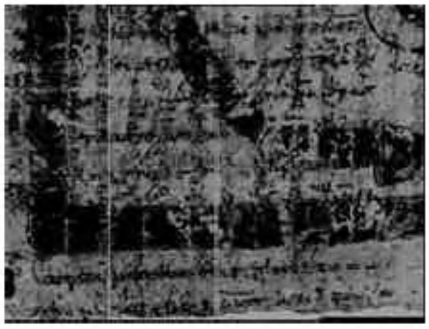

Figure 4. X-ray fluorescence imaging at SSRL revealed the hidden text. This X-ray iron map shows the lower left quadrant of the page (Image taken at Stanford Linear Accelerator Center).

letters by comparing the layers of text from the synchrotron images and from the multi-spectral images.

According to Bergmann, the studies using the X-ray technique have just begun and should help to uncover the missing 25–30% of the text in the palimpsest[4]. The work carried out so far has revealed that Archimedes was the first Greek to use infinity. The studies have also allowed the first interpretation of *Stomachion*, a treaty dealing with the number of ways a problem can be solved which is used in modern computation. The team, consisting of researchers from Stanford, Rochester Institute of Technology, Johns Hopkins University, and Rutgers University, has plans to decipher and read the entire text, catalog and transcribe it into a digital form.

1. Stein, S., Mathematical Association of America, 1999.
2. Usher, A. P., *A History of Mechanical Inventions*, Dover Publications, 1988.
3. Purchased in an auction for US$ 2 million in 1998. The anonymous collector is also involved in funding of the present studies.
4. Bergmann, U., unpublished work and personal communication; See also *Nature*, 2005, **435**, 257.

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Recovery of endangered and threatened species: Developing a national priority list of plants and insects*

Conservation of highly threatened and critically endangered species demands a systematic programme of recovering their populations in the natural habitats so that the declining trend in their numbers is reversed. Such programmes should ensure that the population sizes and densities of the targeted species are enhanced above the critical bottleneck levels such that they become self sustained in reproduction and regeneration in nature. In India, though there are good examples of recovery of threatened species of large mammals, threatened plants and invertebrates are generally neglected. In this context, a two-day workshop was organized at Bangalore for developing a National Programme on Recovering Endangered and Threatened species through biotechnological tools. During the meeting it was recognized that while there are hundreds of species that are endangered, it is important to prioritize them so that *the most endangered* plants and invertebrates that demand immediate recovery programme could be identified. In this context, a preliminary list of plants (List A) and insects (List B) has been developed in consultation with Botanical Survey of India and Zoological Survey of India for further processing.

We invite botanists, zoologists (entomologists), conservation ecologists, field workers and all others interested in the conservation of species to comment on this list. The comments may be structured on the following issues:

1. List a maximum of 12 species (from the list given here for plants and insects) that you think need immediate recovery.
2. Provide reasons for your suggestions based on the following parameters (note that these details are important for a final prioritization and hence need to be provided for each of the species): (a) Qualitative and/or quantitative data on their distribution. (b) Places where you have recorded/observed them. (c) Any problems that you foresee with its reproduction and regeneration. (d) Whether you see any need for biotechnological intervention in their recovery programme. (e) Whether there are any geo-type, ecotype, varietal complexes you see with the species. (f) Any other details.
3. Your name and address (you may be referred to/invited for future discussions).

Your response may be emailed to kng@vsnl.com or mailed to K. N. Ganeshaiah, School of Ecology and Conservation, University of Agricultural Sciences, GKVK, Bangalore 560 065 or faxed to KN Ganeshaiah, 080 2353 0070.

List A: Plants

Trees

Buchanania barberi Gamble
Nothopegia aureo-fulva Beddome
Nothopegia beddomei Gamble var. *wynaadica* Ellis & Chandra
Phaeanthus malabaricus Beddome
Popowia beddomeana Hook. f. & Thomson
Phoenix rupicola T. Anders.
Atuna travancorica (Beddome) Kosterm
Garcinia imbertii Bourd.
Hopea canarensis Hole
Vateria macrocarpa B.L. Gupta
Diospyros bourdillonii Brand.

*Based on the workshop sponsored by the Department of Biotechnology, New Delhi, organized on 19–20 July 2005 at Jungle Resorts, Bannerghatta.

Cinnamoum travancoricum Gamble
Litsea travancorica Gamble
Gymnocladus assamicus U.N. & P.C. Kanjilal
Inga cynometroides (Beddome) Baker
Ormosia travancorica Beddome
Cynometra beddomei Prain
Cynometra bourdillonii Gamble
Aglaia barberi Gamble
Dysoxylum beddomei Hiern
Syzygium palghatense Gamble
Syzygium travancoricum Gamble
Bentinckia condapanna Berry
Helicia travancorica Beddome ex Hook. f.
Madhuca bourdillonii (Gamble) H.J. Lam
Madhuca insignis Radlk.
Palaquium bourdillonii Brandis

Shrubs

Neuracanthus neesianus C.B. Clarke
Strobilanthes dupenii Beddome ex C.B. Clarke
Schefflera bourdillonii Gamble
Vernonia multibracteata Gamble
Reidia gageana Gamble
Pogostemon travancoricus Beddome
Psychotria andamanica Kurz.
Saprosma fragrans Beddome

Herbs

Wiesneria triandra (Dalz.) Mich.
Crinum brachynema Herbert
Rauvolfia beddomei Hook. f.
Aponogeton bruggeni Yadav & Govekar
Arisaema sarracaenioides Barnes & C. Fischer
Ceropegia panchganiensis Blatter & McCann
Impatiens aliciae C.E.C. Fischer
Impatiens anaimudica C.E.C. Fischer
Impatiens cochinica Hook. f.
Impatiens coelotropis C.E.C. Fischer
Impatiens johnii Barnes
Impatiens munnarensis Barnes
Impatiens nilagirica C.E.C. Fischer
Impatiens pandata Barnes
Impatiens platyadena C.E.C. Fischer
Impatiens rivulicola Hook. f.
Impatiens verecunda Hook. f.
Begonia aliciae C.E.C. Fischer
Begonia phryxophylla Blatter *et* McCann
Haplothismia exannulata Airy Shaw
Anaphalis banesii C.E.C. Fischer
Ellipanthus neglectus Gamble
Didymocarpus meeboldii Smith & Ramas.
Drimia razii Ansari
Rotala malampuzhensis R.V. Nair ex Cook
Habenaria flabelliformis Summerh. ex Fischer
Piper barberi Gamble
Hybanthus travancoricus (Beddome) Melchoir
Kaempferia rotunda L.

Climbers

Ceropegia beddomei Hook. f.
Seshagiria sahyadrica Ansari Hemadri
Toxocarpus palghatensis Gamble
Salacia beddomei Gamble
Salacia brunnoniana Wight & Arn.
Salacia jenkinsii Kurz.
Ipomea clarkei Hook.f.
Hugonia bethi Sedgwick

Others

**Poeciloneuron pauciflorum* Beddome
**Dialium travancoricum* Bourd.
**Humboldtia bourdillonii* Prain
**Paphiopedilum druryi* (Beddome) Stein
**Hubbardia heptaneuron* Bor
**Ceropegia fantastica* Sedgwick
**Coscinium fenestratum* (Gaertn.) Colebr.
**Semecarpus kathalekanensis* Das & Swam
**Mantisia wengeri* C.E.C. Fischer
**Nymphea tetragona* Georgi
**Nepenthes khasiana* Hook. f.

*These species are already considered for recovery programme.

List B: Insects

Mesovelia indica (Horvath, 1915) Hemiptera, Mesoveliidae
Taeniopalpus imperialis Hope, Lepidoptera
Almandia lidderdalei (Atkinson), Lepidoptera
Papillion dravidarum Wood-Mason, Lepidoptera
Genus *Poenaesius* Snow Apollo's, Lepidoptera
Kallima philarchus (Westwood), Lepidoptera
Euploea crameri Moore, Lepidoptera
Mycalesis orseis (Heuritson), Lepidoptera
Erebia narasingha (Moore), Lepidoptera
Vanessa ladabensis Moore, Lepidoptera
Atrophaneura pandiyana; Lepidoptera
Paratirrhoea marshalli, Wood-Mason Lepidoptera
Graphium antiphates Lepidoptera

Ants

Vombisidris occidua, Formicidae
Vombisidris humbolticola
Dilobocondyla sp.
Leptallina escheri
Indomyrma dasypyx
Rhoptromyrmex mayri

Dragon flies

Phylloneura westermani Myristica Reed Tail
Davidoides martini Syrandiri Club Tail; Gomphidae
Chlorogomphus campioni Nilgiri Mountain Hawk; Corduligasteridae
Chlorogomphus xanthoptera Mountain Hawk; Corduligasteridae

Tiger beetles

Cicindela (Pancallia) shivah Parry Coleoptera; Cicindelidae
Anthea sexguttata (Coleoptera, Carabidae)

Others

**Onthophagus imperator*
**Papilio buddha* Westwood

*These species are already considered for the recovery programme.

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