chandigarh. The calendar was finally implemented in 2003 (Nesbitt, 2016). In 2010, the SGPC modified the adopted Nanakshahi calendar to align the start of months with the Bikrami calendar, and changed the dates for various Sikh festivals to base them on the lunar calendar. By 2014, according to Purewal, "the changes were scrapped," and SGPC reverted to the Bikrami calendar entirely, but still published it as Nanakshahi (Graney, 2018).

As the debate about Sikhs observing their community occasions according to the "reformed" (Singh, S., 2018) Nanakshahi Calendar or "mool" Nanakshahi calendar (Bodiwala, 2017) continues, the difference is not apparent to many Sikhs. This paper explores the questions, research, and workings of the original (ਮੂਲ) Nanakshahi calendar. An open-source programming library (Singh, A., 2019a,b) was built to encourage the adoption of the Nanakshahi calendar in software. Further, this paper proposes new terms based on Gurbani and Panjabi language etymology that were left open in the original Nanakshahi calendar.

Background

Various calendars have been in use across the world. These calendars are often based on the movement of the sun (solar) or movement of the moon (lunar). Further, solar calendars can have a tropical year or sidereal year. A summary of different calendars is provided in Table 1.

The sidereal year is the time taken by Earth to orbit around the Sun once, with respect to fixed stars (Nebraska Astronomy Applet Project, 2020). The modern value of the sidereal year is 365.256363 days (Purewal, undated). The Julian and the Bikrami calendars are examples of sidereal year calendars.

In contrast, the tropical year "comprises a complete cycle of seasons" (Nautical Almanac Office, 2010). It is the time it takes the sun to come to the same place on the ecliptic (equinox to equinox) (Nebraska Astronomy Applet Project, 2020). The length of the tropical year is 365.2422 days. The tropical year is shorter by just over twenty minutes than the sidereal year (Nebraska Astronomy Applet Project, 2020). The Gregorian calendar is a tropical year calendar.

In a tropical year, the seasons recur on approximately the same dates. In the sidereal year however, the months continue to shift away from seasons. The Julian calendar did not have the correct length for its year and resulted in a shift of 1 day in 128

years. By 1582, this resulted in a shift of ten days and with the adoption of the Gregorian calendar, Thursday, 4 October 1582 was followed by Friday, 15 October 1582, skipping ten days (Mercado, 2007).

Similarly, the Bikrami year is longer than the tropical year by about 20 minutes and 25 seconds. According to Purewal, "the months of the modern Bikrami calendar drift in seasons at the rate of about 1 day in 70 / 71 years on the average. The drift is about a week in 500 years, a month in 2,100 years, reverse of seasons in 13,000 years, and complete cycle in 26,000 years" (Purewal, undated).

Purewal observed this accumulation error between the year length difference of Bikrami and tropical years. For example, in the year of Guru Nanak's birth, the summer solstice in the Bikrami calendar was 15 Harh (Bikrami). In 1998, it occurred on 8 Harh (Bikrami). In another five hundred years, it would differ by a month, in the month of Jeth in the Bikrami calendar. Gurbani embodies the condition of mind, associating months, and their seasons as in Gurbani Barah Maha (SikhCast, 2019). Continuing to observe Gurpurabs with the Bikrami calendar, would, over time, create a loss of historical contexts and their seasonal connection (Purewal, undated). The dates of Gurpurabs in the Bikrami calendar are calculated using lunar cycles and can shift significantly from year to year. For example, in 1999 CE, there was no Parkash Gurpurab[6] of Guru Gobind Singh Sahib as per the Bikrami calendar (Purewal, undated).

According to Purewal, "Even the dates of *desi*[7] months as per *Surya Siddhanta*[8] (year length 365d 6h 12m 36s) which was in use during the Guru period and up to the nineteen-sixties when in most of India it was discarded as being inaccurate, and the *panchanga*[9] editors switched over to *Drik Ganita*[10] ... (year length 365d 6h 9m 10s)" (Purewal, undated).

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[6] Parkash literally means day of illumination, so it is the birth day of a Sikh Guru.

[7]This is a Panjabi word commonly used for something ethnic or local.

[8] The Surya Siddhant is a tenth century Indian work on astronomy, forms foundation of medieval Indian astronomy and basis of calendar developed in Nepal (Bowman, 2000).

[9] A *Panchanga* is the Indian version of the almanac.

[10] *Drik Ganita* is another system of astronomical computations followed by several almanac makers in India (Sarma, 1972).

	Epoch	Type	Year Length	Shift in relation to tropical seasons
CE (Julian)	Year of birth of Jesus Christ	Solar	365.25 days	Approx. 1 day every 128.20 years
CE (Gregorian)	Year of birth of Jesus Christ	Tropical	365.2422 days	Approx. 1 day every 3300 years
Bikrami (Sidhantic)	57 BCE[11]	Sidereal	365.258756481 days	Approx. 1 day every 60 years
Bikrami (Modern)	57 BCE	Sidereal	365.256363 days	Approx. 1 day every 70/71 years
Bikrami (Lunisolar)	57 BCE	Lunisolar	354.37 days	NA
Hijri	Hijrah (622 CE)	Lunar	353 - 355 days	10-12 days every year
Nanakshahi	Year of birth of Guru Nanak	Tropical	365.2422 days	1 day every 3300 years

Table 1: Prevalent calendars and their relation to a tropical year.

Purewal notes that Guru Nanak's observation of physical phenomenon was as a vehicle to impart knowledge and not to highlight the phenomenon itself (Purewal, undated).

ਦਿਨ ਰਵਿ ਚਲੈ ਨਿਸਿ ਸਸਿ ਚਲੈ ਤਾਰਿਕਾ ਲਖ ਪਲੋਇ ॥ ਮੁਕਾਮੁ ਓਹੀ ਏਕੁ ਹੈ ਨਾਨਕਾ ਸਚਿ ਬੁਗੋਇ ॥

- ਗੁਰੂ ਗਰੰਥ ਸਾਹਿਬ, ਅੰਗ ੬੪

Nothing is permanent, the sun moves, the moon moves, the stars move, the constellations move, all are impermanent. Nanak says that the truth is that only Akal Purkh is permanent.

- Guru Granth Sahib, Page 64

Guru Nanak however, does observe the permanence of Sun and its relation to seasons.

ਸੂਰਜ ਏਕੋ ਰੁਤਿ ਅਨੇਕ ॥ ਨਾਨਕ ਕਰਤੇ ਕੇ ਕੇਤੇ ਵੇਸ ॥

- ਗੁਰੂ ਗਰੰਥ ਸਾਹਿਬ, ਅੰਗ ੧੩

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[11] See Sharan (2003) for this dating.

The sun is one, but many are the seasons - says Nanak, how many different ways the Creator manifests Himself!

- Guru Granth Sahib, Page 13

On page 1108 of Guru Granth Sahib, Guru Nanak observes the turning of the Sun's yearly movement or Summer solstice as ਰਥੁ ਫਿਰੈ – the turning of the Sun's chariot.

This forms the base of Nanakshahi calendar and a relatively fixed season tropical year length.

ਰਥੁ ਫਿਰੈ ਛਾਇਆ ਧਨ ਤਾਕੈ ਟੀਡੁ ਲਵੈ ਮੰਝਿ ਬਾਰੇ॥

   - ਗੁਰੂ ਗਾਰੰਥ ਸਾਹਿਬ, ਅੰਗ ੧੦੦੮

The chariot turns, and the soul-bride seeks shade; the crickets are chirping in the forest.

- Guru Granth Sahib, Page 1008

The Nanakshahi year begins as Chet 1, which is the first day of the year, irrespective of the fact that Guru Nanak's birth date falls on a different day. The names of the twelve months are the popular variant of the same names as given in *Baramaha.*[12] The months are described in Table 2.

Nanakshahi *Sangrands* are independent of Indian Zodiac movements and thus may differ from Bikrami *Sangrands*. The first five months of the Nanakshahi year have thirty-one days each, while the last seven have thirty days each. Whenever last month, *Phagun*, falls in leap February, it has an extra day and has thirty-one days instead of thirty.

The Nanakshahi calendar discards the lunar calendar of *sudis*[13], and *vadis*[14] for the determination of the dates of Gurpurabs and has fixed dates for most Gurpurabs. The exceptions are Guru Nanak Sahib's Parkash Gurpurab and Bandi Chhor Divas (Divali), which continue to be celebrated according to the old calendar. On the

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[12] *Baramaha*, or *Bara Maha*, is a form of folk poetry expressing human yearnings and connection with changing seasons of twelve months of the year. Guru Nanak's *Bara Maha* transforms this love theme into a spiritual realm.

[13] Date One after the full moon, indicating the beginning of the month in the luni-solar calendar.

[14] Day after the new moon, indicating the middle of the month in the luni-solar calendar.

demand of *Sant Samaaj*[15], the *Hola Mohalla* Sikh festival held in Spring, that accompanies the display of military might of Khalsa in Anandpur Sahib was also kept according to old Bikrami calendar.

As the Gregorian and Nanakshahi calendars are both based on a tropical year, there is a fixed Gregorian date for each Nanakshahi date.

	Nanakshahi Month Sangrand (Day 1)	Gregorian Day and Month	Days in Nanakshahi Month
1	Chet / ਚੇਤ	14 March	31
2	Vaisakh / ਵੈਸਾਖ	14 April	31
3	Jeth / ਜੇਠ	15 May	31
4	Harh / ਹਾੜ	15 June	31
5	Sawan / ਸਾਵਣ	16 July	31
6	Bhadon / ਭਾਦੋਂ	16 August	30
7	Asu / ਅੱਸੂ	15 September	30
8	Katik / ਕੱਤਕ	15 October	30
9	Maghar / ਮੱਘਰ	14 November	30
10	Poh / ਪੋਹ	14 December	30
11	Magh / ਮਾਘ	13 January	30
12	Phagun / ਫੱਗਣ	12 February	30/ 31 if leap year

Table 2: Nanakshahi calendar months, number of days and corresponding days on Gregorian calendar

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[15] These are socio-religious organization that are part of Sikh Panth, but may have traditions (*maryada*) that vary from one to another

Code

There have been discussions on Nanakshahi Calendar, yet no open-source library was available at the time. The authors felt a need to develop a Nanakshahi date conversion library for quick adoption into any new software.

An open-source library was developed to support Nanakshahi dates. The Ruby programming language was used to develop this Nanakshahi library (Singh, A., 2019b) or *gem* (Singh, A., 2019a).

The library adds functionality, creating Nanakshahi date objects, conversion between Nanakshahi and Common Era (CE) dates, a comparison between two Nanakshahi dates, printing Nanakshahi dates in Gurmukhi script, and checking and displaying Gurpurabs that fall on a given date. The inclusion of Nanakshahi gem augments the functionality of the Ruby Standard library's date class to convert any date object into a Nanakshahi date object. The code was made available under an MIT license for anyone to use and contribute (Open Source Initiative, 2019).

Proposals

The start of a calendar historically marks the beginning of an era. In Christian usage, the term *BC or Before Christ* precedes era before *AD or Anno Domini*, medieval Latin for "in the year of the Lord," with the modern, non-denominational terms being BCE and CE, for Before Common Era and Common Era. The *Jahiliyyah* is considered the period before Islam in Arabia, an Islamic neologism representing an era lacking in knowledge (*'ilm*) and gentleness (*hilm*) (Khatab, 2006).

For the era before year 1 Nanakshahi, two proposals have been made.

1. The era prior to 1 Nanakshahi should be referred to as Dhundhkaal (ਧੁੰਧਕਾਲ) - a combination of two words - ਧੁੰਧ which means fog and ਕਾਲ - which means era. The nomenclature takes inspiration from Bhai Gurdas Vaaraan (SearchGurbani.com, 2019).

ਸਤਿਗੁਰ ਨਾਨਕ ਪ੍ਰਗਟਿਆ ਮਿਟੀ ਧੁੰਧ ਜਗ ਚਾਨਣ ਹੋਆ॥

- ਵਾਰਾਂ ਭਾਈ ਗੁਰਦਾਸ

True Guru Nanak has emerged, the fog has cleared and the world is illuminated with light.

- Bhai Gurdas Vaaraan

2. Similar to the *Anno Domini (AD)* system based on the Gregorian calendar, there should be no year zero. Year 1 Dhundkaal precedes year 1 Nanakshahi or 1469 CE. This feature has been added to the Nanakshahi open source library.

Purewal's original work recommends the calculation of dates only past its adoption year of 2003 CE to avoid mixing up historical dates given in the original calendars.

It is argued here, however, that given Sikh history has been registered in a variety of calendars such as Bikrami, Hijri, and CE in the last century, it may be prudent to fix these dates on the Nanakshahi calendar. At the least, the events post 1 Nanakshahi, or 1469 CE can be represented on the Nanakshahi calendar.

Future Work

The implementation of the Nanakshahi code libraries in other programming languages such as Javascript and Python are underway.

The Nanakshahi calendar offers a straightforward yet significant departure from traditional almanac dates based on Bikrami calendars prevalent in twentieth-century Panjab and among many Sikh *Sampradahs* [16]. Further advocacy and dialogue are needed to explore its significance in the future of the Sikh Panth.

The permanence of seasons is one of the strong arguments for the Nanakshahi calendar. There has been a mass movement of Sikhs beyond the borders of Panjab in the last century and the Bara Maha's connection to Panjab's local seasons differs from that of the Sikh diaspora's experience. Purewal argues however that "The Barahmahas of Guru Sahiban mention the relation of months with seasons of Punjab and not of Australia" (Purewal, undated).

Further, it needs to be studied if the Nanakshahi calendar software libraries can be extended to take into account the Julian/Gregorian date correction of 1582 CE, to be able to calculate any of the recorded human history dates in the Dhundkaal era.

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[16] These are traditional Sikh organizations based on particular religious beliefs or practices.

References

Bodiwala, Suresh. 2017. Sikh religious society organizes two-day conference in Chicago to implement mool Nanakshahi calendar. https://www.dailyherald.com/submitted/20171118/ sikh-religious-society-organizes-two--day-conference-in\ -chicago-to-implement-mool-nanakshahi-calendar, November.

Bowman, John. 2000. *Columbia Chronologies of Asian History and Culture.* Columbia University Press.

Deol, Jeevan. 2001. Eighteenth century Khalsa identity: Discourse, praxis and narrative. *Sikh Religion, Culture and Ethnicity.*

Dilgir, Harjinder Singh. 1997. *The Sikh Reference Book*. Sikh Educational Trust for Sikh University Centre, Denmark.

Fenech, Louis E. and W. H. McLeod. 2014. *Historical Dictionary of Sikhism.* Lanham, MD: Rowman and Littlefield.

Graney, Juris. 2018. Sikhs around world celebrate new year using Edmonton man's calendar. https://edmontonjournal.com/news/local-news/ sikhs-around-world-celebrate-new-year-using-edmonton-mans-calendar/, March.

Khatab, Sayed. 2006. *The Political Thought of Sayyid Qutb: The Theory of Jahiliyyah*. Routledge.

Nesbitt, Eleanor M. 2006. *Sikhism: A Very Short Introduction*. Oxford University Press.

Mercado, Alejandra. 2007. *Gregorian calendar*. http://scienceworld. wolfram.com/astronomy/GregorianCalendar.html.

Nautical Almanac Office, editor. 2010. *Astronomical almanac for the year 2011*. Astronomical Almanac Office US Naval Observatory, Washington.

The Nebraska Astronomy Applet Project. 2020. *Sidereal vs. Synodic Motions*. https://astro.unl.edu/naap/motion3/sidereal_synodic. html, May.

Open Source Initiative. 2019. *The MIT License*. https://opensource.org/ licenses/MIT, February.

Purewal, Pal Singh. (undated). *Gurbani and Nanakshahi Calendar*. Purewal.biz, Edmonton, Canada.

Sarma, K.V. 1972. *A History of the Kerala School of Hindu Astronomy*. Vishveshvarananda Institute of Sanskrit and indological Studies, Panjab University, Hoshiarpur.

SearchGurbani.com. 2019. *Bhai Gurdas Vaaraan*. https://www. searchgurbani.com/bhai-gurdas-vaaran/index/vaar, accessed February.

Sharan, Anand M. 2003. Understanding of periodic motions and utilization of this knowledge in ancient India. https://www.engr.mun.ca/~asharan/ VIKRAM/VIKRAM_V7.htm, December.

SikhMuseum.com. 2013. First Sikh Coin. http://www.sikhmuseum.com/ words/artifacts/artifact1.html.

Singh, Arvinder. 2019a. *Nanakshahi ruby gem*. https://rubygems.org/gems/ nanakshahi, January.

Singh, Arvinder. 2019b. *Nanakshahi*. https://www.rubydoc.info/gems/ nanakshahi, January.

Singh, Surjit. 2018. HT Explainer: Know about the controversial Nanakshahi calendar. https://www.hindustantimes.com/punjab/ht-explainer-know-about-the-controversial-nanakshahi-calendar/ story-UeKm0yTcDtat1FCRIel86K.html, March.

The Sikh Cast. 2019. What is barah maha and why your kids will love it? https://sikhcast.podbean.com/e/what-is-barah-maha-and-why-your-kids-will-love-this-with-jasmine-kaur/, February.

Zerubavel, Eviatar. 1982. Easter and Passover: On calendars and group identity. *American Sociological Review*, 47(2):284–289.