habitats. About 40,000 large dams around the globe exist today. But what has been ignored in this mammoth dam venture is, building a series of check dams upstream and downstream that would have benefited more stakeholders in the chronic conflict for water.

The Chief Minister of Rajasthan recently inaugurated a check dam (367 m long and 7.25 m tall) built by the NM Sadguru Foundation at a cost of 4.5 crore rupees that can store 350 mcft of water and commended the foundation's unique contribution to rural development (Figure 1). This check dam, India's largest to be constructed by a non-profit agency with government support, is located on the river Mahi where the government had built a bigger Mahi–Banas Sagar dam on the upstream. River Mahi originates in the Mahi Kanta hills in western Madhya Pradesh, and enters near Chandangarh in Rajasthan's Banswara district. This example of building check dams even near big dams should be replicated in south India. When I saw the NM Sadguru Foundation's check dam in Mahi, it reminded me of the Grand Anicut, also known as the 'Kallanai' in Tamil, built during the end of second century AD, which is still supplying water to the Cauvery delta in Tamil Nadu.

Figure 1. India's largest check dam built by NM Sadguru Water and Development Foundation on river Mahi at Baneswardham on the border of Banswara and Dungarpur districts of Rajasthan. (Photo: Agoramoorthy.)

Unlike big dams, small check dams neither displace people nor destroy natural resources. Even silt is not a problem since opening the gates will wash away accumulated sediment. Only the last flow of water from monsoon is harvested in these remarkable dams which is then pumped upwards via lift irrigation systems. Ever since these environment-friendly dams were built by the NM Sadguru Water and Development Foundation in rivers across Gujarat and Rajasthan, the groundwater levels in many villages were raised – an indication of effective recharging[4]. With a rapidly growing human population pressure, water shortages and desertification in India is likely to worsen. Nonetheless, water problems can be averted by a change in attitude and the check dams implemented by the Sadguru Foundation in the drylands of west India is an outstanding and cost-effective model that should be seriously considered by scientists, bureaucrats and politicians in the Cauvery Management Board.

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Is elephant tail hair osmetrichia?

Oestrous/pro-oestrous female elephants are known to raise their tails up, rather like a flag, after rubbing the brush of their tails against their vaginal region. This 'scent flagging', as it has been termed[1], is likely to disperse putative voltatile pheromones in vaginal exudate through air/wind. We have addressed the question: Is the ultrastructure of elephant tail hair adapted to fulfil this function? This question is warranted by the following line of argument.

Over the last three decades or so, specialized hairs with altered ultrastructure, facilitating storage of pheromones, have been discovered in mammals. Hairs of certain body parts (such as at or near some glandular structures exuding pheromone) which collect and store pheromones reveal an ultrastructure that markedly differs from that of the general body hair, such as the honey comb-like structure of the hair of African crested rat (see below). On the basis of this specialized structure and function (pheromone storage) such hair have been termed osmetrichia (smell-hair). After the pioneering work on black-tailed American deer[2] followed by that of the African crested rat[3], a number of osmetrichia has been recorded. A few more examples are in the Antechinus, a marsupial[4], the Indian musk shrew[5] and some bat species[6]. The general pattern of body hair ultrastructure of many mammals is a series of scales arranged like those of a fish. SEM images show that tiger, leopard, lion, spotted deer and gorilla have the same general pattern of scaly structure differing only in details. Figure 1 *a* and *b* shows that head hair and tail hair of the domestic cat have the same general structure (scaly), but that the dimensions of the scales vary. Tail hair is also thinner. The same applies to goat hair (not shown), i.e. both body and tail hair are scaly.

We therefore addressed two questions: (i) Is the ultrastructure of elephant hair which is so stiff and sparsely distributed, basically different from that of the hair of most mammals? (ii) Is the tail hair significantly different from that of head hair so as to merit the term osmetrichia? The first question is of minor interest, while the second one is more important, and is warranted by the behaviour pattern, i.e. 'scent flagging' as mentioned above. Figure 2 *a*–*c* reveals that neither the tail hair nor the forehead hair has the usual scaly structure. Furthermore, there is an unexpected difference between the tail and forehead hair. Although both have a fibrous, non-scaly pattern, the forehead

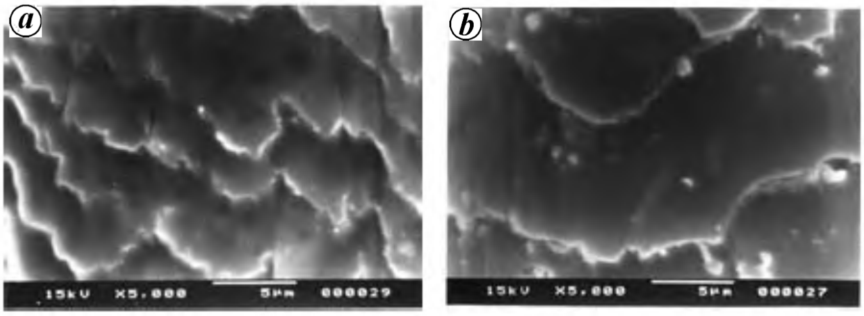

Figure 1. Cat body hair (***a***) and tail hair (***b***) of the domestic cat.

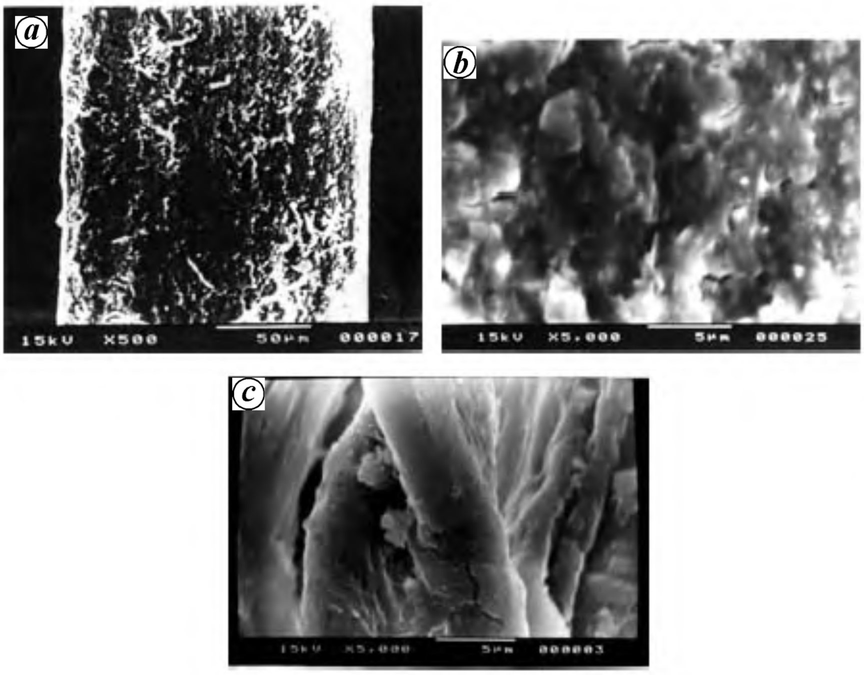

Figure 2 *a–c*. Elephant hair. ***a***, ***b***, Head hair; ***c***, Tail hair.

hair is a thick, single-strand (170 μm) as shown in Figure 2 *a* and *b*. The tail is a brush with each individual hair of the brush consisting of a number of fibres of thickness 5 μm or less, which constitutes a miniature brush (Figure 2 *c*). Figure 2 *b* shows that even at higher magnification, it is not resolved into constituent thin fibres though 'impurities' on the surface may have masked the structure. Vaginal exudate would however be more easily mopped by such a contraption. Spaces between fibres are more than those between scales. The different structure of pachydermatous hair and the special structure of the tail hair, together seem to be well adopted to collect vaginal exudates.

The question may arise, whether these animals mentioned above can possibly have osmetrichia. This is unlikely because no distinctive relevant behaviour (such as raising the tail by the she-elephant) is known, except the following. The tail with tail glands is used by cats for communication but tail hair ultrastructure is of normal type. Lion mane has a similar functional role and this too has the normal structure (i.e. not evolved into osmetrichia).

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