THE SOLAR ENERGY AS UNDERSTOOD FROM 
SĀMBAPURĀṆA

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Abstract

The ancient seers have observed nature closely and have recorded their observations in the Vedas and Purāṇas. Sun is the main source of light and energy to planet earth. The various aspects of Sun and its mode of worship has been dealt with in the Purāṇas. This paper brings to notice some of the aspects of sun which have been specifically termed to be the cause of energy and change in environmental conditions on earth and other planets. The Sāmbapurāṇa is the prime source of the information for this paper.

INTRODUCTION :

The Purāṇa literature is vast and in large numbers. The Purāṇas are grouped as Mahapurāṇas and the Upapurāṇas with eighteen principal ones in each classification. Based on the principal deity dealt with in the Purāṇas, they are further grouped as Saurapurāṇas dealing with Sun, Sāktapurāṇas - with the Goddess as the Supreme, Gāṇapatya - Lord Gaṇesa as the principal God, Śaiva - Śiva as the Highest Lord, Vaiṣṇava - Viṣṇu as the Supreme Deity and Kaumāra - Kumāra as the Supreme.

The Sun worship exists from the Vedic times. The yearly Saṅkrānti is celebrated in the month of Pauṣa throughout India when the Sun starts moving northwards from the tropic of Capricorn. The Sundays of the Śrāvaṇa month are dedicated to Sun-worship. The famous Sun temple at Konark also remains as a
place of the Saura worship. Some Purāṇas describe in detail the worship of Sun while a few deal briefly about it.

Today science has developed to such an extent that the solar energy is trapped and utilised for various purposes especially in generating electricity. Further it is discovered that there are many rays like the ultra violet ray which are harmful with direct exposure during intense summers but put to use effectively in medical field. Similarly the Vitamin D – indispensable for human health especially the bones, is available exclusively in the Sun's rays alone. These are the general facts known about the Sun's rays in recent times.

**SUN IN THE SĀMBAPURĀṆA**

The Purāṇas though dedicated to a particular cult as Śākta or Śaiva, deal with all the subjects. The description of Sun, it's size, various rays, names of different months and seasons etc presented in Purāṇas reveal that the sages of ancient times have made a deep study of nature around them. Sun worship and description of Sun can be found in most Purāṇas in a few chapters. The Bhaviñya, Agni, Garuḍa, Viṣṇudharmottara, Bhaviṣyottara, Kālikā, Mārkaṇḍeya and other Purāṇas have extracts on the various aspects of Saura cult. Of all the Purāṇas extant, the Sāmbapurāṇa is the only one that deals principally with the Saura worship. Thus the present paper culls out information about Sun and Solar energy from the Sāmbapurāṇa.

The Sāmbapurāṇa¹ records that the Supreme Lord Śūrya took the form of twelve Ṛṣabha. The twelve Ṛṣabha are Indra, Dhatā, Parjanya, Pūṣā, Tvaṣṭā, Aryamā, Bhaga, Vivasvān, Viṣṇu, Amśu, Varuṇa and Mitra:

\[
\text{तत्त: स च सहस्राभ्यस्त्रृष्णयः पुरुष: स्वर्यम्।}
\text{कृत्वा द्वादशभात्मानमादित्यमुद्दपदति।}
\text{इन्द्रो धाताः परजन्य: पूर्वा त्वादाृवर्यम् भगम्।}
\text{विवस्वानं विष्णुर्मण्ड्रश्च वरुणों मिन्नु एवं च।}
\]

¹ Sāmbapurāṇa
Of these twelve Ādityas, Indra is said to lead the Gods; Dhātā is the creator; Parjanya exists in the clouds and showers rain; Pūṣā exists in the food nourishing all the living beings; Tvaṣṭā presides over the plants and herbs; Aryamā is responsible for the movement of air; Bhaga exists in the bodies of living beings; Vivasvān assumes the form of digestive fire in living beings; Viṣṇu takes various forms to destroy the enemies of the gods; Amśa existing as the winds pleases all beings; Varuṇa enters the water as the life energy and Mitra as the sun, gives light and energy to the world.

THE RAYS NOURISHING THE STARS AND PLANETS:

Sāmbapurāṇa² states that there are seven important rays which nourish the planets and stars:

\[
\begin{align*}
\text{Rays} & : \text{Planet/Stars} \\
\text{Suṣumnā} & : \text{The moon} \\
\text{Samyagvasu} & : \text{Lohita (Mars)} \\
\text{Viṣvakarmā} & : \text{Budha (Mercury)} \\
\text{Udāvasu} & : \text{Bṛhaspati (Jupiter)} \\
\text{Viśvavyacā} & : \text{Śukra (Venus)} \\
\text{Surāt} & : \text{Śanaiścara (Saturn)} \\
\text{Harikeśa} & : \text{The stars}
\end{align*}
\]

As gleaned from the verses cited above the different types of rays and the planets that they support are given in the table:
The distance of the planets from the sun varies and hence the intensity, angle and other aspects influence the ray’s component ratio which is observed by our seers and hence termed particularly.

Different bodies of the Solar System receive light of an intensity inversely proportional to the square of their distance from Sun. The actual brightness of sunlight that would be observed at the surface depends also on the presence and composition of an atmosphere. For example, Venus’s thick atmosphere reflects more than 60% of the solar light it receives. Sunlight on Mars would be more or less like daylight on Earth during a slightly overcast day, and, as can be seen in the pictures taken by the rovers, there is enough diffuse sky radiation that shadows would not seem particularly dark. Thus, it would give perceptions and “feel” very much like daylight on the Earth. The spectrum on the surface is slightly redder than that on Earth, due to scattering by reddish dust in the Martian atmosphere.

**RAYs AND THEIR VARIED EFFECTS :**

The Sāmbapurāṇa³ states that the rain causing rays are collectively called Amṛtas, which are four hundred in number with the following names— Vandanās, Medhyās, Kātanās and Ketanas. The rays that cause hima (snow) are yellow coloured, thirty in number and are called Candras. The rays that nourish the men through the food are Auṣadhas(herbs), which nourish the Pitṛs (manes) are Svadhā and gods are Amṛta(nectar):

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तासां चतुःशतं नाडों वर्णंशेषा चिन्त्यमूलं।
बन्दनाल्लभं मेध्यास्य कातनाः केतनास्य च।
अमुता नामतः स्वर्यं रजमयो वृद्धिःस्फर्जच्या।
हिमावहास्तु त्रिशृद्धं ताम्योदन्यं रसायं रसायं।
सम्यं विभृति ताः सर्वानु मनुष्यान्तः देवता।
मनुष्यानोष्मेवधिन्तु स्वव्ययं च विन्दुः।
अमृते सुरासुरां सर्वस्त्रयशीविधिर्कर्मकृतः॥
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The various rays of the sun and their numbers found in each season is also recorded in the *Purāṇa*¹: In the *vasanta* (spring) and *grīṣma* (summer) He shines with six rays; in the *śarad* (autumn) and *varṣā* (rainy seasons) He causes the rains with four of his rays; in *hemanta* (winter) and in *śīśira* (cold season) He emits the dew with only three of his rays:

कसन्ते चैव ग्रीष्मे च शति: स: तपति विषुः ॥
शरस्तु चैव वर्षातु चातुर्भिः संप्रवर्षित।
हेमन्ते शाशिरे चैव हिमोत्सर्ग त्रिभि: पुनः ॥

**THE TWELVE SUNS IN-CHARGE OF EACH MONTH OF THE YEAR:**

The twelve Ādityas shining in the twelve months and the number of their rays are recorded in the *Sāmbapurāṇa*²:

उत्तिष्ठति सदा छोटे मासेद्वारादाशिमाः करातूः ॥
विश्वस्वार्थवेष्ठमासे तु अपाते चामुखानूः स्मृतः ॥
पर्जन्यः आचण्यां भासां वरुण: प्रोज्ञसंजयः ॥
इन्द्रोद्यधयुज्ज्वले मासेः धाता तपति कालिकः ॥
मार्गशीर्षिः तथा मित्रः पौषे पूषा दिवाकरः ॥
मागेष्व भद्रस्तु विश्वस्वार्थवण्डा तपति फाल्युगे ॥

In accordance with the above details, the *Purāṇa*³ also adds the number of rays of the sun that reach the planet earth in each month of the year. Further it records that during the northern solstice the solar radiation increases and during the southern solstice it decreases; they vary in each month and season:

ऐतेद्वारादाशिमविश्वास्चारुव्रीमाः दीयः सदा ॥
दीयाः गोसाइवेश शतेश्व तिमिरयमः ॥
हििवास्तकविष्टथु वांशुमानू पञ्चकीर्तिमाः ॥
विकल्पान्ति पर्जन्यो वरुणचर्मायथा ॥
इन्द्रस्तु दिगुणः पद्भिधार्तिकादाशिमः शते: ॥
These records as given above are represented in the chart below:

| Ādityas | Month | No. of Rays |
|---------|-------|-------------|
| Viṣṇu   | Caitra | 9,000       |
| Aryamā  | Vaiśākha | 1300       |
| Vivasvān | Jyeṣṭha | 1400       |
| Amśumān | Āśādha | 1500       |
| Parjanya | Śravaṇa | 1400       |
| Varuṇa  | Bhādra | 1300       |
| Indra   | Āśvina | 1200       |
| Dhātā   | Kārttika | 1100      |
| Mitra   | Mārgaśirṣa | 5,000   |
| Pūṣā    | Pauṣa  | 1000       |
| Bhaga   | Māgha  | 5000       |
| Tvaṣṭā  | Phālguna | 1100     |

From the above table it can be understood that the ancient seers were aware of the different types of rays of the sun and their numbers. In modern days, the pyranometer or the pyrheliometer is used to measure the rays of the sun. But the instruments used by the ancient Indians are not mentioned in the Purāṇas or any other text.
In modern research it is understood that the total amount of energy received at ground level from the Sun at the zenith depends on the distance to the Sun and thus on the time of year. It is about 3.3% higher than average in January and 3.3% lower in July.

The *Sāmbapurāṇa* also describes the sun to have a particular colour in each season. It is further stated that these are the natural colours of the sun in each season. In such a natural course of the sun the land is said to be prosporous.

The colour of the sun in each season is represented in the table below:

| Season       | Colour       |
|--------------|--------------|
| Vasanta (Spring) | *kapiṣa* (Tawny) |
| Grīṣma (Summer)  | *kāṇcana* (Golden hue) |
| Varṣā (Rainy)    | *śveta* (White) |
| sarad (Autumn)   | *pāṇḍu* (Pale-white) |
| Hemanta (Winter) | *tāmra* (Coppery red) |
| sīśira (Dew)     | *lohita* (Reddish) |

The *Bṛhatsamhitā* (XXX. 22) also records the particular colour of the sun's beam during the different seasons. It also declares that each colour at twilight is beneficial in its own season and harmful if it is contrary:

The *Bṛhatsamhitā* also deals with its effects on the earth indicated by the change in the colour of the sun in various seasons.
MODERN RESEARCH:

The spectrum of surface illumination depends upon solar elevation due to atmospheric effects, with the blue spectral component dominating during twilight before and after sunrise and sunset, respectively, and red dominating during sunrise and sunset. These effects are apparent in natural light photography where the principal source of illumination is sunlight as mediated by the atmosphere.

Also it has been established that direct sunlight has a luminous efficacy of about 93 lumens per watt of radiant flux. This is higher than the efficacy (of source) of most artificial lighting (including fluorescent), which means using sunlight for illumination heats up a room less than using most forms of artificial lighting.

CONCLUSION:

From the information available in the Purāṇas, it is evident that the sages had keenly observed every aspect of the sun through a period of time and have recorded it. The rays causing change in seasons, nourishing the planets and stars, intensity of the rays, their colours in different seasons have been specifically named and dealt with in detail. These can be taken up for further research and can be re-established with experiments by a modern researcher.

End Notes:

1. Sāmbapurāṇa, IV.5-6; 8-22
2. ibid, VII. 62; 64-69
3. ibid, VII. 46-50
4. ibid, VII. 51-2
5. ibid, IX. 5-8
6. ibid, IX. 9-14
7. ibid, VIII. 12-13
8. Bṛhatatsamhitā, XXX. 22
9. ibid, XXX.
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2. *Varāhamihira’s Brhat Samhitā*, with eng.tr. M. Ramakrishna Bhat, MLBD, Delhi, 2010.
3. *Kūrma Mahāpurāṇam*, with Hindi tr. K.L. Shastri, Parimal Publications, Delhi, 2003.
4. Hazra, R.C., *Studies in the Upapurāṇas*, Sanskrit College, Calcutta, 1958.
5. Pai, G.K., *Cultural history from the Kūrma Purāṇa*, Sukrtindra Oriental Research Institute, Cochin, 1975.

All modern research data has been collected from https://en.wikipedia.org/wiki/Sunlight.

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