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CORRESPONDENCE

Importance of herbaria and taxonomists

I would like to emphasize the importance of herbaria and the taxonomists – both becoming extinct at many places (*Curr. Sci.*, 1995, **69**, 968–969). Higher plants are a recognized source of useful chemicals for the pharmaceutical and chemical industries, but authenticity of the specimens is an important step for these industries. Commercial plant suppliers should maintain a *Voucher Herbarium Specimen* of the plant or else they should not be given licence. Commercial pharmaceutical firms have failed several times due to the acceptance of wrong plant material for extracting drug, resulting in a loss of billions/trillions of dollars. That is the reason why the pharmaceutical industry and Government agencies turned their heads against further exploitation of a market now estimated in the US at $ 6 billions at the consumer level.

During World War II, some professional botanists and graduate students who were thorough in taxonomy were drafted, enlisted or commissioned in the armed forces and it was possible to use their training in taxonomy directly. The role of botanists in the military ranged from teaching or research to participation in combat or support operations. A few taxonomists in uniform, in spite of their occupational obligations, were encouraged by civilian museum personnel to collect botanical specimens. The best-known projects for taxonomists (botanists) as civilians involved the search for native supplies of strategic new materials, particularly the Cinchona mission, the Rubber mission – *Hevea*, *Carica papaya*, *Castilla elastica*, Cryptostegia, Haocomia, Micrandra, Manihot and its species, Parthenium-Guayule, Sapium, Solidago and its species, Taraxacum and its species.

The USA Typhus Commission was established by executive order of President Roosevelt as a quasi-independent agency under the aegis of the Preventive Medicine Service of the Office of the Surgeon General, US Army. An outbreak of murine typhus was investigated in Egypt, but the major concern was the occurrence of rickettsial scrub typhus (Japanese river fever) among the American and Australian troops in the Solomons and in New Guinea. South Bat Island in the Purdy Group was abandoned for military purposes in mid-April 1944 when two-thirds of the military personnel got the disease within six weeks of their arrival. There followed severe outbreaks in 'Marrill's Marauders' in Central Burma area and among British troops in the area of Imphal, India and in Central Burma. The USATC India–Burma Field Party formed a 'Botany section with stress on taxonomy' in June 1944, with a mission to sample the vegetation around infested camp sites and control areas for infected mites. A British Typhus Commission with A. A. Bullock of Kew Botanic Gardens as botanist (taxonomist) had suggested that mites were confined to stands of Elephant Grass. Drying plants in the monsoon was a problem. Army blankets were cut into rectangles to be used as blotters in presses with Coleman stoves as source of bottom heat in improvized drying cabinets. About 3000 herbarium sheets were sent to the Smithsonian, but identifications were delayed for lack of data on locale. No voucher specimens were available for correct identification of plant species.

Malarial survey units, because of the severe and debilitating effects of malaria on troops in the southwest Pacific Islands, attempted to eradicate the mosquito vectors and to develop medicinal alternatives to quinine. The survey and control work was usually done by medical personnel, with entomologists and several botanists (mainly taxonomists) playing a major role.

In Trinidad it was determined that the malarial mosquito bred in water in the rosettes of epiphytic bromeliads. The bromeliads were identified by a taxonomist in the States and a programme of eradication by sprays removed all bromeliads, designated by botanists, for a considerable distance around the military bases.

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Uses of herbaria

R. R. Rao (*Curr. Sci.*, 1995, **69**, 968–969) has rightly emphasized the importance of herbaria.

The herbarium specimens have proved of immense value in locating mines after the indicator value of the species was realized. For example, reading the localities of copper mosses from herbaria sheets led to the location of copper mines in Sweden.

In other cases, the specimens collected in the last century can throw light on the environmental changes in the recent past.

Herbarium specimens of leaves of the tree *Palaquim grande*, collected a century ago from the Deltota estate near Peradeniya, Sri Lanka, show a lot of growth of a curious alga-like moss *Ephemeropsis tjiboldensis*, which is a very good indicator of an ever-moist microclimate. However, a search for such epiphylous mosses in the same locality in recent years by W. Meijer of Kentucky University, USA, proved futile because of the destruction of forests.

Herbaria could also illuminate the evolutionary trends in the taxa with *environmental implications*. Study of populations within a species could provide information as to whether a particular site is undergoing accentuation of aridity or not. Certain species exhibit a number of populations, for e.g. the grass *Oropetium thomaeum* Linn. f. [Tandon, R. K., Ecological investigations on *Oropetium thomaeum* (Linn. f.) Trin., Ph D thesis, University of Delhi, 1977]. It may be possible to arrange these populations along a gradient of humidity–aridity. It would be an interesting exercise to compare the population of a particular site of Rajasthan or Sind with the herbarium specimens collected from the same locality a century or so ago and to note whether a trend towards xericity is indicated. Such an investigation may give a clue to a biometeorological shift or stability in the degree of aridity.

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Animal usage in research

The *Current Science* issue of 25 August 1995 carried a special section on Animal Welfare. In a prefatory note to the article entitled 'On the use of animals in research and education' you identify one of the authors Dr Jane Goodall as a noted advocate for the noninvasive use of animals in research. But Dr Goodall is not an advocate for animal use at all. What she advocates is conduct toward animals with ethical consideration and with respect.

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Biodiversity information networks

C. P. Geevan's article (*Curr. Sci.*, 1995, **69**, 906–914) suffers from the deficiency of not identifying adequately the information sources or the ongoing efforts in building up such sources in India. A glaring example is the omission of efforts of the BSI and the ZSI in creating an information network. There are a few others that should have been examined and mentioned. The other difficulty with this article is its thorough neglect of the limitations of the telecommunication infrastructure in this country, which necessitates development of suitable hybrids of electronic and conventional databases and mechanisms of dissemination. Without a thorough analysis of at least these issues, the article is an exercise in speculation without the rigour that converts speculation into reality.

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C. P. Geevan replies:

Balaji's comments pertain to two key points:

(a) the information sources need to be fully identified, and
(b) the limitations of telecom infrastructure in the country have been neglected and that these limitations necessitate the development of 'hybrid' databases.

With regard to the first observation, I would like to stress that my focus was primarily on establishing special interest groups for biodiversity conservation making use of available or emerging computer networking options and not on information sources in their numerous forms. Nor was there any selective mention or omission of information sources. I have pointed out only networking efforts which involve a variety of organizations and *not* those being carried out *within* large institutions. It is quite well known that BSI and ZSI – among the oldest institutions – possess the largest depositories of biodiversity information in the country. However, networking efforts, if any, initiated by them with the participation of other organizations have not been publicized. If such an initiative exists it certainly is a welcome development.

Both small and large organizations have a place in networking, since the information available with a minor player may potentially be of high value to another participant. It may also be noted that a large number of research institutions and NGOs in the country already possess or have initiated databases in the areas of their concern and are important information sources. I have also refrained from identifying information sources since it has been much discussed. What is needed, however, is easy access to both information and expertise. Even if such access is based on very low speed modems connected to poor telephone lines, it will make a world of difference.

In his second observation, Balaji argues for 'hybrid' (distinct from multimedia) databases, and implies that the present telecom infrastructure cannot support the concept presented in my article. I am unaware of instances of database designs that are able to overcome the barriers imposed by the technology level of communication systems. It will be a major breakthrough if some 'hybrid' data structure can perform a miracle of sorts by circumventing these limitations. Undoubtedly, considerable R&D effort is needed to transform this fond hope into a technical possibility. Sadly, there are no reports of such efforts.

As regards the adequacy of telecommunication links in the country, it may be noted that (a) networking efforts in India have progressed in spite of severe constraints, and (b) the telecom infrastructure in the country is not so bad as to deter large-scale data networking. Such scepticism is rather misplaced, particularly at a juncture when the telecom options are comparable to that in developed countries. The telecom network in India, though not among the very best in the world, certainly does not rank among the worst. It is, in fact, possible now to operate data links from some of the remotest locations. If better links are a must, the user can opt for VSAT.

The critics of data networking using terrestrial links have been proven wrong by the very success of such networks