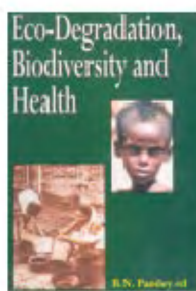


related to the topics covered in the main text.

In summary, this book brings out clearly the mathematical physics aspects associated with the three formulations of quantum mechanics. It fulfils the requirement of being vol. 27 of *Progress in Mathematical Physics*. The book is of much interest and use to students, teachers and researchers in the areas of theoretical physics and applied mathematics.

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**Eco-Degradation, Biodiversity and Health.** B. N. Pandey. Daya Publishing House, 1123/74, Deva Ram Park, Trigar, Delhi 110 035. 2002. 335 pp. Price not mentioned.

Biodiversity refers to the totality of all heritable variation in the world, which means variety of all life forms – the different plants, animals and microorganisms, the genes they contain, and the ecosystems of which they form a part. It is usually considered at four levels of organization: (1) Genetic diversity – the variety of genetic material contained in all species that inhabit a region, including the variation within and between populations of species, (2) Species diversity – the variety of species, (3) Ecosystem diversity – the variety of habitats, biological communities (groups of organisms that co-occur and interact within a habitat), and ecological processes,

and (4) Cultural diversity – the variation in behaviour or customs among different groups of the same species.

The phenomenal diversity of organisms and cultures on the earth is the result of biological evolution over a period of about 4 billion years. Through the millennia, each living being has adapted to meet the demands of the ecosystem. Physical forces such as earthquakes, floods, droughts, volcanoes, etc. have altered the character of a region including its array of organisms. Biological forces such as disease, starvation, predation, etc. have also influenced populations or communities of organisms. On a general consensus it has been found that overall estimates are about 10 to 15 million species exist on the earth and to date around 1.5 million species have been described. A vast diversity in genes, species, ecosystems and even culture provides the raw materials with which populations and communities, including humans, necessarily adapt to change.

The habitat changes (physical, chemical and biological) have inextricably altered interwoven complex relationships between species and habitat, resulting in species extinction which unfortunately is an irreversible process. The natural disturbances, in small amounts, in ecosystems dominated by late successional communities like forests, will result in increased diversity. The healthier the ecosystem is, the more diversity will it contain, which is capable of finding an alternate pathway.

Ecosystem services of the natural habitats to humans include: (a) extractive benefits like seafood, timber, biomass fuels, precursors to various industrial and pharmaceutical products and (b) non-extractive benefits like water purification, renewal of soil fertility, climate regulation, pollination, etc. Humans also derive aesthetic, cultural, intellectual and spiritual values from Nature. Conservation of these natural ecosystems is essential for the very survival of humans as a species on the earth.

Human health and well-being directly reflect the health of biodiversity of a region. 80% of the world's population depend on plant-based medicines for primary healthcare. It is estimated that over 50% of commercially available drugs depend on bio-active compounds extracted/patterned from non-human species. Currently 80,000 species are used for drug formulations. So far, less than 1% of flowering plants have been screened for their beneficial pharmaceutical properties.

Some of the plant sources amounting to 37% of all pharmaceutical sales of drugs and other products include sugar alcohol sorbitol, a product of *Sorbus aucuparia* used as sweetener; diclofenac (voltaren) like aspirin, non-steroidal anti-inflammatory drugs, derived from willow bark (*Salix* spp.); anticancer alkaloid vincristine from the Madagascar periwinkle (*Catharanthus* spp.); antimalarial sesquiterpene artemisinin (qinghaosu) from the Chinese herb (*Artemisia annua*); cichoric acid which causes significant stimulation of phagocytotic activity in *in vitro* granulocyte bioassay and was first isolated from *Echinacea purpurea* and antineoplastic paclitaxel (Taxol) which was discovered from the bark of the Pacific yew tree (*Taxus brevifolia*) are some of the most promising drugs for the treatment of ovarian and breast cancer. It is now being extracted from a fungus reserpine for hypertension derived from *Rauwolfia serpentina*, etc.

Anthropogenic activities to meet the growing demand of a burgeoning population have increased (non-sustainable) resource use per capita, cultural homogenization, agricultural development, habitat fragmentation, environmental pollution, introduction of alien species and genes (through genetically modified organisms), and diseases, resulting in rapid climate change and natural habitat destruction. This has contributed to the degradation of the ecosystem or **eco-degradation** and lowering of its productivity and increase in pests, invasive species, etc. In order to maintain the productivity, more and more chemicals (in the form of inorganic fertilisers), herbicides, pesticides, etc. are being added to the natural environment. These enter the food chain through water, soil and air, affecting human health seriously.

Climate change has warmed the earth by 5 to 9 degrees, since the end of last ice-age (about 20,000 years ago). Also, it is predicted that the planet will warm by 2 to 6 degrees over the next 100 years. The changes in climate with steady increase in atmospheric greenhouse gases, depletion of ozone in stratosphere, etc. leading to global over-warming will increase the incidence of diseases related to ultraviolet radiation, such as skin cancers, immune defects, etc. El Nino weather change leading to *Vibrio cholera*, deforestation leading to the spread of malaria and lyme disease are linked basically to land-use changes. These are mainly due to unplanned anthropogenic activities that

lack holistic ecosystem approach. Higher pollution levels in the environment have led to asthma, constriction of blood vessels, and increase in the incidence of heart disease/cardiopulmonary disease, and lung cancer.

Eco-degradation leading to climate change and biodiversity loss has resulted in the following:

The extinction of endangered, rare and threatened endemic species of flora and fauna, emergence, resurgence and redistribution of infectious diseases, which may also lead to extinction of endangered species (e.g. emergence of hantavirus pulmonary syndrome, Lyme disease, AIDS pandemic, viral hemorrhagic fevers like Ebola and Machupo; re-emergence of tuberculosis and measles, etc. due to erosion of vectors, hosts and parasites and other means), loss of potential therapeutic agents/new medicines from plants, animals and microbes, which have inestimable value, loss of medical models (e.g. sea squirt (*Molgula manhattensis*) develop stones in kidney-like organs helped to increase our understanding of how uric acid and oxalate kidney stones form in humans; sharks rarely develop cancer, evidence suggests that a substance in sharks may inhibit tumour growth by constricting neighbouring blood vessels; hibernating bears do not lose bone mass and do not urinate for months, and studying these bears may help in treating kidney failure and osteoporosis patients), affecting biotechnology and genetic engineering research. Nature's storehouse is still the largest and most chemically diverse source of unique molecular architecture and of the genes that encode for them, loss of bio-indicators (distance early warning, e.g. amphibian population decline indicating climate change), loss of defenses against the threats of bio-terrorism, loss of bioremediation (e.g. involving aerobic and anaerobic microbial process to clean-up the toxic wastes and oil spills), loss of protection against flooding, storm surges and erosion, loss of essentials like food, shelter and clothing, deterioration of air, water and soil quality and finally affecting carbon sequestration.

The book under review is a compilation of invited articles in the field of eco-degradation and population health.

The first article on 'Eco-degradation: Its implications and management' by

Omkar and Pandey explains the causes and implications of eco-degradation. However, this chapter fails to provide viable management strategies to be implemented to combat eco-degradation.

Robert J. Gregory through a Socratic dialogue presents a parable suitable for enhancing awareness of the most significant problems of declining human and habitat health due to degradation of ecosystems.

Pramod Misra and Kapoor through a case study of tribals – the Saharias of Rajasthan, explain the linkages between environment and health. Environmental health comprises aspects of human health, including quality of life, that are determined by physical, biological, social and psychological factors of the environment, listing factors like genetics, environment and lifestyle.

Elucidating causes and perennial effects of deforestation, V. K. Sharma discusses the shift in socio-cultural patterns in the society due to loss of natural resources. Exposing fertile soil to the vagaries of nature erodes it and thereby resulting in impoverishment. Loss of moisture from the soil surface is the cause of loss of water from the lower strata. Due to the evaporation of water from the soil surface, water from the lower strata is forced to come up due to higher temperature, which results in the loss of water from the sub-soil.

Surveillance of congenital anomalies and pregnancy outcome indicate the effects of regional environmental factors. Careful evaluations of malformations, spontaneous miscarriages, morbidity and sex ratio offer insights to the environmental health. Pandey *et al.*, based on the survey of 1003 tribal families in Jharkhand, analyse linkages between foetal wastage and infant mortality with ecological and social factors.

P. K. Gangopadhyay, provides an overview of occupational health, which deals with the working environment and the health of workers. It is a multidisciplinary approach to the recognition, diagnosis, treatment and prevention and control of diseases and injuries of occupational origin.

B. N. Pandey discusses the impact of industrialization on tribal groups based on a survey in eight villages near the Uranium Corporation India Limited. The study brings out very disturbing trends in the health of the inhabitants near the

industry about suffering from musculo-skeletal abnormality, leukemia, thalassaemia, and disturbances in menstrual cycle and increasing rate of sterility in male.

Indian economy depends on agriculture and 70% of the population depends on agriculture. Agriculture contribution in the gross domestic product (GDP) is about 28%. Continuous and indiscriminate usage of synthetic pesticides has led to the contamination of precious natural resources, which was evident from the recent reports of traces of pesticides in the popular brands of soft drinks being marketed in India. When pesticides are used for crops, considerable amounts will eventually reach groundwater sources via agricultural runoff. Environmental contaminants have toxic effects on different types of organisms at various trophic levels and affect biological processes at cellular, population, community and ecosystem levels of organizations. Toxic effects of organo phosphorous and organo chlorine pesticides on *Anabas testudineus*, the freshwater climbing perch showed several behavioural responses like erratic opercular activity, convulsion, etc. Jha and Kumar's article based on the test fish, exhibited more or less similar behavioural responses.

Even though we appreciate the efforts involved in bringing out this kind of compendium, we feel the editor could have carefully looked into (a) the selection of articles, (b) the unnecessary elaboration of simple concepts in some articles, (c) some articles are not centered around the theme of the article, (d) some articles are not touching upon the vital issues relating to the subject, and (e) spelling errors (e.g. shold for should (page 1); world for word (page 185); gains for grains (page 275), etc).

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