*J Biosci* (2019)44:68
DOI: 10.1007/s12038-019-9876-4

© Indian Academy of Sciences

# Methodological issues in the Indo-European debate

Michel Danino

*Archaeological Sciences Centre, Indian Institute of Technology Gandhinagar, Palaj, Gandhinagar, Gujarat 382 355, India*

*(Email, micheldanino@gmail.com, micheldanino@iitgn.ac.in)*

The Indo-European debate has been going on for a century and a half. Initially confined to linguistics, race-based anthropology and comparative mythology, it soon extended to archaeology, especially with the discovery of the Harappan civilization, and peripheral disciplines such as agriculture, archaeometallurgy or archaeoastronomy. The latest entrant in the field, archaeogenetics, is currently all but claiming that it has finally laid to rest the whole issue of a hypothetical migration of Indo-Aryan speakers to the Indian subcontinent in the second millennium BCE. This paper questions the finality of this claim by pointing to inherent limitations, methodological issues and occasional biases in current studies as well as in the interpretation of archaeological evidence.

**Keywords.** Archaeogenetics; Aryan; Harappa; Harappan; Indo-Aryan; Indo-European

## 1. Introduction

Towards the end of the Discussion Meeting on Human Diversity and Ancestry in India held in Bengaluru on 19–21 September 2018, which saw many exchanges on the perennial Aryan invasion/migration theory (henceforth AI/MT), a participant asked why there should be so much sensitivity to a single migration event; after all, he argued, none of the later invasions, whether by the Persians, the Greeks, the Scythians, the Kushanas, the Hunas, etc., had attracted so much debate. (We could add a few groups of early Christians, early Jews, the Parsis and migrants from Africa or, in the northeast, from beyond the borders.)

The question is pertinent and has multiple answers. The most obvious is that the above invasions, all of historical times, are well attested not only in archaeology but in literature and often epigraphy; there is hardly any controversy about them. Such evidence for AI/MT has long been contested and shown to be ambiguous at best (Elst 1999; Bryant 2001; Kazanas 2009, 2015) and fabricated at worst (Danino, in press). The list of dissenters, which goes back to the nineteenth century, includes many distinguished names: Mountstuart Elphinstone (in 1841), Swami Vivekananda (1897 onward), Sri Aurobindo (from 1910 to 1914), PT Srinivasa Iyengar (in 1914), BR Ambedkar (in 1946); numerous archaeologists (especially from the 1960s) such as Dilip K Chakrabarti, SR Rao, Jim Shaffer, SP Gupta, BB Lal, VN Misra, MK Dhavalikar; bioanthropologists Kenneth Kennedy, Mario Cappieri, Subhash Walimbe, V Mushrif-Tripathy; anthropologists Edmund Leach (in 1989), to whom we will return, and Peter G Johansen, who wrote: ‘This [Aryan invasion] theory of Indian civilization is perhaps one of the most perduring and insidious themes in the historiography and archaeology of South Asia, despite accumulating evidence to the contrary’ (Johansen 2003, p. 195). Yet the Indian media never misses a chance to spread the grotesque misrepresentation that ‘Hindutva’ activists (Friese 2018) or ‘Hindu right-wingers’ (Joseph 2018) are alone contesting AI/MT, implying that this is a political rather than scholarly debate.

This dissenting school has its counterpart in Europe, where the dominant view of an immigration of Indo-European speakers arriving from anywhere between the Black Sea and Anatolia has also been hotly contested: by the French prehistorian Jean-Paul Demoule (since the 1980s), who has argued that the said Indo-Europeans may simply be the old Aryans reborn and the product of our imagination; by the Belgian prehistorian Marcel Otte (since the 1990s), who proposes a Palaeolithic origin of Indo-European languages; by the Italian linguist Mario Alinei (in the 1990s), who proposed a similar ‘Palaoelithic Continuity Theory’, a view supported by the Spanish linguist Xavier Ballester; by the Italian linguist Angela Marcantonio (in the 2010s), who contested some foundations of Indo-European linguistics (all references in Danino, forthcoming). It is regrettable that none of those learned critiques are ever discussed or even acknowledged in India.

A weightier answer to the question ‘Why be so sensitive about AI/MT?’ is that it happens to carry a heavy historical baggage: It is the child of the nineteenth-century racial and racist genesis of the Aryan myth, which, slightly inflated, was

**http://www.ias.ac.in/jbiosci**
Published online: 08 July 2019

to become a major weapon in the Nazi arsenal (Poliakov 1974; Olender 1992; Arvidsson 2006). Recently, Demoule argued that the same myth should be read as nothing less than 'the origin myth of the West' (Demoule 2014). In the case of India, AI/MT carries an additional baggage, that of having been a weapon in the colonial arsenal: its usefulness in dividing the North Indians from the South Indians, the light-skinned upper caste from the dark-skinned lower caste or tribal Indians, is well documented (Danino, forthcoming). After India's Independence, AI/MT has continued to be put to a whole range of ideological uses, such as those of the Dravidian movement, much Dalit activism (despite Ambedkar's vigorous rejection of the theory) and missionary propaganda (Elst 1999; Danino 2006; Malhotra and Neelakandan 2011).

To those concerned about the theory's past and present baggage, and its continuing misuse, its wrapping bears a 'handle with care' cautionary in big bold type.

Speakers at the Bengaluru event were also asked to help identify reasons for any 'non-congruence' of views among them. Except for the relatively new field from archaeogenetics, most of those reasons are, in fact, decades-old (Bryant and Patton 2005; Trautmann 2005). Among them, methodological issues preventing a consensus on AI/MT are perhaps the most fundamental, yet, paradoxically, the least discussed. Let us review some of them.

## 2. Misreading texts

How should a text like the Rig Veda be read, and what can it tell us on the purported movement of its Indo-Aryan composers into the subcontinent? Leaving aside the religio-cultural content of the hymns, many Indo-Europeanists and Indologists insist on extracting from the Rig Veda not only historical data, but a whole image of Vedic society, even though the text's metaphorical language makes such interpretations highly conjectural, and therefore widely different from one scholar to the next. Most scholars have, for instance, insisted that the Vedic people were pastoral or nomadic (though which of the two has never been clear), but a few, such as HH Wilson or T Goldstücker in the nineteenth century, saw reflected in the Rig Veda 'an advanced stage of civilisation' (Goldstücker 1879), which would be much harder to reconcile with the image of intruding pastoral Aryan tribes. The dominant view dismisses not only those dissenters (and their more recent Indian counterparts, e.g. Bisht 1999), not only the various Indian schools of Vedic interpretation, but also Leach's warning: 'Whatever the date of the Rig Veda text may be, absolutely no grounds exist for supposing that it refers to events that actually happened in "real" historical time' (Leach 1990, p. 234).

Instead, it is generally taken for granted that historical data can be freely extracted from the Veda – a little too freely perhaps, especially when 'textual evidence' is fabricated, then recycled without further reference to the original text. A case in point is Witzel's reference to a 'mountainous terrain of Afghanistan' left behind by the incoming Aryans who then proceeded to cross 'many rivers' (Witzel 1995a; for a discussion, see Danino, forthcoming), or his reading of references to the horse in the Rig Veda to the effect that 'The first appearance of [the invading Aryans'] thundering chariots must have stricken the local population with a terror similar to that experienced by the Aztecs and Incas upon the arrival of the iron-clad, horse-riding Spaniards' (Witzel 1995b). This is hardly different from the nineteenth-century method of torturing a very recalcitrant Rig Veda into a sort of victory chant by the fair-skinned Aryans over the dark-skinned, stub-nosed autochthons – crude racial stereotypes that persist in much literature in India, including some textbooks, when, in reality, the Vedic hymns tell us nothing about different races, skin colour, a homeland outside the subcontinent or a long march by a conquering clan or 'race'. Similar survivals of colonial stereotypes can be found in Jha (1998) and several other scholars. Equally of concern is the lack of scholarly discussion of recent challenges to the mainstream reading, or misreading, of the Rig Veda. Thomson's refreshing perspectives, which would further weaken the arbitrary extraction of historical data from the text, have been studiously ignored (Thomson 2009a, b).

## 3. Misreading archaeological evidence

Leach continues: 'Equally, I consider it futile to suppose that the cultural environment that seems to be postulated by the Rig Vedan [*sic*] texts might be identified with any "real" cultural environment that might be reflected in the excavations of archeologists working in northern India' (Leach 1990, p. 234).

Leach's remark on the 'futility' of correlations between a text (the Rig Veda in this case) and archaeological remains (of the subcontinent's north-west) is perfectly apposite. The arbitrary manner in which widely different Late Harappan or post-Harappan cultures of the second millennium BCE – the period when 'Aryans' are supposed to have entered the Indian subcontinent – have been attributed to them, will forever remain a dark spot in the historiography of AI/MT, whatever its ultimate outcome, and a lesson for future students of India's protohistory. Table 1 (full references and extensive discussion in Danino, forthcoming) is eloquent testimony to the complete lack of reliable criteria to correlate archaeological remains with a particular language or textual culture.

Underlying this archaeological free-for-all, the problem is how to determine whether or not a 'new' material culture is intrusive or the result of change in continuity. Demoule defines the challenge thus: 'In order to prove a migration archaeologically, it is necessary to trace, step by step, the diffusion of a complete material culture – pottery forms and decoration, tools and weapons, architecture, funerary practices, etc. – from a specific region' (Demoule 2016, p. 166). With none of the cultures listed in table 1 is this condition

**Table 1.** Widely divergent identifications by various scholars of Late or Post-Harappan cultures

| | Gandhara | Pirak | Jhukar | Cemetery H | OCP | Copper hoard | PGW |
|---|---|---|---|---|---|---|---|
| Allchin and Allchin | | | LH + A? | LH + A? | | | A? |
| P Bellwood | | | | | LH + A | | |
| G Benedetti | | | | | A | | |
| AH Dani | A | | | | | | |
| H Falk | | | | | | A | |
| R Heine-Geldern | | | A | | | A | |
| A Ghosh | | | | | | | A |
| DD Kosambi | | | | A | | A | |
| DN Jha | | | A | A | | | |
| Krishna Kumar | | | | | A | A | |
| BB Lal | | LH | LH | LH | | | A |
| JP Mallory | A | | | A? | | | A |
| J Manuel | | | | | A | A | |
| VN Misra | | LH | LH | LH | LH | | |
| A Parpola | A | A | A | A | A | A | A |
| S Piggott | | | A? | A? | | LH | |
| B Sergent | A | A | A | A | | | A |
| RS Sharma | A | A | | A | | A | A |
| G Stacul | A | | | | | | |

A: Aryan; LH: Late Harappan; a question mark reflects an expression of uncertainty on the author's part.

met; on the contrary, most of them show strong continuity with the preceding, Mature Harappan (or urban) stage, as recent work invariably tends to show.

To take a single example here, some scholars decided that the Pirak culture, which emerged around 1800 BCE in the plains of Baluchistan, is the best representative of the Aryan intrusion. However, Jarrige, who directed excavations in the region, found that none of the transformations happening there in the early second millennium BCE, including the introduction of summer crops such as rice and millets (especially sorghum or *jowar*, in addition to the traditional winter crops of wheat and barley), 'can be explained in the context of invasions of semi-nomadic peoples coming from the [Central Asian] steppes. … How could this series of transformations be seriously attributed to Indo-Aryan invaders? … Nothing, in the present state of archaeological research … enables us to reconstruct convincingly invasions that could be clearly attributed to Aryan groups' (Jarrige 1995, pp. 24, 21). Regrettably, such well-informed views have been brushed aside in the desperate but vain search for material traces of those 'Aryan groups'.

If no material evidence for the putative migrations of Indo-European speakers into the subcontinent can be unambiguously accepted, archaeologists are generally reluctant to proceed further. While some reject the said migrations altogether (e.g., Lal 2005, 2015; Chakrabarti 2008; Shaffer and Lichtenstein 2013), others, still convinced that the said migrations did occur, at least admit that they are 'scarcely attested in the archaeological record' (Allchin and Allchin 1997, p. 222). Boivin sums up the situation thus: 'Archaeologists in particular have thus very much moved away from migrationist models, including the idea of Indo-Aryan invasions, as an explanation for cultural change in South Asia. And those scholars, both archaeological and otherwise, who continue to embrace an Indo-Aryan migration paradigm now generally present a very different model that sees the language change as resulting more from social processes than any substantial population movements' (Boivin 2007: 349).

## 4. Linguistics, anthropology and archaeogenetics

I briefly referred above to linguists Alinei, Ballester and Marcantonio, who in different ways challenge the mainstream linguistic model; so does Kazanas (2009, 2015) by proposing that Sanskrit has preserved some of the most archaic features of the Indo-European family. Among the pioneers of dissent from the mainstream model, I cannot omit here Trubetzkoy, one of the founders of modern linguistics, who in the 1930s had cautioned, 'The assumption of an Indo-European protopeople with definite cultural and racial characteristics is untenable. We are chasing a romantic illusion … The idea of an Indo-European protolanguage is not absurd, but it is not necessary, and we can do very well without it … There is … no compelling reason for the assumption of a homogeneous Indo-European protolanguage from which the individual branches of Indo-European descended. … [I]t is equally probable that the Indo-European family arose when some originally non-related languages (the ancestors of the later branches) converged and that the Indo-European languages developed from a protolanguage by divergence' (Trubetzkoy 2001, pp. 87–90).

As an anthropologist, Leach, again, objects to philology's method in reconstructing ancient languages, Proto-Indo-European (PIE) in our case. Philologists, he complains, 'go on to discuss how languages were spread across the map by

"movements of peoples". All studies of Indo-European language, culture, and literature are permeated with thinking of this sort' (Leach 1990). Indeed they are, and most archaeogeneticists implicitly accept not only a one-to-one equivalence between a particular haplogroup (e.g., R1a1) and a particular language (PIE or some of its derivatives), but the linguistic migrationism Leach refers to.

The first pitfall was flagged long ago by the US anthropologist Franz Boas, one of the first to denounce the fallacy of race and the resulting illegitimate conflation between *Race, Language and Culture,* as the title of one of his books went (Boas 1940), a conflation all too common in the Indo-European literature. In an earlier work, problematizing the linguistic question, Boas had in effect argued against the above one-to-one relation: 'This [Aryan] language has not necessarily arisen among one of the types of men who nowadays speak Aryan languages; that none of them may be considered a pure, unmixed descendant of the original people that spoke the ancestral Aryan language; and that furthermore the original type may have developed other languages beside the Aryan' (Boas 1938: 156). Translated into current genetics, we may say that carriers of the R1a1 marker may have spoken languages from several families; or conversely that PIE speakers may have had much greater genetic diversity than is implicitly assumed; the equation R1a1 = PIE is alluring, but simplistic and unlikely to have ever been correct.

The second linguistic pitfall is that while some languages have historically developed and spread through migrations, others have not. In the 1870s, Schmidt's wave theory of language evolution and propagation, through a series of contacts within a group of dialects, offered an alternative to the tree (or cladistic) model of linear genealogy, which implied a neat but unrealistic social if not demographic split at every new branching off of the tree. In recent years, the limitations of the tree model have increasingly come to light, giving fresh life to the wave model or new variations of it: 'The Tree Model presupposes a flawed understanding of language diversification processes. In a nutshell, cladistic (tree-based) representations are entirely based on the fiction that the main reason why new languages emerge is the abrupt division of a language community into separate social groups. Trees fail to capture the very common situation in which linguistic diversification results from the fragmentation of a language into a network of dialects which remained in contact with each other for an extended period of time' (François 2014, p. 162). The emphasis is on networks, not migrations. Yet this tree model is the one implicitly adopted in most archaeogenetic studies, where cladistic haplotype 'trees' are sought to be mapped to a correspondingly cladistic linguistic evolution.

Another linguist, Johanna Nichols, challenges the migrationist model of linguistic propagation: 'Almost all literature on language spreads assumes, at least implicitly, either demographic expansion or migration as basic mechanism, but in fact language shift is the most conservative assumption and should be the default assumption. There is no reason to believe that the mechanism of spread has any impact on the linguistic geography of the spread … simple phylogenetic descent [i.e., the tree model] is insufficient for tracing the origin and dispersal of the world's languages and peoples' (Nichols 1997a, pp. 372, 380). In her model, central Eurasia, where most Indo-Europeanists locate the PIE homeland, is not a homeland but a 'spread zone' for the Indo-European family, with its original 'locus' close to Bactria, that is, much farther south than generally assumed (Nichols 1997b).

Such models may end up giving historical linguistics the level of complexity that human evolutionists have reached, abandoning the linear tree model of evolutionary descent, which failed to take into account the complex interplay of various hominin ancestors, and experimenting with 'braided stream' or 'reticulation network' models. Be that as it may, if Indo-European languages evolved not through linear descent, as is generally assumed, but through more complex mechanisms – including non-migratory ones, 'spread zones' or even a dusted-off version of Trubetzkoy's concept of 'linguistic area/network' (*Sprachbund*) – what validity should we attribute to archaeogenetic studies claiming to map the movement of those languages? Mallory and Adams put it this way: 'The temptation to read every cline on a map of genetic features as a migration and tie it to a putative linguistic movement has led to ostensibly circular reasoning. … [T]here is an assumed correlation between language and human physical type. … [But] there is no requirement whatsoever that the trail of language shift should also leave a clearly defined genetic trail as well. Nor for that matter can we assume that if we do find a genetic trail, this necessarily resulted in a language shift favourable for those carrying the gene rather than their absorption by local populations' (Mallory and Adams 2006, pp. 450–451).

Walimbe also cautions against an association between physical type and language. Surveying many bioanthropological studies of the subcontinent, in particular those by Kennedy and his collaborators, he concludes, 'If the hypothesis of an "Aryan invasion" cannot be supported using physical anthropological data, then the spread of Indo-European languages in the subcontinent needs to be explained on non-biological grounds' (Walimbe 2007, p. 313).

## 5. Interdisciplinarity and politics

For most archaeologists, the Indo-European problem is primarily an archaeological one, and we saw above their inability to agree on hard evidence that would clinch the issue (the decipherment of the Indus script would probably be clinching, but remains as elusive as ever). For linguists, however, 'the Indo-European problem is primarily one of historical linguistics, not archaeology, anthropology, or genetics, although evidence from these disciplines can be

very helpful' (Pereltsvaig 2015). Population geneticists now attempt to bridge these two disciplines, no doubt a desirable objective in itself. However, a few of the preceding conclusions arising from archaeology, bioanthropology and linguistics point to the need for interdisciplinarity of a much more sophisticated kind than has usually been attempted.

A telling illustration comes to us from a recent sensational cover story in *India Today* (Friese 2018). The title says it all: '4500-year-old DNA from Rakhigarhi reveals evidence that will unsettle Hindutva nationalists'; a single DNA sample taken from a skeleton has revealed 'the complete absence of any reference to the genetic marker R1a1 in the ancient DNA retrieved from the site', and we are told that this genetic marker is 'often loosely called the "Aryan gene"'. Leaving aside this disturbing last phrase, which hopefully belongs solely to the author's fevered imagination despite his use of 'often', let us sum up the basic facts:

(1) The article is based on a study in progress, with no paper having been published, submitted, or even written at the time the article was written (the last point was conveyed to us during the Bengaluru Discussion Meeting by one of the study's collaborators).
(2) The study is based on the DNA extracted from a single specimen; let us compare with 400 genomes sequenced from the Neolithic to Bronze Age specimens from Europe (Olalde *et al.* 2018), whose results are still giving rise to discussions as regards population movements in protohistorical Europe.
(3) The article quotes a geneticist leading the study to the effect that 'We do not have much coverage of the Y chromosome regions [of the genome]'; if so, it is indeed puzzling how R1a1 can be said to be 'completely' absent from the specimen's Y-DNA, and so much erected on that supposed absence.
(4) The article – and possibly the geneticists involved in the study – fail to address the central question: Who was buried there? It is implied that the specimen might be somehow representative of the Harappan population, even though Friese also admits that 'the Indus Valley Civilisation population was evidently multiethnic'. If so, getting hold of a single Harappan's DNA would have little meaning it itself. However, Friese fails to consider the possibility that the skeleton may have belonged not to a Harappan at all, but to an outsider. This is not a gratuitous speculation: working with human remains from Harappa and Farmana (the latter in Haryana, just 90 km away from Rakhigarhi), Valentine *et al.* (2015) made an unexpected discovery: their study of the stable-isotope composition of 44 teeth from at least 38 individuals at Harappa and 33 teeth from 17 individuals at Farmana (therefore a decent sample size of 55 individuals) enabled them to reconstruct those specimens' palaeodiets and geological environments: they turned out to be 'composed almost entirely of first-generation immigrants'; the individuals buried were not local residents. This, argued Valentine *et al.*, 'demands a consideration of new interpretive models'.

In other words, the article, published with fanfare in a leading Indian magazine and relayed in dozens of articles in the Indian and international press, apart from countless blogs, rests on the preliminary study of an admittedly incomplete DNA sample from a single Rakhigarhi specimen who may not be a local resident at all. This not only betrays the singular absence of understanding of the issues involved, but also dubious journalistic ethics: the article's objective was not a dispassionate study of the issues concerned, but to deal 'Hindutva' a mortal blow – not exactly an ideal recipe for scientific investigations.

Professionals in the field will of course protest that such sensational journalism should not be taken as a reflection on their work. True, but politics does at times seem to lurk in the background of recent archaeogenetic studies. In a recent work, Reich (2018) rightly complained against 'biologically based nationalism', citing the example of Nazism and continuing in the next sentence with 'the Hindutva ideology that there was no major contribution to Indian culture from migrants from outside South Asia'. Typically, Reich neither defines 'Hindutva ideology' nor supplies any reference to an assumed Hindutva ideologist actually denying any such 'major contribution', which would be a prodigiously ignorant statement to make in view of the known historical immigrations. We have no way to know who or what work he is actually referring to, and it does look at times as if 'Hindutva ideology' is little more than an all-weather bogeyman. If so, then Reich's work is vulnerable to the charge of being prejudiced and leaning towards predetermined conclusions designed to oppose the said bogeyman. Other illustrations of such prejudices are involved in the issue of circularity.

## 6. The issue of circularity

Most genetic studies are built on unstated, unproven (and often unwitting) assumptions: not only that migration is the supreme mechanism to account for the spread of genes and languages, but also that, in India's case, the said genes could only have spread unidirectionally. The studies then proceed to marshal evidence to 'prove' the assumption, in a classic case of circularity. We find Reich (2018), for instance, asserting that 'In the Rig Veda, the [Indo-Aryan] invaders had horses and chariots'. As has often been pointed out – in vain, apparently – the text does not offer a single reference to Vedic clans as 'invaders' (the only geography they know of is the Saptasindhava and possibly parts of Afghanistan; no mention is made of an immigration from outside). But once those clans have been labelled 'invaders', the 'evidence' will naturally follow, but will perforce have to be selective. This device has been extensively used since the nineteenth century.

I referred at the outset to some of the well-attested historical invasions of or migrations into India. It is forgotten that there occurred equally well-attested migrations out of India, beginning with protohistorical forays by Harappans into Central Asia, the Persian Gulf and Mesopotamia. In the first millennium BCE, Indians joined the Persian army and fought wars in Greece; Greek records speak of Indians travelling to Athens, while Ashoka boasted of sending his emissaries to teach Dharma all the way to Antioch or Alexandria; an early Christian historian, Zenob Glak, recorded the destruction of a Hindu city established in Armenia centuries earlier by Indian princes; Indians traded with and migrated to many parts of Central and Southeast Asia; Indian scholars were established in China in the eighth century CE and at Baghdad and Damascus a century later; and so on. Yet, with the exception of the Romas, I am unaware of a single genetics study detecting or even envisaging those persistent emigrations over three or four millenniums. The unidirectionality is total.

The circularity of the 'Ancestral North Indians' (ANI) *vs* 'Ancestral South Indians' (ASI) concept is another case in point. Reich (2018) admits that he thought it up overnight simply to avert serious differences with his Indian collaborators. No precise definition was ever given to these two supposedly highly distinct groups; they were simply stated to be 'genetically divergent' (Reich *et al.* 2009) and were used in several subsequent studies as though they had been rigorously established. Elsewhere (Danino 2014), I showed that the populations sampled were very seriously restricted, since 18 states of India had either no representation or only one group represented in the 2009 study. Despite such a skewed distribution, Reich *et al.* exuded confidence in the newly coined terms and found it 'tempting to assume that the population ancestral to ANI and CEU [Europeans] spoke "Proto-Indo-European" … ' (Reich *et al.* 2009, p. 492) – a gratuitous association built, again, on circularity.

So was their assumption that 'strong endogamy must have shaped marriage patterns in India for thousands of years', a very useful conjecture for archaeogeneticists, since it enables them to regard today's castes (and their gene pools) as virtual carbon copies of groups 3000 years ago. However, this ignores considerable data from texts, inscriptions and other sources on caste mobility and even (in more orthodox texts such as the Dharmasutras) the *de facto* acceptance of intercaste marriages (whether approved or frowned upon, *anuloma* or *pratiloma*).

Another recent coinage is that of 'peripheral Indus', with the associated assumption the 'Indus Periphery-related people are the single most important source of ancestry in South Asia' and specifically of the Harappans (Narasimhan *et al.* 2018). Clearly, 'Indus Periphery-related people' are another case of a concept carrying its own built-in conclusion. The authors not only disregard all that is known of the subcontinent's many Neolithic populations, but do not stop to ask why archaeology is silent on the arrival of such people, while it is loud on the presence of Harappans in Central Asia and beyond.

## 7. Is reality parsimonious?

The above discussion points to the need for far more sophisticated population models than those reflected in the present archaeogenetic studies. Understandably enough, they often propose the 'most parsimonious' explanation for a given genetic pattern. But let us recall that the 'parsimonious' tree models in human evolution and linguistics have largely failed; so has the parsimonious assumption that skeletons at Harappa or Farmana belonged to locals. Reality is rarely parsimonious; had it been, the Indo-European issue would have been laid to rest in the nineteenth century.

Another such case comes from the parsimonious diffusionist hypothesis, reflected of late in many studies both in Europe and Central Asia, that agriculture spread through migration. It is surprising to find such an untenable view under the pen of serious scholars. Agriculture emerged in the Neolithic era at many independent locations worldwide: 'The domestication of plants and the origins of agriculture was a pivotal transition in human history, which occurred several times independently around the world' (Fuller *et al.* nd); or again 'the processes of plant domestication and agricultural origins … evolved in parallel in several world regions' (Fuller *et al.* 2014, p. 6147).

If there is a lesson we may draw from archaeology, it is that migration patterns have generally been far more complex than linear thinking may predict, and that human interactions have used other mechanisms in addition to migrations, such as sustained contacts through trade networks involving back-and-forth exchanges. These mechanisms need to be reflected in archaeogenetic studies.

I will end with a more subtle case of questionable 'parsimoniousness': the question of numbers, using Reich (2018) as a good representative of other workers in the field: 'The mitochondrial DNA [of modern Indians], passed down along the female line, is almost entirely restricted to India, suggesting that it may have nearly all come from the ASI, even in the north. The only possible explanation for this is *major migration* between West Eurasia and India in the Bronze Age or afterward. Males with this Y chromosome type were extraordinarily successful at leaving offspring while female immigrants made far less of a genetic contribution. … Most of the ANI genetic input into India came from males. … the common thread is that males from populations *with more power* tend to pair with females from populations with less. … This pattern is exactly what one would expect from an Indo-European-speaking people taking the reins of political and social power after four thousand years ago …' (emphasis mine).

Such assertions are troubling for two reasons: they echo nineteenth-century scholarly rants on the 'powerful' Aryans; and they assume a 'major migration', which remains

invisible on the ground and was sought to be diluted by more recent models, such as Witzel's 'trickle-in theory', according to which, 'Just one "Afghan" Indo-Aryan tribe that did not return to the highlands but stayed in their Panjab winter quarters in spring was needed to set off a wave of acculturation in the plains' (Witzel 2005, p. 342), i.e. to overturn the subcontinent's linguistic and cultural landscape. Reich offers no discussion.

Indeed, a troubling aspect of the recent archaeogenetic literature is the near complete absence of intra- and interdisciplinary research. Every new study seems to emerge in isolation; very rarely does it engage in a discussion with preceding work. Granting that sequencing techniques have vastly improved in the last few years, the lay reader would still like to know how some of the earlier studies reached very different conclusions (Danino 2016). Dissent, disagreement and discussion have been one of the engines of science; one would like to see it more in operation in this young field.

'We geneticists may be the barbarians coming late to the study of the human past, but it is always a bad idea to ignore barbarians' (Reich 2018). Very true, and we should be grateful for the fresh vigour brought in by the 'barbarians'; but the complexities and the multidisciplinary nature of the field still need to be understood and respected.

## References


Allchin R and Allchin B 1997 *Origins of a civilization: the prehistory and early archaeology of south Asia* (New Delhi: Viking) p 222

Arvidsson S 2006 *Aryan idols: Indo-European mythology as ideology and science* (Chicago: The University of Chicago Press)

Bisht RS 1999 Harappans and the Rigveda: Points of convergence; in *Dawn of Indian civilization* (ed) GC Pande (New Delhi: Centre for Studies in Civilizations) pp 393–438

Boas F 1938 *The mind of primitive man* (New York: Macmillan) p 156

Boas F 1940 *Race, language and culture* (New York: Macmillan)

Boivin N 2007 Anthropological, historical, archaeological and genetic perspectives on the origins of caste in south Asia; in *The evolution and history of human populations in south Asia: inter-disciplinary studies in archaeology, biological anthropology, linguistics and genetics* (eds) MD Petraglia and B Allchin (Dordrecht: Springer) pp 341–361

Bryant E 2001 *The quest for the origins of vedic culture: the Indo-Aryan migration debate* (New York: Oxford University Press)

Bryant EF and Patton LL (eds) 2005 *The Indo-Aryan controversy: evidence and inference in Indian history* (London & New York: Routledge)

Chakrabarti DK 2008 *The battle for ancient India: an essay in the sociopolitics of Indian archaeology* (New Delhi: Aryan Books International)

Danino M 2006 *L'inde et l'invasion de nulle part: Le dernier repaire du mythe aryen* (Paris: Les Belles Lettres)

Danino M 2014 Genetics and the Aryan issue; in *History of ancient India*, vol. 3: *the texts, political history and administration till c. 200 BC* (eds) DK Chakrabarti and M Lal (New Delhi: Vivekananda International Foundation & Aryan Books International) pp 44–64

Danino M 2016 Aryans and the Indus civilization: archaeological, skeletal, and molecular evidence; in *A companion to south Asia in the past* (eds) G Robbins Schug and SR Walimbe (West Sussex: Wiley–Blackwell) pp 205–224

Danino M forthcoming The dawn of Indian civilization and the elusive Aryans

Danino M in press Fabricating evidence in support of the Aryan invasion-migration theory

Demoule J-P 2014 *Mais où sont donc passés les Indo-Européens? Le mythe d'origine de l'Occident* (Paris: Éditions du Seuil)

Demoule J-P 2016 The canonical Indo-European model and its underlying assumptions. *Faits de Langues: Comparatisme et Reconstruction: Tendances Actuelles* **47** 161–167

Elst K 1999 *Update on the Aryan invasion debate* (New Delhi: Aditya Prakashan)

François A 2014 Trees, waves and linkages: Models of language diversification; in *The Routledge handbook of historical linguistics* (eds) C Bowern and B Evans (London: Routledge) pp 161–189

Friese K 2018 4500-year-old DNA from Rakhigarhi reveals evidence that will unsettle Hindutva nationalists. *India Today* 31 August. *www.indiatoday.in/magazine/cover-story/story/20180910-rakhigarhi-dna-study-findings-indus-valley-civilisation-1327247-2018-08-31* (accessed January 2019)

Fuller DQ, Denhamb T, Arroyo-Kalina M, Lucasa L, Stevensa CJ, Qinc L, Allabyd RG and Purugganane MD 2014 Convergent evolution and parallelism in plant domestication revealed by an expanding archaeological record. *Proc. Natl. Acad. Sci.* **111** 6147–6152

Fuller DQ, *et al.* nd Early rice project: the origins and spread of agriculture. *https://www.ucl.ac.uk/rice/history-rice/origins-and-spread-agriculture* (accessed January 2019)

Goldstücker T 1879 *Literary remains of the late Professor Theodore Goldstücker* Vol. **1** (London: W.H. Allen)

Jarrige J-F 1995 Du néolithique à la civilisation de l'Inde ancienne. *Arts Asiatiques* **L** 5–29

Jha DN 1998 *Ancient India in historical outline* 2nd edition (New Delhi: Manohar) p 49

Johansen PG 2003 Recasting the foundations: new approaches to regional understandings of South Asian archaeology and the problem of culture history. *Asian Perspect.* **42** 193–206

Joseph T 2018 How ancient DNA may rewrite prehistory in India. *BBC News* 30 December. *https://www.bbc.com/news/world-asia-india-46616574* (accessed January 2019)

Kazanas N 2009 *Indo-Aryan origins and other vedic issues* (New Delhi: Aditya Prakashan)

Kazanas N 2015 *Vedic and Indo-European studies* (New Delhi: Aditya Prakashan)

Lal BB 2005 *The homeland of the Aryans: evidence of Rigvedic Flora and Fauna* (New Delhi: Aryan Books International)

Lal BB 2015 *The Rigvedic people: 'Invaders'?/'Immigrants'? Or Indigenous? Evidence of archaeology and literature* (New Delhi: Aryan Books International)

Leach E 1990 Aryan invasions over the millennia; in *Culture through time: anthropological approaches* (ed) E Ohnuki-Tierney (Stanford: Stanford University Press) pp 227–245

Malhotra R and Neelakandan A 2011 *Breaking India: Western interventions in Dravidian and Dalit faultlines* (New Delhi: Amaryllis)

Mallory JP and DQ Adams 2006 *The Oxford Introduction to proto-Indo-European and the Proto-Indo-European world* (New York: Oxford University Press) pp 450–451

Narasimhan VM, Patterson NJ, Moorjani P, Lazaridis I, Mark L, Mallick S, *et al.* 2018 The genomic formation of south and central Asia. bioRxiv doi: http://dx.doi.org/10.1101/292581

Nichols J 1997a Modeling ancient population structures and movement in linguistics. *Annu. Rev. Anthropol.* **26** 359–384

Nichols J 1997b The epicentre of the Indo-European linguistic spread; in *Archaeology and language* (eds) R Blench and M Spriggs, Vol. **1** (London: Routledge) pp 122–148

Olalde I, *et al.* 2018 The beaker phenomenon and the genomic transformation of northwest Europe. *Nature* **555** 190–196

Olender M 1992 *The languages of paradise: race, religion, and philology in the nineteenth century* (Cambridge, Massachusetts & London: Harvard University Press)

Pereltsvaig A 2015 Are Indo-Europeans 'untraceable'?—A response to Jean-Paul Demoule. www.languagesoftheworld.info/bad-linguistics/are-indo-europeans-untraceable-a-response-to-jean-paul-demoule.html (accessed January 2019)

Poliakov L 1974 *The Aryan myth: a history of racist and nationalist ideas in Europe* (London: Sussex University Press)

Reich D 2018 *Who We Are and How We Got here: Ancient DNA and the New science of the human past* (New York: Pantheon Books)

Reich D, Thangaraj K, Patterson N, Price AL and Singh L 2009 Reconstructing Indian population history. *Nature* **461** 489–494

Shaffer JG and Lichtenstein DA 2013 South Asian archaeology: Late prehistoric cultural continuity or discontinuity'; in *Perspectives on the origin of Indian civilization* (eds) A Marcantonio and GN Jha (Dartmouth: Center for Indic Studies and New Delhi: D.K. Printworld) pp 233–259

Thomson K 2009a A still undeciphered text: how the scientific approach to the Rigveda would open up Indo-European studies. *J. Indo-Eur. Stud.* **37** 1–47

Thomson K 2009b A still undeciphered text, continued: the reply to my critics. *J. Indo-Eur. Stud.* **37** 59–88

Trautmann TR (ed) 2005 *The Aryan debate* (New Delhi: Oxford University Press)

Trubetzkoy NS 2001 *Studies in general linguistics and language structure* (ed) A Liberman (Durham and London: Duke University Press) pp 87–90

Valentine B, *et al.* 2015 Evidence for patterns of selective urban migration in the greater Indus Valley (2600-1900 BC): A lead and strontium isotope mortuary analysis. *PLoS ONE* **10** e0123103. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0123103 (accessed January 2019)

Walimbe SR 2007 Population movements in the Indian subcontinent during the protohistoric period: Physical anthropological assessment; in *The evolution and history of human populations in south Asia: Inter-disciplinary studies in archaeology, biological anthropology, linguistics and genetics* (eds) MD Petraglia and B Allchin (Dordrecht: Springer) pp 297–319

Witzel M 1995a Rgvedic history: Poets, chieftains and polities; in *The Indo-Aryans of ancient south Asia: Language, material culture and ethnicity* (ed) G Erdosy (Berlin & New York: Walter de Gruyter) pp 307–352

Witzel M 1995b Early Indian history: Linguistic and textual parameters; in *The Indo-Aryans of ancient south Asia: Language, material culture and ethnicity* (ed) G Erdosy (Berlin & New York: Walter de Gruyter) pp 85–125

Witzel M 2005 Indocentrism: Autochthonous visions of ancient India; in *The Indo-Aryan controversy: Evidence and inference in Indian history* (eds) EF Bryant and LL Patton (London & New York: Routledge) p 342