

RIGVEDA AND SARASVATI-SINDHU CIVILIZATION

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SARASVATI RIVER

The discovery of the ancient courses of the Sarasvati river is the discovery of the millennium and the date of desiccation of this great river is fundamental in providing a broad range of dates for the Rigveda. Rigveda refers to the might of this river flowing from the mountain to the ocean and relates to a period when the river was in full flow, fed by the glacier waters from three sources: (1) Mt. Kailas (S'atadru), (2) Yamuna (erstwhile Chambal river) fed by the glacier waters of Yamunotri and (3) Tons and Giri rivers fed by the Har-ki-dun glacier complex (Rupin and Supin) of the Bandarpunch massif (20 kms. NW of Yamunotri, in W. Garhwal, UP)

The desiccation of the river over an extended period of about 300 years (ca. between 1700 to 1300 B.C.), is the central cause for the migration of the peoples eastward, northward and southward from the settlements on the banks of the Sarasvati river which had nourished the civilization ca. 3000 to 1700 B.C. (See web: <http://www.probys.com/sarasvati>)

The river also binds the Rigvedic culture and the Sarasvati-Sindhu civilization since the Sarasvati river is the locus of over 1200 ancient archaeological settlements and sapta-sindhu is the Rigvedic domain.

Archaeology has provided C-14 dates for the settlements on the banks of the Sarasvati river and work in historical metallurgy has established the antiquity of the Ganeshwar mines in Rajasthan which provided the mineral sources to sustain the bronze age civilization.

Tritium (hydrogen isotope) analysis of deep water samples taken by BARC (Bhabha Atomic Research Centre) has provided a broad spectrum dating for the waters of the Sarasvati river now revealed as groundwater sanctuaries and aquifers. The waters range from 4000 to 8000 years Before Present (B.P.).

Glaciological studies have shown the secular sequence of desiccation of the Sarasvati river: (1) the streams were flowing through Markanda river; (2) the streams migrated towards the Drishadvati river; (3) Drishadvati river migrated eastwards, linked up with Chambal which captured the Tons river stream flowing into Sarasvati river at PaontaSaheb (H.P.); (4) S'atadru river stream which had joined Sarasvati river at Shatrana migrated westwards with a 90-degree turn at Ropar and ultimately became a tributary of the Sindhu river. Glaciological studies have also showed the existence of quartzite and metamorphic rocks in Paonta Doon valley and near Ad Badri in Siwalik ranges attesting to the existence of the mighty Vedic Sarasvati river which had brought in these signature rocks.

After the rise of the Himalayas, S'atadru became the anchorage river of Sarasvati; what is now called Yamuna joined the Sarasvati river at PaontaSaheb. Ganga which had emerged from Gangotri received Chambal (now Yamuna) as its tributary at Prayag, Allahabad. An important glaciological dating tool is the fact that each glacier can supply waters into a major stream like the Ganga for a period of 10,000 years. The conclusions from these earth science perspectives are that when the Sarasvati river was in its mighty flow, it had carried the glacier waters which are now carried by S'atadru and Yamuna.

RIGVEDIC CULTURE: SOMA AND MAHA_VRATA

Rigvedic culture was governed by a cooperating society among the yajn~ikas and others, both endeavouring to generate wealth:

sama_ne u_rve adhi sangata_sah sam ja_nate na yatante mitha-s-te te deva_na_m na minanti vrata_nyamardhanto vasubhir-ya_dama_na_h (RV. 7.76.5)

Being united with common people they become of one mind; they strive together as it were, nor do they injure the rituals of the gods, non-injuring each other they move with wealth. (Sa_yan.a explains sama_ne u_rve as cattle --common property of all: sarves.a_m sa_dha_ran.e go-samu_he).

The Sarasvati-Sindhu rivers supported the cultivation of wheat and barley, as evidenced by the archaeological finds. (John Marshall, *Mohenjo-daro and the Indus Civilization*, vol. 1, p.27) s'unam nah pha_la vi kr.santu bhu_Umim... suns_s'i_ra_ s'unam-asma_su dhattam: the ploughshare ploughing makes the food that feeds us and with the feet cuts through the path it follows (RV. iv.57.5-7).

Many vedic people were herdsmen, pastoralists: ja_to-yad-agne bhuvana_ vyakhyah pas.un na gopa_: agni looks upon the people of the world as a herdsman watches his cattle. (RV. x.19.3-5).

The vedic period was a nascent material culture: the period had weavers; the words siri_ and vayitri_ denote a female weaver. (RV. x.71.9; PB, I.8.9); tasara is referred to which is a shuttle (RV. xiv.2.51). Reference to women workers engaged in weaving is provided: tantum tatam samvayanti (RV. ii.3.6).

Like the people of the Sarasvati-Sindhu civilization who were fire- and metal-workers, the people of the Rigvedic culture were fire-workers *par excellence*. Gold (hiran.yapin.d.a_n, hiran.yayuh) was highly valued (cf. RV. vi.47.23, vii.78.9). Divoda_sa gave golden treasures to the r.s.i Garga. Rigveda refers to nis.kagri_va (RV. v.19.3) which is a golden ornament on the neck and necklaces of gold reaching down to the chest.hiran.ya (pl.) means gold ornaments (RV. 1.122.2). Gold was smelted from the ores (PB, xviii.6.4, JB I,10) which evoke the Indian alchemical tradition enshrined in the soma rasa, later elaborated as the science of alchemy: rasa-va_da. In Tamil soma-man.al means, sand containing silver ore. In Egyptian, assem means electrum; in Gypsy, somnakay means gold. Gold was won from the river-beds: Sindhu is called the hiran.mayi_ (RV. x.75.8); Sarasvati_ is called hiran.yavartani_ (AV. vi.61.7). [cf. the reference to vasati_vari waters in vedic hymns related to soma, an apparent reference to panned-gold from the Sarasvati_ river-bed.]

SOMA

With this background information on the locus of Rigvedic culture and the Sarasvati-Sindhu civilization, we can revisit the archaeological evidence and the textual evidence.

The **Soma** yajn~a is the soul of the Rigveda (**a_tma_yajn~asya**: RV. IX. 2,10; 6,8). Linking with Indra, **Soma** is called in RV. IX.85,3 the ‘soul (a_tma_) of Indra’, the bolt (vajra) of Indra’ (RV. IX.77,1) and even ‘generator of Indra’ (RV. IX.96.5).

What is **Soma**? **Soma** which was the ‘soul’ of the vedic sacrifice was put through three daily pressings, while worshipping all the gods. (Avesta Yasna X.2 mentions only two pressings). **Soma**/haoma literally means ‘extract’, from the root su – hu ‘to press’. Scores of decipherments have been claimed as summarized by Harry Falk (**Soma** I and II, 1989, *BSOAS*, LII, Pt. 1, pp. 77-90). It would appear that a new interpretation is possible: **Soma** was electrum (gold-silver ore) which was purified in the pavitram to yield potable gold and silver after reducing and oxidizing the baser metals using ks.a_ra supplied by plants and using bones also as reducing agents. (Kalyanaraman, *Indian Alchemy: Soma in the Veda*, Delhi, Munshiram Manoharlal, in press). This metallurgical, allegorical interpretation is consistent with the decipherment of the script of the civilization revealed through over 3000 inscriptions on seals, tablets, copper tablets and on metallic weapons. The decipherment claims that the inscriptions are lists of bronze-brass-copper weapons produced by the fire- and metal-workers of the civilization. The dawn of bronze age in the civilization area is attested by many hundreds of artefacts of weapons and tools, apart from exquisite articles of jewellery using gold, silver, electrum, bronze, copper and artificial stones.

In the early stages of the use of **Soma**, mythology was not the dominant characteristic; it was simply a product which had to be processed. (See also Falk, Harry, **Soma** I and II, 1989, *BSOAS*, LII, Pt. 1, pp. 77-90; Falk analyses **Soma** as a plant and concludes that it was *ephedra*, used as a stimulant). In the context of the poetics of the Rigveda which abounds in allegories, puns and metaphors, it is hypothesised that only **Soma**, and **Soma** alone was a product refined using Agni; all the other references to gods are poetic degrees of freedom to invoke gods into artefacts used in the processing of **Soma**. Perhaps, even Indra was relatable to the lexeme: **indh** (semant. firewood or charcoal):

i~dhaur.a_ = room for storing wood (H.); **idho_n** = tripod to put over the fire (Kal.); **indhana** = fuel (Pali); **e~_date** = fireplace (Wg.); **samiddhe_** = sets fire to, takes fire; **samidha** = ignited; **samidh** = fuel (RV.); **samidha_** = fuel (Pali); **samiha_** = fuel (Pkt.); **su~dhkan.a_** = to be kindled (P.); **negad.i** = large fire lighted for warmth in cold weather or to keep off wild beasts (Te.); **iruntai, iruntu, iruntil** = charcoal (Ta.); **cirun** = charcoal (Pa.); **sindi** = soot (Kol.); **sirin** (*pl. sirnil*) = charcoal, cinders (Ga.); **irk, sirik** = charcoal (Go.); **ri_ka, ri_nga** = charcoal (Pe.); **si_nga** = charcoal (Kui); **ri_nga, ri_ngla** charcoal (Kuwi)

Gernot L. Windfuhr, [Haoma/Soma: the plant, in: *Acta Iranica* 25 (= *Papers in Honour of Professor Mary Boyce*, Hommages et Opera Minora, 11) (Leiden, 1985), 699-726, see pp. 703, 707] has pointed out that **Soma** was neither hallucinogenic nor intoxicant and proceeds to identify **Soma** as ginseng, a root used as a stimulant. The identification of **Soma** as a root is questionable because ginseng has no component to connote am.s’u/asu.

RV 10.34.1 states: Somasyeva maujavatasya bhaks.o vibhi_dako ja_gr.vir mahyam accha_n (an alerting eatable or food from mount mu_javat). **Soma** keeps Indra awake (vivyaktha mahina_vr.s.an bhaks.am. **Somasya** ja_gr.ve (RV. 8.92.23). **Soma** is the inspirer or vipra of Angiras (RV. 9.107.6). [cf. **an:ga_ra** = glowing charcoal (RV.); **angar** id. (Gypsy). **in:gha_la** = growing embers (Pali); **i-gal., i-gla_** charcoal-burner (M.); **aggi** = fire (Te.)] In the context of processing (refining or purifying or smelting) **Soma** (electrum ore or quartz), charcoal is a vital component; since charcoal combines with the baser metals and oxidizes them leaving the residual potable, gold-silver compound which is electrum. When **Soma** is referred to as indrapi_ta or ‘drunk by

Indra (**indav indrapi_tasya**) (PB 1.5.4), the reference is indeed to the reducing action of glowing charcoal embers during the process of smelting the electrum ore. Naturally, Indra received the major share of **Soma**. (RV. I.2,3; II.41 indicate the sequence of offerings of **Soma**: va_yu, indra-va_yu, mitra-varun.a, as'vins, indra, vis've deva_h, Sarasvati_) Thus, Indra, as the chief partaker of **Soma**, is linked with **Soma** from the mountains (the ore) and some on the earth (ground in pressing-stones): 'May heavenly drink exhilarate thee, Indra, and also what is pressed in earthly places'. (RV. X. 116,3).

RV. X. 85,3 refers to the **Soma** known only to the brahmins; this is an early indication of the mystery or secret doctrine that would surround the **Soma** pressing process in later-day texts. The nature of **Soma** would be mystified in later texts by references to the moon (the colour of silver component of electrum). Tamil tradition has it in a lexeme: co_ma man.al = sand containing silver ore. (Winslow's lexicon).

The water element is the potable metal; Vr.tra withheld the waters. Indra frees the waters. **Soma** is described as having 'hanging branches bending down' (**naica_s'a_kha**: RV. III.53,14) It is not necessary to interpret the term 'ti_vra' (sharp) in the context of taste; ti_vra connotes the sharpness of the metallic components of the ore blocks. **a~_su** = fibrous layer at root of coconut branches, edge or prickles of leaves; **a~_s** = fibre, pith (Or.); **a~_si~_** fine particles of flattened rice in winnowing fan (M.); these lexemes provide a semantic lead to the am.s'u/asu used to describe **Soma**; the term connotes the streaks of metal, seen like fibres of a stringy fruit or nap of cloth [**a~_s** (B.)]. The am.s'u was ruddy (RV. VII.98,1). The RV reference to **Soma** 'growing' on the mountains (giris.t.ha_) is explained in the context of the ores obtained from the mines in NW India. (**giris.t.ha**: RV. III.48,2; V.43.4; IX.18.1, 62,4; **parvata_vr.dh**: RV. IX.46.1) Hence, the reference to Somam adrau (RV. 5.85.2) plucked in two rocks. The colour of the **Soma** filaments contained in the ore block are 'reddish' or 'yellow' (**arun.a/arus.a** or **hari/za_iri**). Za_iri = golden-hued (Yasna IX.16,30). RV. 10.97.18, 19 refer to the group of herbs having **Soma** as their king (Somara_jn~ih); the growth of herbs on the mountains is the obvious reference here. 'Ma_taris'van fetched one of you (Agni and **Soma**) from heaven; the eagle twirled the other from the cloud-rock'. (RV. I.93,6). The links of **Soma** with rocks are vivid. (adri: RV. V.85,2; I.93,6)[See Bloomfield, The Legend of **Soma** and the Eagle, *JAOS*, 16, 1896, pp. 1-24). 'High is the birth of thee, the plant; thee being in heaven the earth received'. (RV. IX. 61.10). Yasna (X.4,10-12,17) places haoma on the high mountain haraiti; it is placed there by a skilful god, wherefrom holy birds carried it everywhere to the heights. Rigveda connects **Soma** with the mount Mu_javant: 'As draught of Maujavata **Soma**, so doth, the enlivening vibhi_daka delight me' (RV. X.34,1). Griswold notes: 'The mountain Mu_javantt (if it was a mountain and not simply the name of a people), being closely connected with the Gandha_ris (AV. V.22,5,7,8,14) must have been situated somewhere between Bactria and the Punjab. In the Tait. Samh. I. 8,6,2 and the AV. Passages referred to above the Mu_javants are taken as a type of distant folk, to which Rudra with his fever-bearing bow is entreated to depart. In fact Mu_javant is as far off and mysterious as the river rasa_. Possibly both embody dim reminiscences of the undivided Indo-Iranian days.' (p. 217). **Soma** flourished during the rainy season, swelling with milk (RV. II.13,1), strengthened by the rain-cloud, parjanya (RV. IX.82,3; 113,3). Yasna (X.3): 'I praise the cloud and the waters that made thy body to grow upon the mountains.' Later rituals state that **Soma** had to be purchased from a s'u_dra, who was a trader in **Soma** who was like the gandharva who held back the celestial **Soma**. (cf. ks.udraka = maker of minute beads or minor work in gold (*Arthas'a_stra*: 2.13.37 and 40). There is a reference to ki_kat.as in the context of the sacrifice: 'Amid ki_kat.as what do thy kine, O Indra? That tribe nor mixture (a_sir or milk for mixing with **Soma**) pours nor heats oblation; bear thou to us the wealth of pramaganda, give up, O Maghavan, to us the 'low-branched'. (RV. III.53,14). Regarding the ritual purchase of the **Soma**, TS. 6,1,6,7 states that one buys the **Soma** with a ruddy, yellow-eyed cow; 'this, one should know, is the form

of **Soma**: then one buys it with its own deity. That became gold... Those who discourse on brahman say, ‘how is it that offspring are produced through that which is boneless, and yet are born with bones?’ Because one offers the gold, placing it in the ghee, therefore offspring are born... with bones.”

In the tradition of the Black Yajurveda, A_pS’. 10,25,11 states that the adhvaryu should buy the **Soma** with gold saying: “ I buy the bright (s’ukra, **Soma**) with bright (gold), the glittering (candra) with glittering, the amr.tam with amr.tam to match thy cow” (TS. 1,2,7,1); the **Soma**-dealer answers: “King **Soma** deserves more than that”. Adhvaryu washes king **Soma** with water and unfolds him (A_pA’. 11,1,11). “Every shoot of thee, O **Soma**, must swell for Indra...” (TS. 1,2,11,1). The purpose of the yajn~a is: ‘ by means of ghee as the vajra and two sacrificial ladles as their arms the gods slew Vr.tra. Vr.tra is the **Soma**. One should know that they slay **Soma**, when they sacrifice with ghee in his presence. By means of these mantras one makes **Soma** swell again.” (TS. 6,2,2,4)

The Avestan references to Haoma as a plant can be explained as a ritualistic representation of the **Soma** refining process of the earlier days on the banks of the Sarasvati river. Yasna refers to the scent of the plant (Yasna, 10,4) but RV does not. There is, however, reference to the intense smell of the type common in the workshop of a metalsmith who uses ks.a_ra (plant-based alkalis) to oxidise the impurities or baser metals in an ore block. Griswold notes that there are only two references to haoma in the Ga_theta_s of Zoroaster, one mentioning du_raos’a ‘ the averter of death’ (Yasna, XXXII.14), the standing epithet of haoma in the later Avesta, and the other alluding to ‘the filthiness f this intoxicant’(Yasna, XLVIII.10).These allusions are sufficient to prove that the intoxicating haoma was under the ban of the great reformer (H.D. Griswold, 1923, *The Religion of the Rigveda*, London, Oxford University Press, p. 14)

Next in importance to Agni and Indra, **Soma** is addressed in about 120 hymns of the Rigveda. Indra and Varun.a gain anthropomorphic status as gods; but **Soma** is generally represented in its physical nature.

Soma pavama_na. **Soma** in the process of passing through the refining instrument (potr.). [The actors are: Hotr., connected with Indra; the Potr. connected with the Maruts (Potr. is the purifying priest; also the ‘cleaning’ instrument); the Nes.t.r. linked with Tvas.t.r.; the divine wives, agni_dh with agni, the brahman with Indra and the pras’a_s.t.r. with mitra-varun.a]. ulu_khala (mortar) is used to press **Soma** (RV. I.28,1,5; gra_van is rendered as a ‘press-stone’). This is a reference to the pounding of the ore block to pulverize the ore. In Yasna (XXIV.7; XXV.2) ha_vana (hu = to crush) is ‘the utensil in which the twigs of the haoma plant are pounded’. Another method refers to the gra_va_n.ah (press-stones) are placed on the’ox-hide’, held by the hands and with ten fingers and activated through two boards. (RV. X.76,94 and 175). Dhis.an.a_ (RV. X.17,12) is perhaps a reference to a hollow in which the press-stones work. This may be a reference to a hollow covered with ox-hide specially prepared on the sacrificial ground. The ox-hide is referred to in RV. IX.79,4; IX.66,29; IX.101,11 and was used to catch the drops of **Soma** (apparently, the pulverized bits of the electrum ore block). The later rituals state that the pressing-boards are adhis.avan.a phalaka and are also laid across a sounding-hole dug beneath (See Hillebrandt, VM. I.148). A reference to the sacrificial ground with the hollow is mirrored in the term: r.tasya yoni (RV. IX.64,11,22): the home of the yajn~a. The reference to r.tasya dha_ra_ (RV. IX. 63,14,21) is a reference to the process of flowing through the wool strainer.

Indra’s outward appearance flowed away from his semen and became suvarn.am hiran.yam when he had drunk **Soma** that was exposed to witching. (S’Br 13,1,1,4: S’Br. 12,7,1,1: retasa eva_sya ru_pam asravat; tat suvarnam hiran.yam abhavat; cf. J.Gonda, 1991, *The Functions and*

Significance of Gold in the Veda, Leiden, E.J.Brill, p. 5). [Note: S'Br. 12,7,2,10: lead (s'i_sa) is 'a form of both bronze and gold'; ahi is a snake; na_ga is a snake; na_ga = lead (Skt.)] RV. 4,17,11 relates how Indra gained cows, gold, troops of horses. When **Soma** purifies itself, **Soma** wins cattle, chariots, gold, the light of heaven, and water for them (RV. 9,78,4). The river Sindhu is rich in excellent horses, good chariots, good garments, rich in gold (RV. 10,7,5,8). RV. 9,112,2 recounts how the blacksmith searches for a customer who possesses (much) gold. Gold is described as s'ukram hiran.yam (RV. 8,65,11) or shining with a light of its own. "He who buys the (**Soma**) with gold buys it as sas'ukram" (*Taittiri_ya Sam.hita_*: 6,1,10,1). Even the sun is equated to gold: hiran.yam prati su_ryah (RV. 1,46,10: sun is equivalent to gold). Agni is called hiran.yaru_pa (RV. 4,3,1: gold-like). Apa_m Napa_t (the Child, Descendant of the Waters) has a terrestrial form of the earthly fire and is associated with gold (RV. 2,35,10: hiran.yaru_pah; RV. 2,35,9: hiran.yavarn.a_h). Indra and Va_yu's chariot (which is 'heaven-touching') is made of gold (RV. 4,46,4). RV. 2,35,10 reports that Apa_m napa_t in his earthly manifestation as the sacrificial fire, comes out of the golden yoni (yoni hiran.yaya which is **Soma**'s seat (RV. 9,64,20).

References to electrum may be noticed in RV. 8,45,22 where the metal silver is called 'whitish hiran.ya'; rajata is used as an adjective to mean 'whitish, silver-coloured'. [See A_pS. 5,29,2 which states that rajatam hiran.yam should not be given as a daks.in.a_.]

Pu_s.an has golden ships which sail in the sea (RV. 6,58,3) and bears an axe made of gold (RV. 1,42,6).

RV. 9,86,43 refers to **Soma** as hiran.yapa_va_h which can be interpreted as 'purified golden **Soma**.'

Soma was poured through through a sieve made of wool. Every hymn of Book IX of the Rigveda refers to the filtering through the strainer. (pavitra = sieve, means of purifying, filter; pu_ = to purify; pavate = he cleanses himself; pavama_na = self-purifying). References to filtering are in : RV. IX.1, 1 and 6; IX.28, 1,2,6. '**Soma** while filtering himself, flows thousand-streamed, across the wool' (RV. IX.13,1). In this filtering process, **Soma** is tawny in colour; and sounds like the thunder of the sky or the bellowing cattle. In RV. IX.97,33 the word 'karman' is used to denote the toil involved in the sacrifice.

Soma is mixed with milk (gava_s'ir = addition of milk to **Soma**), curd and grain. These are intended to stoke the burning embers and to act as oxidizing agents to remove the baser metals.

The rasa of the **Soma** is emphasized (RV. 8,3,20; 9,67,8; 15; 9,76,1 describes the rasa as kr.tvya or efficacious, as daks.a or ability. Somya rasa (RV. 9,67,8) is the 'sap, which constitutes the essence, best, beneficial element of **Soma**'. The colour of the rasa is hari (yellow, tawny)(RV. 9,19,3; 9,25,1; 9,103,4; 9,78,2; 10,96,6 and 7. RV. 8,29,1 refers to **Soma** as babhru (reddish-brown) and a youth who is applying a golden ointment (an~ji... hiran.yayam) to himself. RV. 9,107,4 refers to **Soma** as **utsah hiran.yayah**: a spring of gold [Geldner, Rig-Veda ubers, K.F. Geldner, Der Rig-Veda ubersetzt, Cambridge, Mass., 1951, III, p. 110). RV. 9,86,43: **sindhor ucchva_se patayantam uks.an.am hiran.yapa_va_h pas'um a_su gr.bhn.ate**: "purifiers of gold seize in them (i.e. the vasati_vari_ water left standing overnight) the animal (pas'u_), i.e. the bull (**Soma**) that flies in the upheaving of the river." Thus in this hymn, the gold which is purified refers to the juice of **Soma** which is golden.

RV. 6,61,7 refers to Sarasvati_ as **hiran.yavartani** or one endowed with a golden course. RV. 9,8,39; 38 implore **Soma** to clarify itself while procuring gold.

RV. 9,75,3: **ava dyuta_nah kalas'am acikradan nr.bhir yema_nah kos'a a_hiran.yaye = Soma** rushed down in the jars with loud cries, held (in hands) by the men in the golden vessel (kos'e).

Soma is *pita_devana_m* (RV. IX.109,4) or father of the gods.

Hiran.yagarbha, the golden germ was evolved in the beginning (RV. 10,121,1'). Hiran.yagarbha is the title of Praja_pati, who is declared as the only god who encompasses all the created things (**ja_tah patir**). “(he) who by his might has ever been (*babhu_va*) the sole lord of the world that breathes and blinks, who rules over these two-footed and four-footed (beings), to what god shall we pay homage with oblation?” (RV. 10,121,3). This reference is considered by some to be a later addition. (for e.g., cf. Edgerton, F., *The Beginnings of Indian Philosophy*, London, 1965). The Being who evolved in the beginning is also the lord of the snow-clad mountains, the ocean and the river *Rasa_*. He is the fashioner who tied heaven and heaven. When the waters moved producing Agni, from the waters evolved the **asu** (life-principle?) of the gods. [Note the use of **am.s'u** as an epithet of **Soma**.] Hiran.yagarbha is the only god over the gods: **yo_deves.v adhi deva eka asi_t**.

Rigveda riddled with allegory and metaphor enters the philosophical domain with these descriptions of Hiran.yagarbha. Post-Rigvedic texts and philosophical tracts abound in references to Hiran.yagarbha as attested by J. Gonda (*opcit.*, ppo. 217-246). *Ma_nava S'rautasu_tra* (MS. 6,2,3,9) stipulates the use of stanzas 1,3, 2-7 of RV. 10,121 (Hiran.yagarbha *su_kta*) in connection with the naturally perforated 'brick' (*agnicayana*). It has been argued elsewhere that the perforated bricks are integral to the later-day alchemical processes of transmuting baser metals into gold. (*Kalyanaraman, opcit.*, in press)

MAHA_VRATA

Maha_vrata is the last day but one of the *Gava_mayana Sattra* which represented the whole year. The middle day was the *vis.uvat* or summer solstice and the last day but one was the *Maha_vrata* or the winter solstice. The rites are related to the increase of the sun's heat after the solstice. [*gava_* can be interpreted as 'earth' and hence, *gava_mayana* connotes the reference to the wintersolstice which records the apparent shift in the motion of the sun.]

Some typical activities on this ancient festival day were: warriors fully armed would pierce with arrows the stretched skin of a barren cow. On a rough hide, an *a_rya* and a *s'u_dra* wrestle. The *Ma_rjali_ya* fire is lit and maidens carrying jugs of water on their heads encircle the fire. *Maithuna* is an attempt to produce fertility as a form sympathetic magic. Music by drumming is played accompanied by obscene language to drive away the demons.

Maha_vrata (as a remarkable example of the continuity of the civilization and culture on the banks of the *Sarasvati*). *Maha_vrata* is the day of the winter solstice which is celebrated as the New Year's Day in Punjab, Assam and Tamil Nadu (cf. *Festivals of Rohri, Bogali Bihu, Bhogi-Pongal*; the tradition is to burn out the old and herald the new by using the fresh produce from the harvest.) *Aitareya_a_ran.yaka* is an integral component of the Rigveda. The *a_ran.yaka* has three books: (1) the first book explains the *maha_vrata* as a ritual and as an allegory and described the 'sastras of the morning, midday and evening libations of the *maha_vrata* day of the *gava_mayana*; (2) the second book explains the allegory of the *uktha*, which is the *nis.kevalya s'astra* (midday *s'astra* as the *pra_n.a* or *purus.a*); the second book also has the superb *upanis.ad* (*adhy_ayas* 4-6); (3) the third book discusses the mystic meaning of the various forms of the text of the *sam.hita_*,

the nirbhujā, pratr.n.n.a and ubhayamantaren.a, and of the vowels, semivowels and consonants. These terms are used to describe the sam.hita_, pada and krama pa_t.has of the sam.hita_. The fourth book has maha_na_mni_ verses to be studied in the forest. The fifth book has the nis.kevalya s'āstra of the midday libation of the maha_vrata. The fifth book is attributed to S'āunaka (ca. 500 B.C.) who is anterior to Pa_n.ini by about 100 years. (A.B.Keith, 1909, *Aitareya A_ran.yaka*, Oxford, Clarendon Press).

“Now begins the Maha_vrata rite. Indra having slain Vr.tra became great. When he became great, then there came into being the Maha_vrata.” (Sa_yan.a explains the term mah_vrata: **maha_n bhavaty anena vratena** or **mahato devasya vratam** or **mahac ca tad vratam**. (*Aitareya A_ran.yaka* I.1)

“In the Maha_vrata ceremony there are twenty-five verses to accompany the kindling of the fire (*Aitareya A_ran.yaka*: V.1)

Maha_vrata is an agnis.toma and has the morning, midday and evening pressings of the **Soma**.. The fire-altar is in the shape of a bird. The activity of the Hotr. in the Maha_vrata rite is recorded only in the *Aitareya A_ran.yaka* and the S'a_n:kha_yana *A_ran.yaka*. The activity is shrouded in total secrecy. “The Adhvaryu brings up the vessel containing the libation and the (three) atigra_hya bowls. As soon as he perceives the food, the Hotr. Descends from the swing towards the east. Then they tie up the swin to the west that it may not slay the reciter when about to eat. For the Hotr. eats seated on the place of the swing. Then the Hotr. consumes the (libation in the) vessel with the words uttered in response, ‘May speech, the deity, rejoice in the **Soma**,’ ‘May **Soma**, the king, shower life on me for my breath,’ ‘May my breath milk mightily all life... At the proper time they should carry the swing to the bath, and burn together the seats.’ “ (*Aitareya A_ran.yaka* : V.3,2) As it is completed, the vedi and the br.si_s are both consumed by fire.

RIGVEDA: REFERENCES TO METALSMITHY

taks.a, tvas.t.r., r.bhu

In the Rigveda, the lexeme taks.am is used to define composition or fashioning. apu_rvya_purustamanyasmai mahe vi_ra_ya tavase tura_ya; virips'ane vajrin.e s'antama_ni vaca_msya_sa_sthavira_ya taks.am (RV. VI.32.1): a seer has composed unprecedented, comprehensive and gratifying praises for the mighty Indra. agnaye brahma r.bhavastataks.uh (RV. X.80.7):the fashioning of hymns for agni is done by the r.bhus. Avestan tradition, Ahur Mazda_ is conceived as a carpenter who fashions the earth from wood and who fashions bodies and souls: ga_us'-tas'a_: da_idi mo_i ya_gam ta'so_apas ca urvaras ca: 'grant me thou -- who has created Mother Earth and the waters and the plants' (Yasna 51.7); hyat na_mazda_, paourvi_m ga_eoasca tas'o_dae_nasca_: 'since for us, O Mazda, from the beginning Thou didst create Bodies and also Souls' (Yasna 31.11)(The Divine Songs of Zarathushtra, pp. 682-3, pp. 210-1). gaus = ga_v (Skt. gau). The phrase mahigauh in RV refers to the earth. Tas'a_ is from the root tas' (Skt. taks.) = to create, to fashion; to hew, to cut. The cognate lexemes are: technos (Greco-Roman), tas'yati (Lith.)

The gavam-ayanam is a sattra related to the turning of the earth which is related to the solstice or the apparent shift of sun's motion. Maha_vrata day is the last day but one of the year; it was, as Tilak observed, a link between the dying and the coming year. (Tilak, *Arctic Home in the Vedas*, p. 122).

gavam-ayanam is a sattra similar to a_ditya_na_m-ayanam and an:gi_rasa_m-ayanam. *Aitareya Bra_hman.a* (iv,17) notes: "They hold the gava_m-ayanam, that is, the sacrificial session called

the 'cows' walk'. The cows are the a_dityas (Gods of the months). By holding the session called 'the cows' walk', they also hold the a_ditya_na_m-ayanam (the walk of the a_dityas)." The origin of the sattra is described as follows (Dr. Haug's trans. Vol. II, p. 207): "The cows being desirous of obtaining hoofs and horns held (once) a sacrificial session. In the tenth month (of their sacrifice) they obtained hoofs and horns. They said, we have obtained fulfillment of that wish, for which we underwent the initiation into the sacrificial rites. Let us rise (the sacrifice being finished). Those that rose are those who have horns. Of those who, however, sat (continued the session), saying 'Let us finish the year', the horns went off on account of their distrust. It is they who are hornless (tu_para_h). They (continuing their sacrificial session) produced vigour (u_rjam). Thence after (having been sacrificing for twelve months and) having secured all the seasons, they rose (again) at the end, for they had produced vigour (to reproduce horns, hoofs when decaying. Thus the cows made themselves beloved by all (the whole world), and are beautified (decorated) by all."

The sememe taks. refers to the technical skill of fashioning metallic objects. r.bhus do great deeds and have dexterous hands (svapasah suhasta_h) and frame a chariot for the as'wins (RV.1.111.1; X.39.4), fashion the vigorous horses for Indra (RV. 1.20.2; 1.111.1; III.60.2) and divide the single camasa into four (RV. I.161.2). The r.bhus fabricate the ratha (chariot)(RV. 1.111.1; IV.33.8), fashion agni for manu's sacrifice: dya_tva_ yamagnim pr.thive_ janis.ta_ma_pastvas.ta_mr.gavo yam sahbhah, i_d.enyam prathamam ma_taris'va_ deva_stataks.urmanave yajatram (RV. X.46.) ye as'vina_ ye pirata_ ya u_ti_ dhenum tataks.urr.bhavo ye as'va_; ye amsatra_ ya r.dhagrodasi_ ye vibhvo narah svapatya_ni cakruh (RV. IV.34.9): r.bhus fashioned the chariots for as'vins, renovated their parents, restored the cow, fabricated the horses, made armor (am.sattra) for the gods, separated earth and heaven and accomplished the acts of good results. Sa_yan.a explains the equivalence of tvaks. and taks. in re: RV. I.100.15: taks.u_ tvaks.u_ tanu_karan.e (to accomplish by reducing, scraping, cutting) in the context of the skills of carpentry, using tools. Taks.a is a professional like the bhis.ak (physician) and priest (Brahman): taks.a_ ris.ta.am rutam bhis.agabrahma_ sunvantamicchati_ndra_yendo pari srava (RV. IX.112.1) The major wood-work included cutting of the sacrificial stake (yu_pa), fastening of the wooden ring (cas.a_la) on its top and fashioning of the wooden vessels: yu_pa vraska_ uta ye yu_pava_ha_s'cas.a_lam ye as'vayu_pa_ya taks.ati; ye ca_rvate pacanam sambharantuyo tes.a_mabhigu_rtirna invatu (RV. I.62.6) Tvas.t.r. carved the vajra, the weapon wielded by Indra to sever the limbs of vr.ttra (RV. I.32.2; 52.7; 61.6; 121.3; X.48.3; 99.1); it is a_yasam (metallic)(RV. X.48.3) atha tvas.ta_ te maha ugra vajram sahasrabhr.s.t.im vavr.tacchata_s'rim nika_mamaraman.asam yena navantamahi sam pin.agr.ji_s.in (RV. VI.17.10): fierce Indra, Tvas.t.r. constructed for thee, the mighty one, the thousand-edged, the hundred-angled thunderbolt, wherewith thou hast crushed the ambitious audacious loud-shouting ahi = vr.ttra. RV. I.85.9: tvas.ta_ yadvajram sukr.tam hiran.yayam sahasrabhr.s.t.am svapa_ avartayat: refers to the shaping of the thunderbolt, vajra, by skilful (svapa_ = s'obhanakarma_); Sa_yan.a explains sukr.tam as samyak nis.pa_ditam or well made; hiran.yayam as suvarnamayam or golden; sahasrabhr.s.t.im as aneka_bhir dha_ra_bhir yuktam or 'of numerous edges'. Tvas.t.r. augments the strength of Indra by fashioning a vajra of overpowering vigour: tvas.ta_ citte yujyam va_vr.dhe s'avastataks.a vajramabhibh_tyojasam (RV. I.52.7)

The transition from the lithic age to the bronze age is apparent from the description of adze or va_s'i as either metallic or made of stone and used for shaping wooden vessels: va_s'i_bhah as'manmayi_bhah (RV. X.101.10) Rigveda refers to smelter of metals (dhma.ta_: RV. V.9.5) and the smith (karma_ra: RV.X.72.2)[Schrader notes that the names of smiths in IE languages are often derived from the old Indo-Germanic names for stone of which the smiths' tools were originally made; e.g. hamarr (OHG); akmo_n (= anvil)(Gk.); as'man (=hammer, anvil, oven)(Skt.)

Tvas.t.r. is shown sharpening his metallic axe while fabricating the camasa bowl used for soma (apparently, the axe is used to fashion the bowl): s'isi_te nu_nam paras'um sva_yasam (RV. X.53.9) The camasa created by Tvas.t.r. is later divided into four parts by his disciples, the r.bhus: uta tyam camasam navam tvas.t.urdevasya nis.kr.tam (RV. I.20.6); akarta caturah punah (RV. IV.33.5-6)[Commenting on RV. I.20.6, Sa_yan.a says that r.bhus are the disciples of Tvas.t.r.: tvas.t.uh s'is.ya_r.bhavah. Elsewhere, Sa_yan.a refers to Tvas.t.r. as the preceptor of the r.bhus: r.havah tvas.t.a_ yus.madguruh (RV. IV. 33.5)]

The reference to ratha is: ratham suvr.tam (RV. 1.111.1). Sa_yan.a interprets this as well-built or good-wheeled: s'obhanavartanam sucakram va_ The carpenters' tools are: svadhiti which is used to cut and trim the wooden post: ya_nvo naro devayanto nimimiyurvanaspate sva_dhitirva_tataks.a (RV. III.8.6) va_s'i_ and paras'u are also creations of divine artificers: tvas.t.r. and r.bhus (RV. I.110.5; X.53.9-10) Vis.n.u prepares the womb and Tvas.t.r. adorns the forms: vis.nuryonim kalpayatu tvas.t.a_ ru_pa_n.i pim.s'atu (RV. X.184.1) svadhiti is used to create a well-made form (tvas.t.reva ru_pam sukr.tam svadhityaina_:AV. XII.3.33) Atharva Veda refers to the use of va_s'i_ by taks.an: yat tva_ s'ikvah para_vadi_t taks.a_ hastena va_sya_ (AV.X.6.3) RV I.32.5 alludes that Indra strikes Vr.ttra with vajra, as the kulis'a (=axe) fells a tree-trunk: ahanvr.tramk vr.trataram vyamsamindro vajren.a mahata_ vadhena; skandha_msi_va kulis'ena_ vivr.kn.a_ hih s'yata upapr.kpr.thivya_h. A cognate Indian lexeme is: kulha_d.i_ (a metallic blade with a cutting edge and a handle). r.bhu, vibhu, va_ ja constitute a trinity; the r.bhus are saudhanvana_h (sons of Sudhanvan). The r.bhus are mortals who attained immortality by dint of their workmanship: marta_sah santo amr.tatvama_nas'uh (RV. I.110.4) Commenting on RV. I. 20.1, Sa_yan.a observes that r.bhus were pious men who through penance obtained deification: manus.yah santastapasa_ devatvam pra_ptah. Aitareya Bra_hman.a describes them as men who by austerity (tapas) obtained a right to partake of soma among gods (AB. III.30.2) ya_bhiih s'aci_bhiih'camasa_m apis'ata yaya_ dhiya_ ga_marin.i_ta carman.ah; yena hari_ manasa_ nirataks.ata tena devatvamr.bhavah sama_nas'a (RV. III.60.2): With those faculties by which you have fashioned the drinking bowl; with what intelligence wherewith you have covered the (dead) cow with skin, -- with what will by which you have fabricated two horses (of Indra); with those (means) r.bhus, you have attained divinity. Macdonell derives the term r.bhu from the root rabh, to grasp and explains it as handy or dexterous and identifies it with German elbe and English elf. (opcit., p. 133)

tvas.t.r., soma

Tvas.t.r. is the master of all forms and shaper of all animals (tvas.t.a_ ru_pa_n.i hi prabhuh pas'u_nvis'va_ntsama_naje)(RV I.188.9) He is the fashioner of the quick-moving horse: tvas.t.urva_ ja_yata a_s'uras'vah (TS. V.I.11.3; KS. XLVI.2) The lexeme also means a fashioner or artificer (A.A.Macdonell, Vedic Mythology, p.117) Indra drinks soma in the house of Tvas.t.r. : tvas.t.ugr.hi apibat somamindra (RV. IV.18.3) Tvas.t.r. is referred to as supa_n.im, beautiful-handed; sugabhastim beautiful armed and r.bhvam shining or glorious (RV. VI.49.9) sukr.tsupa_n.ih svavau r.ta_va_ devastva.s.t.a_vase ta_ni no dha_t (RV. III.54.12): May the divine Tvas.t.r., the able artificer, the dexterous handed, the possessor of wealth, the observer of truth,bestow upon us those things (which are necessary) for our preservation. ugrastura_va_lamibhu_tyoja_yatha_vas'am tanvamcakra evah; tvas.t.a_ ramindro janus.a_bhiih_ya_manus.ya_ somamapibaccamu_s.u (RV. III.48.4): fierce, rapid in assault, of overpowering strength, he made his form obedient to his will; having overcome Tvas.t.r by his innate (vigour), and carried off the soma, he drank it (or deposited) in the ladles. These and other references lead Macdonell to surmise that Indra's father whom he slays in order to obtain the

soma, is Tvas.t.r. (opcit., p. 57) [cf. Chaturvedi, P.S., 1969, Technology in Vedic Literature, Delhi, Books and Books]

MARITIME, RIVERINE RIGVEDIC CULTURE

The maritime/riverine nature of the Sarasvati Sindhu civilization is borne out by the archaeological finds of contacts with Sumeria, particularly in the trade of copper/bronze weapons exported from ancient India.

Rigveda has a number of allusions to the use of boats.

The vedic people had used ships to cross oceans: anarambhan.e... agrabhan.e samudre... s'ata_ritram na_vam... (RV. 1.116.5; cf. VS. 21.7) referring to as'vins who rescued bhujyu, sinking in mid-ocean using a ship with a hundred oars (na_vam-aritraparani_m). There is overwhelming evidence of maritime trade by the archaeological discoveries of the so-called Harappan civilization, which can now be re-christened: Sarasvati-Sindhu civilization. Some beads were reported to have been exported to Egypt from this valley (*Early Indus Civilization*, p. 149); Sumerians had acted as intermediaries for this trade (L. Wooley, *The Sumerians*, pp. 46-47; cf. Ur Excavations, vol. II, pp. 390-396). which extended to Anatolia and the Mediterranean.

Boats drown in the river Sarasvati when the river was in spate (RV. 6,61,3); Devi Aditi comes in a boat for the reciters to board (RV. 10,63,10); Soma, the king of the waterways, who covers the universe as a cloth, has boarded the boat of sacrifice; the su_rya descends the heavens on a boat (RV. 1,50,4; 5,45,10; 7,63,4; 10,88,16,17). Sudasa built an easily pliable boat to cross the Purus.n.i river (RV. 7,18,5); Agni is a boat which carries the sacrificers over the difficult path of sacrifice (RV. 1,9,7, 7-8: 5,4,9); Agni is the boat of the reciters in troubled times (RV. 3,29,1), to ford enemy lines (RV. 3,24,1); Agni is the carrier-boat of oblations to the gods (RV. 1,128,6); Agni is the boat of all wishes (RV. 3,11,3); Indra was like a ferry-boat (RV. 8,16,11); Indra protected the boats (RV. 1,80,8); Indra is invoked to carry the reciters over the ocean of misfortune (RV. 3,32,14); Indra takes the reciters in his boat across the ocean (RV. 8,16,11); Indra saved the ship-wrecked Naryam, Turvasu, Yadu, Turviti and Vayya (RV. 1,54,6); Indra-Varun.a sail on the boat on the celestial ocean (RV. 7,88,3); Purus.an's golden boat moves on the sky (RV. 6,58,3) Varun.a's boat will carry the reciter on to the mid-ocean of the sky (RV. 7,88,3); Maruta helped the reciters to cross the ocean of war in a boat (RV. 5,54,4); Maruta was compared to a tempestuous ocean in which had sunk a laden ship (RV. 5,59,2); there are references to: house boat (RV. 1,40,12); long boat (RV. 1,122,15); well-furnished boat with oars (RV. 10,101,2); boats carrying foodgrains for overseas markets (RV. 1,47,6; 7,32,20; 7,63,4); boats fit to cross the ocean with oars (RV. 1,40,7); ocean-trading boats (RV. 1,50,2). [See also Swami Sankarananda, *Hindu States of Sumeria*, Calcutta, K.L.Mukhapadhyay, 1962 for the story of Bhujyu who was the son of a king named Tugra (a worshipper of As'vina) whose boat was sunk in the mid-ocean, p. 32].

Riches are obtained from the samudra (i.e. by maritime trade) (RV. 1,47,6); there were two winds on the ocean, one to put the boat to the seas and the other to bring it to shore (RV. 10,137,2).

INDIA OF THE SARASVATI SINDHU CIVILIZATION AS A LINGUISTIC AREA

The decipherment of the inscriptions of the civilization uses an *Indian Lexicon* which integrates the lexemes of all the languages of India in semantic clusters, as an exercise in general semantics. (<http://sarasyati.simplenet.com>) Many lexemes of the substrate language of Sumer are relatable to the Indian Lexicon entries. So are many lexemes relatable to the artefacts of weapons made by the kut.ha_ru (armourers). The lexicon heralds a change in paradigm in philology establishing India of the days of the Rigvedic culture and Sarasvati-Sindhu civilization as a Linguistic Area as the bronze age dawned ca. 3000 B.C. and matured for the next two millennia with further advances in philology, philosophy, mathematics, alchemy, architecture, iconography and other cultural phenomena, resulting in the formation of Indian languages. The story of the formation of Indian languages is as yet an untold story.

NOTES

Websites: <http://www.probys.com/sarasvati>; <http://sarasyati.simplenet.com>

Sir A. Burnes, Memoir on the Eastern Nara Branch of the River Indus, giving an account of the alternations produced on it by an earthquake, also a theory of the formation of the Runn, *Trans. RAS*, III, 1834, pp. 550-88; Major F. Mackeson, Report on the Route from Seersa to Bahawalpore, *JAS Beng.*, XLII, Pt.1, 1844, No. 145 to 153 recommending the conversion of Sarasvati river bed into a great road from the sea-coast in Sind to Delhi via Bahawalpur, Marot., Anupgarh, Suratgarh, D.a_bli, Ka_libagga_n., Bhat.ner (modern Hanumangarh), T.ibi and Sirsa.

Falk, Harry, **Soma** I and II, 1989, *BSOAS*, LII, Pt. 1, pp. 77-90: "...between the Iranian and Indian **Soma**/Haoma... the most important descriptive terms are identical (am.s'u/asu, hari/za_iri), the processing tools are comparable (cf. *Visp.* 10.2; 11.2), but the mythologies show marked distinctions. In India, **Soma** and Agni occasionally represent the dual forces of cosmic evolution. Nothing similar is known from the Avesta. Again, in India **Soma** as a drink helps Indra to become strong enough to fight Vr.tra... Indra kills Vr.tra many times, either without **Soma** or with the help of other gods. And likewise, **Soma** as a complementary element of Agni is by no means indispensable... In Iran, (Haoma) it functions as a mythological priest and as an energizing offering to different gods... This tendency of **Soma**/Haoma to look for a suitable place in already existing mythologies proves to my mind that the mythological qualities of **Soma**/Haoma did not stand at the beginning of its career."

Keith, Arthur Berriedale, *The Aitareya A_ran.yaka*, 1909, Oxford, Clarendon Press.

Aloys Arthur Michel, *The Indus Rivers: A study of the effects of partition*, 1967, Yale University Press, New Haven.

"... the uplift of the Himalayas, including the Siwaliks, is apparently still continuing, offset by rapid erosion of course, and earthquakes are by no means uncommon as a result... (p.25)... there would seem to be little doubt that the present, almost imperceptible watershed between the Ganges and Indus drainage is very recent in origin. Here the key seems to lie in the shifting or migration of stream beds across the alluvium of the plains, and key role to have been played by the Jumna and a former stream (possibly the legendary Sarasvati) the course of which is now marked by the bed known as the Ghaggar in the Indian Punjab and Rajasthan, and as the Hakra in Pakistan Bahawalpur, that parallels the Sutlej towards the Indus. The enormous amounts of detritus brought down by the Punjab rivers and the present affluents of the Ganges are more than

sufficient to explain stream blockage and shifting without invoking tectonic forces, and capture of one stream by another is well-attested. The Beas, for example, was captured by Sutlej at the end of the eighteenth century. Its old course near Harike to the Chenab above Panjnad is well marked in the landscape of the southern Pakistan Punjab, with the town of Kasur and a series of villages still lining its 'banks'. The Ghaggar, which is used in part by modern canals and which has begun to flow again as water tables have risen, may very well represent the former course of such a truncated river. Spate suggests that it could have been fed either by the Sutlej, itself occupying a different channel, or by the Jumna. If it was the Jumna, then the Jumna clearly has been captured by the Ganges... in the broadest sense the Indus Plains may be regarded as one vast and fairly homogeneous aquifer, a sort of vast sponge, capable of absorbing runoff from the foothills as well as rainfall and seepage from the rivers and canals that cross them, and of transmitting this subterranean flow downslope to the Arabian Sea. (Notes: cf. the legends regarding the disappearance of Sarasvati underground-*antah salila_ sarasvati_!*) The water table or top level of this vast reservoir varies with distance from the foothills and from the rivers and canal, as well as with local alterations in the nature of the matrix, and it varies from season to season and year to year. Recent investigations in the Pakistan Punjab have been sufficiently detailed to allow preparation of contour maps showing depth to water table, and comparisons with older data from wells indicate its general rise since irrigation was introduced (cf. Greenman et al, Maps 11, 12, 16-20). Variations in the salt content of the groundwater have also been charted over much of Punjab... The groundwater reservoir apparently represents at least ten times the annual runoff of the Indus Rivers, and in many areas offers an additional source of irrigation water when tapped by tubewells. The control of the water-table level by means of pumping from wells or by drains is also essential to the success of the surface-water irrigation, for in many areas the salt-carrying groundwater has risen perilously close to the surface (pp. 27-28)(Note: see the situation *hu_daka*-in Sarasvati Ghat and Brahma yoni near Vasis.t.a_s'ramam where the river becomes *pra_ci_va_hini_*; *sarasvati* is so named in the revenue maps of Haryana and also in *Bharat Bhu_racana_*, Survey of India maps.)

Puri, V.M. and S.P. Verma, Glaciological and Geological Evolution of Vedic Sarasvati in the Himalayas, Paper presented in Delhi on 5 October 1997, *Itihasa Sankalana Samiti* (repr. in: *Itihas Darpan*, Special Issue on Sarasvati River).

Alex Rogers, 1869, A few remarks on the geology of the country surrounding the Gulf of Cambay, in Western India, Proceedings of the Geological Society, in: *Quarterly Journal of Geological Society of London*, Vol. 26, 1870, pp. 118-123. [Explains the remarkable presence of alluvium in the Gulf of Khambhat thanks to the mighty Sarasvati river bringing down enormous amounts of detritus.]

Sarasvati-Sindhu Research Centre, Chennai (Kalyanaraman) has established in a technical monograph (by Dr. K. R. Srinivasan, ex-Director, Central Ground Water Board) that the central Sarasvati River basin in Rajasthan alone can support one million tube wells on a sustainable basis with recharge principally from the Rajasthan canal. *Itihas Darpan* (Hindi magazine) is bringing out a special issue on Sarasvati river.

Srinivasan, K.R., Paleogeography, Framework of Sedimentation and Groundwater Potential of Rajasthan, India-Central part of Erstwhile Sarasvati Basin, Group Discussion, Geological Society of India: Drainage Evolution of North-western India with particular reference to the Lost Sarasvati, December 1997, Baroda

Valdiya, K.S., River Piracy, Sarasvati that disappeared, Bangalore, Indian Academy of Sciences, *Resonance*, I, 5: 19-28, 1996. [explaining the river piracy-capture of the Yamuna by Ganga; explaining how through the Sarasvati River had flowed the combined molten glacier waters of Sutlej and Yamuna.]

Wilhelmy, Herbet, 1969, Das Urstromtal am Ostrand der Indusebene und der Sarasvi-Problem, *Zeitschrift für Geomorphologie*, Supplementband 8: 79-93. [explaining the secular sequence of desiccation of Sarasvati River, first, the diversion of Sutlej westwards and second, the joining of Beas with Sutlej.]

Sarasvati River ca 3000 B.C. flowing from Har-ki-dun glacier to the Gulf of Khambat



