

A lost chance to use nature's medicine chest?

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EACH year the anniversary of Earth Day on March 22 is observed in both rich and poor countries with no exuberance but new alarm about a common global peril. The dire warning that rapid industrialisation is devastating our fragile natural resources and undermining the health and well-being of growing numbers of people goes unheeded. On an Earth Day gathering of world leaders in 1999 developmentalists pitched in with a sobering reminder that the industrialised world's investment in sustainable economic and social advancement in underprivileged states was an all time low -- barely \$45 billion. In contrast global expenditure on weapon touched almost \$1 trillion.

Earth Day, these days is only an annual occasion to reaffirm warm fuzzy resolutions about recycling and tree-hugging. In the years gone by, troubling reports highlighted the link between environmental problems and weakening economic and social structures in a growing number of nations. The World Commission on Forests and Sustainable Development said that in the past 20 years alone, forests have disappeared in 25 countries, and another 18 have lost more than 95 percent of their tree cover. Just before World War II, there were an estimated 60 billion hectares of forest, now there are only 3.6 billion globally. The causes can be attributed to logging, indiscriminate cutting for fire wood and thus desertification. The Switzerland-based World Conservation Union said that such forest decline threatens 12.5 percent of the World's 2,70,000 species of plants and 75 percent of mammals and other wildlife. And the International Organisation for Migration added that the number of "environmental refugees" -- those who fled their homes because of depletion of natural resources -- was now at a record high of 25 million, mostly in Africa, Asia and parts of Eastern Europe. The environmental refugees bring with them other problems. The United Nations said that between 1990 and 1999, the number of people infected with HIV/AIDS grew fivefold, from 9.8 million to 47 million. In this period global spending on AIDS research and prevention merely doubled to \$350 million. The HIV/AIDS virus is frequently borne by environmental and other refugees.

Most disquieting, recent reports indicate that more than 11,000 species of animals and plants are threatened with extinction and most ominously about 15 million hectares of forest are being razed annually. The Sunderbans in Bangladesh that occupied an area of ten thousand six hundred sq. kilometres at the beginning of last century has now shrunk to 5,700 sq. km. Gone with this are invaluable plant and animal species.

In the face of such extinction process, the rainforest spreading over 1.6 million hectares in Central Suriname, the former Dutch Guyana, north of Brazil is still intact untrampled by human encroachment. The question may be asked as to why government, international organisations and communities should preserve rainforest. These rain forests contain a disproportionate share of the world's wealth of living things. As reports indicate, Suriname's is the least troubled rainforest in existence, harbouring 200 known mammal species (including monkeys in trees), 674 bird species, 99 amphibian species, more than 5000 plant species, rivers, rocks and what more are darkness and a silence as deep as stars. These species of plants and wild animals, though hitherto unknown to us, are indispensably linked to each other's needs. Say, for example, the spiny palm trees make baskets from branches growing out of their trunks, which become compost machines for falling leaves, which in turn sustain the trees. Since the soil is not deep enough for roots to penetrate, the larger trees like the Ceiba in Suriname forest have buttresses that lie flat on the platform of the forest. Some of the narrower trees are supported by still-roots at the base that look like whisk-brooms. Precisely speaking, there is full employment. Trees support lizards and insects, which themselves support birds and monkeys.

But all over the world, wild animals as much as trees have been displaced by developers and threatened by poachers. Many can no longer survive in their native habitats and live only in zoos. Surprisingly these wild animals much beyond our knowledge and even imagination use nature's medicine chest which could be fruitfully exploited to fight fatal diseases like cancer and AIDS with proper research. For example, reports revealed by some primatologist's observation in the

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deep forest of Tanzania say that a chimpanzee in the Tanzanian forest fell severely ill. She was lethargic and weak, unable even to muster the strength to raise herself to defecate. Even a mound of scrumptious ants hardly tempted her. She barely noticed the other wild chimpanzees looking for food and chewing on stalks of leaves, eating insect larvae topped off with ants. Almost dying, the ailing chimp seemed to summon her last bit of energy. She dragged herself over to a "Vernonia amygdalina" (botanical name) bush, which is seldom eaten by chimps. She sucked loudly on its shoots, swallowed juice from its pitch and spat out the fibrous leftovers. By the next afternoon she had perked up visibly. Her appetite had returned, she socialised groomed and foraged like a chimp reborn.

The observing scientists were amazed. This was the first time researchers had ever seen an animal's health improve after it ate a plant with known medicinal value. Tanzanians use Vernonia to fight parasites and gastrointestinal disorders. They think it was no coincidence. Because chimps rarely touch the bitter shrub, the sick ape was probably not just looking for food, says primatologist Michael Huffman of Japan's Kyoto University and Mohammedi Seifu of the Mahale Mountains Wildlife Research Centre. Rather, she reached out for the plant much as a human might do in such situations.

Since this discovery in 1987, researchers have found strong hints that chimps are not the only species that use nature's medicine chest. They have now identified at least 15 plant species that constitute what they call "the Pharmacopeia of the apes". Noticeably, howling monkeys, rhesus monkeys and even Kodiak bears have figured out that nature

is full of potions, salves and saps that can be good for what ails them. In recent times, the American Association for the Advancement of Science (AAAS) has been devoting sessions to "zoopharmacognosy" i.e. the use of medicinal plants by animals. These symposia would go a long way to exploring not only how the practice evolved but also whether sick apes could lead researchers to medically useful plants unknown to mankind. So says Duke University Primatologist Kenneth Glander. "If these work for primates, then they are potential treatment for humans."

By all evidences, animals know exactly what they are doing. That's what it appeared to scholars who tracked a party of chimps in Tanzania. Anthropologist Richard Wrangham of Harvard University noticed that, instead of heading to the nearest fruit tree for breakfast, the chimps would occasionally walk for as long as 20 minutes in search of 'Aspilia', a member of the sunflower family. "They'd get up early in the morning and make a beeline to the plant" says biochemist Eloy Rodriguez of the University of California, Irvine. They would gulp the leaves whole, then act like children taking cod-liver oil. "They wrinkle their noses, and once a male vomited", says Wrangham. The chimps, always vulnerable to parasites, may have known instinctively what was good for them. Aspilia is high in a red oil called thiarubrine-A, a substance that kills parasites, fungi and



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viruses. Inspired by the chimps, biochemists tested thiarubrine-A in the laboratory and recently found that it killed cancer cells in solid tumours, such as those of the lung and breast. "This is the first time an animal has led us to a drug (whose structure and function) we have identified in detail," says Rodriguez.

To recognise medically useful plants, animals exploit more than trial and error. Glander finds that howling monkeys in Costa Rica

sniff and taste-test plants to weed out poisons from potions. The ability to make that distinction may be partly a matter of natural selection: any howler that mistook poison for medicine would die. But monkeys also pass on their medical lore more directly. By giving their ailing offspring certain leaves and roots, adults teach youngsters which plants will cure them, just as human parents teach their kids home remedies. Like other healthy primates, the chimps appear to

favour an ounce of prevention. Huffman reported in the AAAS meeting that chimps ate more Aspilia and Vernonia during the rainy season, when they were more susceptible to disease than during the dry season. Evidences are there that primate's use of nature's drugs extends to obstetrics. "Some of my female howling monkeys tend to have offspring of only one sex," says Glander. One mother had nine sons and no daughters.

The question that agitated Glander was that could she, and other mothers, be controlling the sex of their fetuses? In primates including humans, female sperm (carrying an X chromosome) survive better in an acidic environment while male sperm (carrying an Y) outlast female sperm in an alkaline environment. Just before and just after mating, Glander's howlers eat plants that "they don't eat at other times." He suspects that the acidity of the uterus could be changed by food, "therefore changing conditions under which sperm fertilises an egg". The question naturally arises why would a monkey care about the gender of its offspring? A male offspring has a chance to become a troop leader, argue socio-biologists and that role would confer status and privileges on his mother. Conversely if there is an oversupply of males, it might be better to have a daughter who can become the alpha's mate and once again give Mama status.

Hormone levels: Can howlers even decide whether to end a pregnancy? Females sometimes choose, for pre and post-coital snacks, plants that they eat at no other times. Glander thinks about testing the plants to see whether they contain substances that might affect a pregnancy. He will be looking for acid compounds that could affect fetal gender, and for chemicals that could affect a female's production of estrogen. Estrogen, it has been known, can interfere with normal hormone levels, inducing abortion.

Primates may not be alone in exploiting plants for more than nutrition. Navajo (a tribe in Tanzania) legend has it that bears

taught the tribe that a species of the "ligusticum" plant can treat worms, stomach aches and bacterial infections. Navajos still use it. Ethnobotanist Shawn Sigstedt of Harvard University wondered if bears might indeed have taught Navajos to exploit the shrub. Sure enough, he found that both wild and captive bears take to "ligusticum" like neurotics to Valium. Alaska's Kodiak bears dig up and swallow Ligusticum roots, or chew them and rub the exposed surfaces on their fur". Brown bears at the Colorado Springs Zoo fight over which gets the root that the keepers throw in. The winner, says Sigstedt, "will go off and chew the root and then put the mixture onto his paws and rub it on his face, behind his ears, then all over the body". Ligusticum contains compounds that may fight ticks and fungi. Surely, among humans a host of natural products is already known to cure diseases, relieve symptoms and fight transplant rejection. There are undoubtedly more. Yet why shouldn't we try the way that the chimps as well as the wild animals can lead us?

Losing species, even bugs and spiders, might matter for a number of reasons. Ecosystems containing a broad diversity of species and genes are generally better able to adapt to changing conditions than those with just a handful of species, however abundant. Genetic variation is nature's insurance against all sort of eventualities. It might help cushion, for example, the impact of a sudden change in the world's climate. It also can help reduce the effect of disease. The Irish potato famine was so devastating because in the 19th century only a few varieties of potato were planted in Ireland, and these all happened to be vulnerable to the same disease. At present almost all the world's food crops are based on a mere nine species of plants, but in the future any of thousands of other species might prove invaluable. Today's apparently useless species may contain tomorrow's medicine.

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