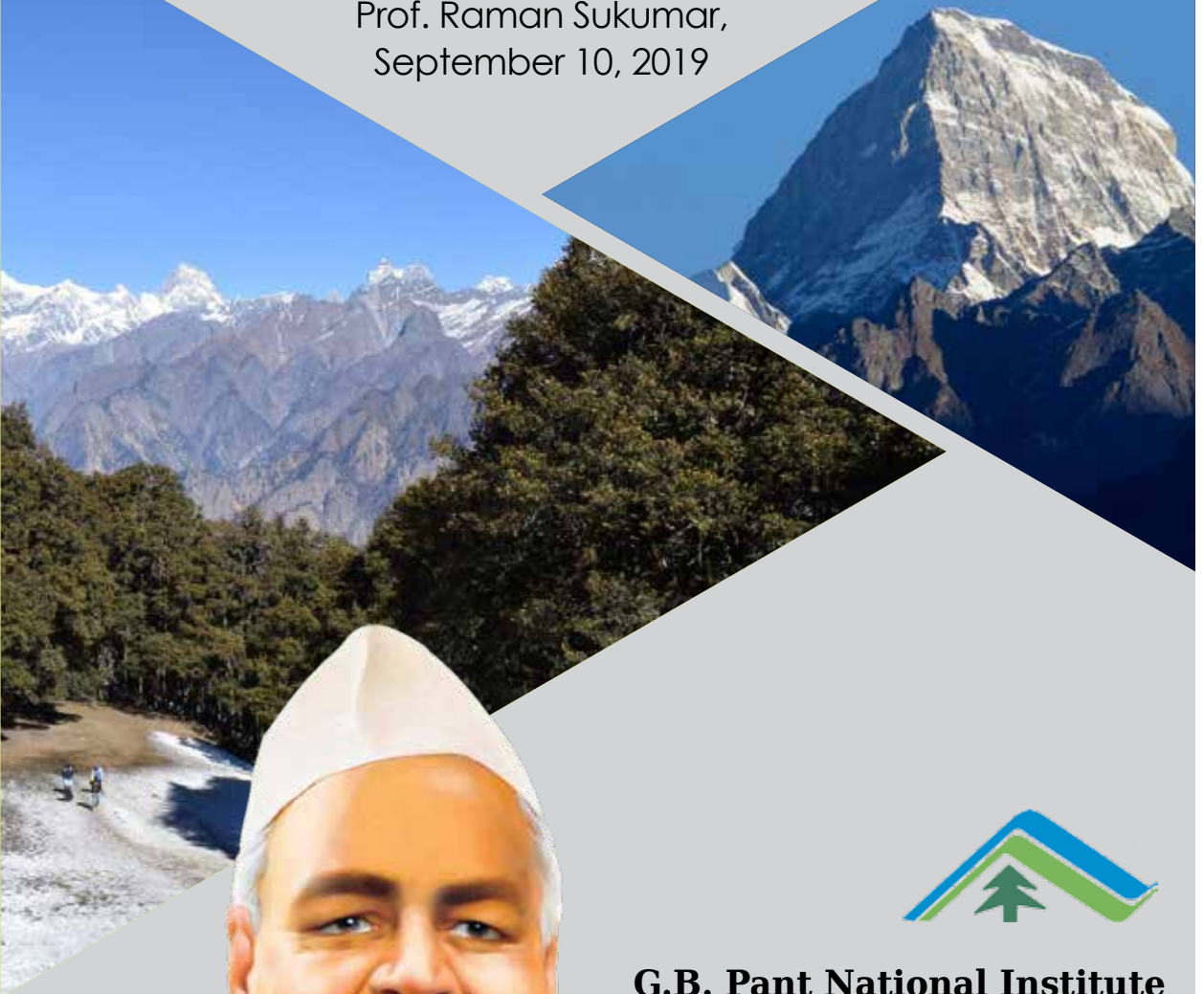


# PT. GOVIND BALLABH PANT

Memorial Lecture: XXV

Prof. Raman Sukumar,  
September 10, 2019



**G.B. Pant National Institute  
of Himalayan Environment  
& Sustainable Development**

(An Autonomous Institute of Ministry  
of Environment, Forest and Climate Change,  
Govt. of India)

Kosi-Katarmal, Almora, 263643, Uttarakhand



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## Prof. Raman Sukumar

- Professor of Ecology at the Indian Institute of Science, Bangalore
- Associate Faculty, Divecha Centre for Climate Change, IISc. (2009 - present)
- Adjunct Faculty, Columbia University (2001 - present)
- Visiting Professor, Institute for Advanced Study, Kyoto University, Japan (2018)
- Fulbright Fellow at Princeton University (1991-92)

### Specialization:

- Wildlife Ecology (Asian elephant ecology and management; Population dynamics; Wildlife-human conflicts)
- Tropical forest ecology (Diversity, structure and dynamics of tropical forests; Conservation of tropical forests)
- Climate change (Reconstructing Quaternary climate change; Assessing impacts of future climate change on forests and biodiversity)

### Fellow of Academies:

- 2013 Fellow of The World Academy of Sciences (FTWS).
- 2006 Fellow of Geological Society of India (FGSc).
- 2005 Fellow of Indian National Science Academy (FNSc).
- 2000 Fellow of Indian Academy of Sciences (FASc).

### Awards & Recognitions:

- 2012 Doctor of Science (Honoris causa), Vidyasagar University, West Bengal, India.
- 2011 Taru Lalvani Award for Protection of the Environment, Rotary Club of Bombay, India.
- 2010 Award for Contributions to National Development, Karuna Trust, Bangalore, India.
- 2010-15 J.C. Bose National Fellow, Department of Science & Technology, India.
- 2007 Commendation by the Prime Minister for contributions to the Intergovernmental Panel on Climate Change (IPCC) that shared the Noble Peace Prize.
- 2007 B.P. Pal National Environment Fellowship Award for Biodiversity, India.
- 2006 International Cosmos Prize, Japan.
- 2006 UGC National Swami Pranavananda Saraswati Award in Environmental Science and Ecology, India.
- 2004 TN Khoshoo Memorial Award for Conservation, India, (first recipient of this award).
- 2003 Whitley Gold Award for International Nature Conservation, U.K.
- 1997 Order of the Golden Ark, The Netherlands.
- 1991 Presidential Award of the Chicago Zoological Society, USA.
- 1973 National Science Talent Award, National Council for Educational Research and Training, India.

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## Conservation at the crossroads amongst conflicts

**Professor Raman Sukumar**

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**I**t is indeed a very special honour to be invited to deliver the 25th GB Pant Memorial Lecture on the occasion of the 132nd birth centenary of this great visionary, freedom fighter and leader, at this picturesque venue in Almora close to his birth place.

In spite of its ancient nature-based value systems, India's forests and its wildlife were staring at a serious crisis, at the time of Independence. Our forests had been mercilessly logged to support the colonial expansion, while its spectacular wildlife had been decimated through capture and trophy hunting. The first major turning point was possibly the enactment of the Wildlife Protection Act in 1972 which significantly helped in reversing the fortunes of many wildlife species, while the Forest Conservation Act 1980 helped in slowing down the rate of deforestation. India has since come a long way in protecting and nurturing its wildlife populations, with the results that many species have recovered significantly to levels which safeguard them from any imminent threats of extinction.

At the same time, wildlife has increasingly come into conflicts with people in India in recent decades, with negative consequences for agriculture, livestock, property and human lives. While the most publicised conflicts involve the larger charismatic animals such as elephants and tigers, a host of other animals including leopards, monkeys, Nilgai and wild pig have also been in chronic and widespread conflict with human interests.

The worst suffers in this conflict are forest dwellers and subsistence farmers living along the periphery of forested areas or in small enclaves within forests. In recent decades, the conflicts have also spread much beyond the "natural habitats", the forests and grasslands under government control, into areas under settlement and agriculture.

At the same time, many animals are also injured or are killed in the course of their interface with people. Wildlife species are run over by trains, killed in road collisions, or electrocuted in settlements and agricultural lands. It is therefore in the interests of both wildlife and people to find practical solutions to reduce these conflicts.

It is important to understand the ecological reasons for this conflict, its increase in recent decades and come up with a comprehensive policy framework for minimizing such conflicts. Otherwise, we risk reaching a situation of such serious magnitude of wildlife-human conflicts from where it would be very difficult to return to tolerable levels without taking extreme management measures.

A rather simplistic narrative of wildlife-human conflicts is often portrayed in the popular media. The story is as follows - humans have intruded into and degraded or destroyed the habitat for wildlife, and the latter are now fighting back for their survival. There are certainly elements of truth in these statements. Over a long historical timescale, wildlife habitats in India have gradually lost their ecological attributes resulting in enhanced wildlife-human conflicts.

But the story is far more complex when you look at trends in recent decades, which is the time scale more relevant to present-day policy and practical management situations.

### **Factors responsible for wildlife-human conflicts:**

Many ecological factors drive wild herbivorous animals to raid agricultural crops and, in the process, come into severe conflicts with people, resulting in both human and animal deaths. A simple way of categorizing the factors enhancing conflicts is to place them under factors that "push" wildlife away from their "natural habitats" (usually forests) into areas largely settled and cultivated by people, and those that "pull" wildlife from their natural habitats into the human-production landscape.

One may, of course, ask what is "natural habitat" really? Why should we relegate wildlife only to the boundaries of what we consider "their natural habitat"? Shouldn't wildlife be allowed to live where it pleases them? Before answering that question, I shall illustrate the push and the pull factors with the example of the elephant, the species that I am most familiar with, in relation to its conflicts with people.

The push factor clearly operates when elephants lose their natural habitat rapidly, as happened in north-western Assam during the 1990s. Large swathes of forest were felled, settled and cultivated with a short period, during a socio-political movement for a separate homeland, rendering several hundred elephants homeless. As a result, conflicts between elephants and agriculture escalated immediately over a wide region as the homeless elephants began wandering into habitations and cultivated fields as far south as the town of Tezpur along the banks of the Brahmaputra. The role of fragmentation in promoting elephant-human conflicts is also evident in east-central Indian states such as Jharkhand and Odisha where mining and other forms of developmental activity have made

deep inroads into the natural forest. This entire region, including neighbouring Chhattisgarh and southern West Bengal, witnesses severe elephant-human conflicts today.

Habitat degradation is more difficult to define, but we can consider this as a process of depletion of natural forage resources for elephants. Contrary to public perception, the selective logging of moist forest or even limited extent of shifting cultivation actually increases the "carrying capacity" of the habitat, thereby attracting elephants and enhancing conflicts with agriculture. When forest land is under intense pressure from mining for minerals, or extraction of biomass for fuelwood, fodder and consumption, this obviously depletes the forage resources for elephants and other wildlife. In recent years, the highly invasive plant, *Lantana camara*, has extensively spread in southern Indian forests; this could have also reduced palatable forage such as grasses for elephants and forced some of these creatures to seek resources outside forest areas. Such cases clearly constitute habitat degradation.

However, we should also look at the other side of the coin. There are many large stretches of forest which are not necessarily degraded, and provide sufficient resources for elephants; yet some or many elephants living in these forests indulge in raiding cultivated crops. Here, the pull factor may be operating. The main factor that "pulls" elephants into crop fields is the abundant quantity of food, be it paddy, millets, or sugar cane, available. Elephants also develop a taste for jack fruit or selective parts of trees such as coconut. Cultivated cereal crops are available in abundance and more nutritious than wild grasses. With better irrigation facilities through small dams, canals or pumping of ground water in many regions, farmers who earlier cultivated a single rain-fed crop in a year are now cultivating two or even three crops in a year. Elephants too have taken advantage of this abundance of water in village tanks and small dams outside forests,

and the perennial availability of cultivated crops. Why then should an elephant be satisfied with “plain bread” when it could more easily obtain “tastier cake” in the supermarkets that people have nurtured so close to forest areas?

The push and the pull factors are not mutually exclusive but may operate simultaneously. I can give an example in the context of an adverse climatic event such as a severe or a prolonged drought. When southern India experienced in 1982 one of the worst droughts of the last century, several elephant family groups left the forests of Hosur (in Tamil Nadu) and Bannerghatta (in Karnataka) the following year and marched into the Chittoor forests of Andhra Pradesh where wild elephants were unknown for the past several centuries. Conflict with farmers escalated as the elephants discovered agricultural crops cultivated through exploitation of ground water. The drought may have been the breaking point, as human extractive pressures on the forests may have rendered them unsustainable for elephants during a difficult year.

Wandering through human habitation and cultivated fields obviously brings its associated risks as an elephant may be injured or even killed by people. Nevertheless, the urge to feast on easily available, abundant and nutritious food overcomes considerations of risk, especially for a creature that can think its way out of challenging situations. This is where some fundamental aspects of biological evolution also begin to operate. When male elephants are on the threshold of becoming adult, they need to begin a course of bodybuilding in order to grow bigger and stronger than their compatriots and potential competitors, and use their energy reserves to come into “musth” when they can achieve the overarching goal of reproduction more successfully. These young bull elephants also need to bid farewell to their families and seek their fortunes in another land with other elephant families they may have never encountered before; otherwise, they risk mating with their close

relatives and eventually their genes fading into biological oblivion through inbreeding. The sub-adult bulls disperse, often through agricultural landscapes, and form coalitions with other bulls especially older ones to learn the tricks of raiding crops. The biological stage is set for conflicts between elephants and people.

Female elephants and their families are not so willing to take risks in venturing into the human domain, in spite of the temptation, because they also need to care for the safety of their young, but when the climate turns adverse, or the habitat becomes patchy or degraded and can no longer cater to their resource needs, they too are eventually forced to take the plunge into the cultivated supermarkets.

A little appreciated factor in the escalation of wildlife-human conflicts is ironically the success of conservation efforts resulting in increasing populations of many wildlife species. Elephant populations have increased over the past four decades in certain regions (such as the south and the north) and have spread into the broader agricultural landscape. Herbivores such as nilgai and black buck have multiplied several-fold in central and northwestern India during this period. Species which numbered in the thousands have now reached population sizes in the tens of thousands. One may, of course, argue that these species were historically very abundant and are only asserting their former population numbers. Nevertheless, such wildlife population growth contributes to increased conflicts in landscapes under higher human densities and more intensive agriculture.

#### **The nature and trends in wildlife-human conflicts**

I would now like to illustrate the nature and trends in conflicts between some of the more prominent wildlife species and people.

The elephant is perhaps the most reported animal when it comes to its impacts on people and agriculture. Not a day passes by without a

report in the media about an elephant or a group of elephants ravaging cultivated crops, breaking into houses in search of food (or liquor), entering a town or even a city or, worse still, killing a person. The elephants themselves have also been at the receiving end. Some years ago, the struggle for survival of “Siddha”, injured when he stumbled at a roadside ditch when coming out of the forest to raid crops, and eventually becoming immobilized along the shores of the Manchanbele dam near Bengaluru, generated a fan club and a wave of public sympathy in Karnataka. A more recent narrative which has gripped the minds of the public is that of the bull elephant “Chinnathambi” (younger brother in Tamil) that was in conflict with agriculture in Coimbatore district of Tamil Nadu, was captured and relocated inside a national park but returned to its original haunts, and has recently been again captured for retention in captivity. Such attention is usually short-lived and fades from public memory, without sufficient appreciation of the underlying causes of why such situation arises or of how they should be managed by the government machinery.

The urban class, largely insulated from conflicts with animals (the exception being monkeys living within cities or pigeons of nuisance value to high-rise apartments), have certain perceptions of this issue. The ground realities for farmers who face the brunt of conflicts with elephants are quite different. Very large herds of elephants routinely mow down vast swathes of standing paddy crop in southern West Bengal. This began as a seasonal movement of about 50 elephants from the Dalma region of Jharkhand during 1986-87, following a drought, but has since grown into a population of 150-200 elephants today. Many of the animals have become resident in this region which had not seen wild elephants for at least the past few centuries. In the year 2015 alone, 71 people were killed in encounters with elephants, a startling figure of one person killed for every two or three elephants in the region. Some years ago

when I had visited the districts of Medinipur and Bankura with a team of senior officials to suggest mitigation measures, a village sarpanch asked us “We understand that these elephants are coming to West Bengal because of disturbance to their habitat from mining activity in Jharkhand. How are we to blame for a problem in another state? Why should we have to endure the ravages of these elephants and spend sleepless nights for several months guarding our fields? Any night our houses may also be demolished by these elephants.” We had no rational answer to these anguished questions.

The magnitude of increase in elephant-human conflicts can be gauged from a simple statistic, namely, the number of people killed by free-ranging elephants in recent decades. During the early 1980s, I had compiled data from across the country which suggested that about 150 people were killed annually by wild elephants, mostly when elephants came to settlements and cultivated fields within forest areas or along its periphery to raid crops. From that number, the figures have steadily increased over the years, reaching a peak of over 500 human deaths by the year 2015-16.

In recent years, there have been several highly publicised incidents of the tiger coming into direct conflict with people, and the rather painful process of capturing or eliminating the offending animal, in many states including Maharashtra, Karnataka, Kerala, Madhya Pradesh, Rajasthan and Uttar Pradesh. The National Tiger Conservation Authority has a “standard operating procedure” in place to deal with tigers which are in conflict with people; while most states meticulously follow the prescribed guidelines, some of the field operations result in public controversy. The case of “Avni” in Tadoba (Maharashtra) which allegedly killed about a dozen people and was eventually shot dead in November 2018 perhaps generated more controversy than almost any other case of a similar nature. Most scientists

and conservationists agree that the tigress had to be eliminated; the controversy was over how the animal was tracked and shot by a private team of hunters rather than by the government machinery. The alternative viewpoint is that Avni should have been monitored closely and awareness created among the villagers to facilitate co-existence.

Leopards are widespread across the country, having made their homes not only in forests but in sugar cane fields, tea gardens, the suburbs of towns and cities, and practically anywhere they find secure cover to raise their cubs and find food. There are many videos circulating in the social media of leopards entering an apartment building or a shopping mall in the Mumbai-Thane region. More seriously, the direct conflicts of leopards with people occur in hill states such as Uttarakhand and Himachal where tragically many people especially children are killed. In states such as Maharashtra, several instances of leopards attacking people have been traced to some misguided management actions such as capture and release of the animals at distant locations which are believed to be “natural habitats”; in many cases the animals have either colonized the nearby agricultural areas or have tended to move back long distances to the original place of capture, resulting in attacks on people.

The Asiatic lion was largely confined to the Gir National Park in Gujarat for over a century until its population exceeded about 250-300 individuals. It then began to disperse over a much larger area, the so-called Greater Gir Landscape and is presently distributed over about 20,000 sq.km. This region obviously encompasses a predominantly human use habitat under cultivation and pastoralism. Surprisingly, conflicts and people are still relatively low for various reasons; lions rarely prey upon people, while predation on livestock is compensated for by the government. More important, the lions keep the populations of wild ungulates such as

the nilgai within limits tolerated by the farmers who see this as a positive benefit of having lions in their midst. While it is too early to say how long this co-existence will last, it is conceivable that this region could witness an escalation of lion-human conflicts in future, especially under adverse climatic periods, as was the case during the drought of 1986-87. Presently, over 650 lions inhabit the Great Gir Landscape, a conservation success for a species which is believed to have numbered only about a dozen individuals at the turn of the 20th century.

While the large charismatic mammals have attracted a disproportionate share of the attention on wildlife-human conflicts, the creature (apart from rats) which is possibly the most chronic and widespread destroyer of crops is the wild pig. Several states from Uttarakhand to Tamil Nadu have permitted the culling of wild pigs outside the forest areas under strict supervision. One would have thought that killing wild pigs would attract the least bit of attention from conservationists and activists (many farmers across the country are anyway quietly killing them and even consuming pig meat), but there has been opposition to this as well.

#### **Need for a rational policy framework for wildlife-human conflict management**

The government has tried out a number of methods to reduce, eliminate or mitigate conflicts between various wildlife species and people, with limited success in most cases. These include compensatory (ex gratia) payments for damage to crops (especially by elephant) or killing of livestock or people, capture of problem animals and their relocation in the wild or retention in captivity, drives to chase offending animals from human habitation, culling (killing in a few instances), and barriers (including trenches, electric fences, walls and highly expensive mechanical fences) to confine animals within forests or prevent them from entering cultivated fields. The actions so far have been largely reactionary and not based

on attaining clearly articulated goals of wildlife conservation and conflict mitigation. Conflicts thus continue to perpetuate and escalate beyond levels of tolerance in an otherwise relatively tolerant society.

The range of management options to deal with wildlife-human conflicts has never been rationally debated taking into consideration what science tells us about the biology and population dynamics of the animal, the imperatives of wildlife managers who have to deal with conflicts on a regular basis, the needs and opinions of the stakeholders (typically farmers, tribals and other rural people) most affected by conflicts, the economics of various mitigation measures and, most important in our context, the cultural significance of each wildlife species across our vast land. After all, large sections of society would certainly object to deliberate killing of sacred elephants or even nilgai. It is time for us to prepare a comprehensive policy framework for the management of wildlife-human conflicts. True, there is a “standard operating procedure” and an ecology-based framework for dealing with “problem” tigers and there are “action plans” or “mitigation methods” for some other species, but these are not necessarily based on an overarching policy framework that has been arrived at after public discussion, debate and analysis.

India also needs to move away from an excessive focus on creating more “Protected Areas”, (especially the categories of National Parks, Wildlife Sanctuaries and Tiger Reserves) which have largely served their purpose of saving many endangered species from extinction and even reversing population trends, to planning for sustainable landscapes encompassing multiple land-use. We also have to give special thrust to the categories of Conservation Reserves and Community Reserves, both of which fall under the ambit of the Wildlife Protection Act, but this needs practical financial incentives which are now possible with the availability of funds through CAMPA (Compensatory Afforestation

and Management Planning Authority).

In the era of climate change, sustainable landscapes can also help a host of plant and animal species to adapt through dispersal and migration. Given its large human population, India needs to actively engage people, especially at the grassroots level, in the broader goals of biodiversity conservation and wildlife conflict mitigation, especially under the ongoing regime of a changing climate. We also need to have clear policies on how different wildlife species are managed within these landscapes as well as outside the landscapes. Many of these concepts have been incorporated into the National Wildlife Action Plan for 2017-32 but have to be actively pursued in conservation planning and implementation at regional and local scales.

The criteria adopted for landscape-scale management will obviously vary across wildlife species. One cannot apply the same criteria for the elephant and the wild pig (ubiquitous across a wide spectrum of land-use categories), nor for the tiger and the leopard (much more widespread and adaptable to human-production habitats). I would suggest that we need to draw fairly clear lines when it comes to the largest land herbivore (the elephant) and the most-feared carnivore (the tiger), but apply different criteria for managing conflicts with other creatures. Wildlife and people cannot be completely separated, but we have to arrive at tolerable levels of co-existence with different wildlife species for defining the type of management action to adopt on the basis of regional considerations. There is also an urgent need to build capacity both among frontline forest staff and local communities for actively managing wildlife species which come into conflict with people. Finally, we need to pursue wildlife conservation with a human face, as though both wildlife and people matter.

[This talk is based on a paper published recently by the speaker in Journal of Governance, 2019]

# Notes

## Research and Conservation Experience:

- 1975 – 1979:**      **Research on the flora and fauna of Guindy National Park, Madras**
- 1980 – 1985:**      **Study of the ecology of Asian elephants and elephant-human conflicts in southern India**
- 1985 – 1988:**      **Survey and design of the Nilgiri Biosphere Reserve, southern India**
- 1999 – 2005:**      **Reconstructing past climate change in southern India**
- 1988 – present:**      **Monitoring the large mammal populations of Mudumalai**  
Established a long-term monitoring system using line transects of the population dynamics of large mammals in Mudumalai Sanctuary, a part of the Nilgiri Biosphere Reserve including a study of predation patterns of the Dhole (Asiatic wild dog), assessing the population structure and numbers of herbivores (elephants, gaur, spotted deer and sambar) and modelling the dynamics of their interactions.
- Dynamics and management of tropical forests**  
Beginning in 1988 a number of permanent plots have been set up in the Nilgiri Biosphere Reserve for long-term monitoring of the dynamics of forest communities in relation to climate, fire, impact of elephants and human disturbances. These plots monitored the fate of about 50,000 individual trees from about 300 species and were the largest and longest running programme of its kind in India.
- 1995 – present:**      **Impact of future climate change on forests and biodiversity in India**  
The potential impact of future climate change on forests in the India is being assessed through models integrating global and regional climate change projections with vegetation change models. The implications of such change during the 21st century for protected areas and wildlife conservation is also being assessed.
- 2001 – present:**      **Radio-telemetry and GPS monitoring of elephants in West Bengal, India**  
A detailed study of elephant ecology is being carried out in the state of West Bengal that experiences one of the highest levels of elephant-human conflict in Asia. Under this study eleven elephants have been fitted with radio-collars to study their movement, use of corridors and patterns of conflict with human settlements across a fragmented landscape. The novelty of this study has been the first “satellite-collaring” of an elephant in the country; three elephants in 4 conflict with villagers now serve as prototypes for an internet-based “early warning” system for field managers of the movement of troublesome elephants.
- 2008 – present:**      **Ecology and mitigation of wildlife-human conflicts**  
Prof. Sukumar has been coordinating a multi-institutional and comprehensive research programme on wildlife-human conflicts under a joint Indo-Norwegian initiative. Aspects covered include the ecological and social dimensions of conflict of humans with several species of herbivores (elephant, blackbuck, nilgai, wild pig) and carnivores (leopard, wolf) across the country. The study will also make cross-cultural comparisons of wildlife-human conflicts in India and Norway.



# G.B. Pant Memorial Lectures

## I

Dr. M.S. Swaminathan, Director, CRSARD,  
Madras - 1991

## II

Dr. T.N. Khoshoo, Jawaharlal Nehru Fellow, TERI,  
New Delhi - 1992

## III

Mr. V. Rajagopalan, Vice President, World Bank,  
Washington - 1993

## IV

Prof. U.R. Rao, Member, Space Commission, New  
Delhi - 1994

## V

Dr. S.Z. Qasim, Member, Planning Commission,  
New Delhi - 1995

## VI

Prof. S.K. Joshi, Vikram Sarabhai Professor,  
JNCASR, Bangalore - 1996

## VII

Prof. K.S. Valdiya, Bhatnagar Research Professor,  
JNCASR, Bangalore - 1997

## VIII

Prof. V.K. Gaur, Distinguished Professor, IIA,  
Bangalore - 1998

## IX

Prof. Y.H. Mohan Ram, INSA Senior Scientist,  
University of Delhi, New Delhi - 2000

## X

Prof. J.S. Singh, Emeritus Professor, BHU,  
Varanasi - 2004

## XI

Prof. Madhav Gadgil, Centre for Ecological  
Sciences, IISc, Bangalore - 2005

## XII

Dr. S.S. Handa, Ex-Director, PRL (CSIR), Jammu  
- 2006

## XIII

Dr. Lalji Singh, Director, CCMB, Hyderabad -  
2007

## XIV

Prof. Roddam Narasimha, Chairman, FMU,  
JNCASR, Bangalore - 2008

## XV

Dr. R.S. Tolia, Chief Information Commissioner,  
Govt. of Uttarakhand, Dehradun - 2009

## XVI

Prof. Raghavendra Gadagkar, CES & CCS, IISC,  
Bangalore - 2010

## XVII

Prof. V. Nanjundiah, JNCASR, Bangalore - 2011

## XVIII

Dr. Kirit S. Parikh, IRADe, New Delhi & Former  
Member Planning Commission - 2012

## XIX

Prof. Jayanta Bandopadhyay, Former Prof. &  
Head, IIM, Calcutta - 2013

## XX

Prof. T.S. Papola, Institute for Studies in  
Industrial Development, New Delhi - 2014

## XXI

Dr. David Moulden, Director General, ICIMOD,  
Nepal - 2015

## XXII

Dr. Vijay Raghvan, Secretary, Dept. of  
Biotechnology, New Delhi - 2016

## XXIII

Prof. S.P. Singh, Former Vice-Chancellor, HNB  
Garhwal University, Uttarakhand - 2017

## XXIV

Prof. P.S. Roy, Former Director, Indian Institute  
of Remote Sensing, Dehradun - 2018