physical, oceanographic, sea-level data and many related subjects required to critically examine the origin, timings, natural or possible anthropogenic (man-made) activity have not been followed so as to have sufficient and necessary data for arriving at a conclusion regarding 'Ram Sethu'. All the necessary data are probably not known yet and need to be collected before an objective assessment could be made. However, the S&T Ministry appears to have arrived at the conclusion that it is not an anthropogenic structure, without indicating the data basis. If the required data are available the concerned scientists and/or groups may bring them out in the public domain to satiate curiosity. But, it seems that the necessary and sufficient data to conclude either way are perhaps not yet available. If the latter is true then on the 'verdict' of the S&T Ministry, should we the 'government-supported' scientists and academies say 'Yes Minister', or be a little proactive and obtain scientific evidences. In short, shall the scientists of a developing country like ours with multitude of problems remain silent observers or participate more actively than hitherto on issues that interface S&T and the society?

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River erosion and integrated water resources development

The major concern in Orissa today is the erosion of river banks. Rivers like Brahmani, Baitarani, Subarnarekha, Mahanadi, Kharasrota, Devi, Kathajodi and Kuakhai dangerously cross their banks because of floods. Due to floods and river current there is severe erosion of river banks. As a result, a number of villages are in danger and thousands of acres of agricultural land are damaged. River erosion is severe in Brahmani, Baitarani, Subarnarekha, Kharasrota and Devi. Steps taken by the Irrigation Department in the form of stone-packing, dyke are not sufficient; high velocity of river water, tides, waves and velocity of wind increase the erosion process. Due to change in the sea process near the river mouths, there is change in the river course and extensive damage to life and property. Presently, there is also sea erosion along the Orissa coast, particularly in Puri, Gopalpur and Satabhaya.

A World Bank Identification Mission which visited the state in August 2007 has advised the State Government to take up a basin development plan in a phased manner. The Mahanadi Basin has a catchment area of over 1.41 lakh sq. km, covering Jharkhand, Chhattisgarh and Maharashtra, besides Orissa. Over 23 lakh hectares of forest land falls under the catchment area. The major components of the Mahanadi Basin Development Plan include five new irrigation projects on Brutanga, Dhauragoth, Upper Lanth, Ong and IB rivers, rehabilitation and improvement of 13 major and medium irrigation schemes, and six mega lift schemes at Mundali, Banpur, Padmabati, Baideswar and Upper Indravati.

Improvement of drainage development in eight doabs under the Mahanadi Basin and flood control below Naraj are the other components. The project also includes development of new minor irrigation schemes in the basin, basin planning and environmental action plan, formation of river basin organization, institutional strengthening and capacity building of Pani Panchayats and support for allied activities such as agriculture and horticulture, according to the Water Resources Secretary.

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Anti-infective agents: Natural products-based drug discovery

Natural products have played a key role in pharma research, as many medicines are either natural products or derivatives thereof. Indeed, it has been estimated that about 40% of all medicines is either natural products or semi-synthetic derivatives thereof. This may not be surprising as herbal medicine has been a tradition of healthcare since ancient times and one of the roots of pharma research, where penicillins and cephalosporins (bacterial infections), salicylic acid (pain relief), quinines and artimesinin (malaria) are a few well-known natural products-based medicines.

For bacterial infections, over 80% of all medicines in clinical use are either natural products or derivatives thereof. Anti-bacterial agents based on natural products include β-lactams that inhibit cell-wall biosynthesis (e.g. penicillin, cephalosporin), macrolides that inhibit protein biosynthesis (e.g. erythromycin), aminoglycosides that inhibit protein biosynthesis (e.g. streptomycin), glycylcyclines that inhibit protein biosynthesis (e.g. tetracycline), and ansamycins that inhibit RNA synthesis (e.g. rifampicin). A reason for the prominent role of natural products among anti-infective agents is the prevalence and need for such compounds among plants, other organisms and soil microorganisms to defend themselves against infections or to protect their ecological niche versus other species. It may be advantageous if such natural products inhibit several species of organisms, rather than just a narrow range.

Synthetic anti-bacterial agents that were initially derived from natural products include the quinolones which inhibit DNA synthesis/topoisomerases, derived from the quinine anti-malarials. The recently introduced linezolid inhibits protein biosynthesis and were derived from cycloserine, also a natural product and anti-bacterial agent.

It is not uncommon for natural products to have complex molecular structures, with cyclic semi-rigid scaffolds, several chiral centres, more than five hydrogen-

bond donors, more than ten hydrogen-bond acceptors, more than five rotatable C–C bonds, and a large polar surface area. This is especially noticeable among natural products with a reversible mechanism of enzyme inhibition, and is seldom found among anti-bacterial agents with an irreversible mechanism of enzyme inhibition. While this may lead to moderate levels of bioavailability and corresponding dosage regimens to achieve the required efficacy, there may be a latent advantage in such complex structures. This complexity may enable such compounds to adopt a discrete set of molecular conformations, which can engage in similar though slightly different bonding patterns of comparable binding energy with the target enzyme from different species and strains of pathogens.

Target enzymes, i.e. enzymes that the drug inhibits, are rarely 100% identical across different species of pathogens or among the strains within a species. There are always some structural differences between them that may affect the binding site of the drug. In such cases it would be advantageous for the drug to bind only to the invariant groups with the required binding energy, and/or to adopt a discrete set of molecular conformations that can engage in similar though slightly different bonding patterns of comparable binding energy. A natural product with a complex structure may be more versatile at this than a synthetic compound with a simpler structure.

This interesting notion or hypothesis has little published data to support it at present. It may be useful to obtain 3D-structural data on these drug–enzyme complexes for a range of pathogenic species or strains. Until such data are available, this hypothesis may suggest why natural products play a prominent role as anti-infective agents so far, and may indicate a hitherto unexplored hypothesis as to why natural products are important for anti-infective drug discovery. It may be valuable for this to be tested. This may suggest that the screening of synthetic compounds may be one of several ways forward, for anti-infective drug discovery. It is of interest to note that the development of combinatorial chemical libraries based on natural products with biological-pharmacological activity is being revived and may become (again) an established trend in drug discovery.

In addition to the established and well-known approaches for drug discovery, namely combinatorial chemistry and high-throughput screening, structure-aided ligand design, mechanism-based ligand design, and analogues of existing drugs with improved properties, it would be beneficial and important for natural products research to get the attention and support it needs and deserves.

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Technologies for sustainable rural development in the Central Himalaya

During the last few decades the distinct features that have characterized the Central Himalayan region are population growth; continued dependence of a large section of the population on land resources, especially the traditional subsistence agriculture resulting in degradation and depletion of land resources, and consequent decline in land productivity and increase in poverty along with lack of proper roads and communication facilities.

The crisis of the environment and the problem of livelihood security of the poor are so interconnected that their solutions are also found together. A sustainable utilization of the remaining land resources through careful management by the communities themselves can help conserve the resources and bail them out of poverty.

Technology is needed to uplift the economic and social status of the villages in the region. It is also required for improving utilization and conservation of natural resources leading to sustainable development. Adoption of improved technologies will lead to employment and business opportunities, and eventually eradicate poverty.

Several technologies have been adopted by government and non-government agencies for demonstration and dissemination among various interest groups as livelihood options for the rural poor living in the remote hills of the Central Himalayan region. They are labour-intensive strategies for action that address poverty issues and rebuild the environment. They suit the local mountain conditions and can help revitalize the community-based livelihoods. Widespread demonstration and dissemination of the following technologies can promote gainful employment opportunities in non-traditional land-based activities as well as other off-farm activities.

Some key technologies of prime importance identified for the Central Himalayan region are:

1. Agro-food processing: It is an important technology due to its impact on overall national economy and the role of sustainable development. It helps in improving life in terms of nutrition and habitat-planning. It involves preparation of jam, jelly, squash, juice, sauce and pickle from cultivated as well as wild/edible fruits and vegetables. This is slowly gaining popularity in the region due to changes in consumer taste, food habits and lifestyle, convenience, nutritional value, longer shelf life and purchasing power. This is complemented by cultivation of cash crops such as medicinal and aromatic plants, gladiolus, bamboo, tea and large cardamom. Mushroom cultivation and apiculture have also been adopted in certain places. As fertilizer, insecticide and pesticide application is negligible they have a premium as organically grown.

2. Soil fertility improvement through vermicomposting, biocomposting and bio-fertilizers has helped rejuvenate soil health. However, it still needs to be disseminated more extensively for effective farm management and ensuring proper yield.

3. Polytechnology: During extreme winter, productivity of vegetables and other plants like nursery seedlings is retarded and damaged due to low temperature and frost. The polyhouse and polypit can