FROM NATURAL HISTORY TO HISTORY OF NATURE:

Redefining the Environmental History of India

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"...the discovery of an unknown genus seemed to me far less interesting than the observation on the geographical relations of the vegetable world..."
A. von Humboldt, *Personal narratives...*, London, 1821-25, I, p. iii.

"...an introduction respecting the nature of the country and the climate is absolutely necessary in anything pretending to be systematic and scientific".
J.F. Royle to John Lindley, 23 June 1835, Lindley Letters, I-Z, Kew Archive, f. 780.

The two observations, one from a metropolitan *savant* and the other from a colonial "devotee" of nature confirm that ecological discourse at the centre and colonial periphery descended at a particular historical juncture. They also reiterates that the discourse had its roots in the broad domain of natural history. History of ecology (ecological ideas), as it stands now, is burdened with metropolitan bias with practically no discussion on its agenda in the colonial peripheries. One most concrete example being the (de)construction of natural history tradition on the Indian periphery. While a few consider it as simply a favourite "mind-relaxing" exercise for men cut-off from home surroundings, others read as plain statistical surveys ("stamp-collecting") without any reference even to the pressing demands of colonial state (1). A major shift came with professional historians joining the debate. Making "colonialism" as the ultimate boundary of a scientific discourse on the periphery, the "second wave" of scholarship links the data gathering exercise with the "changing ideologies" of imperialism (2).

The ideologies of imperialism had, on the other hand, affected third-world environment at different levels in different ways. Besides appropriating natural resources through capital- intensive state planning and private investment, colonialism also capitalized on the unrestrained powers of science and technology. The "interventionist" tendencies of the colonial state have, therefore, generated a controlled yet well-articulated debate on the "historical roots" of environmental crisis world-wide. Viewed from a disciplinary standpoint the debate in India, however, lacks depth of historical under-

standing. Cultural context of resource utilization and the social space within which environmental sciences took shape in colonial India are two prominent issues without which it is difficult to comprehend a meaningful agenda of environmental history. The second issue is a relatively complex one as it requires active participation of historians of science, who, beside having skills to prevent oversimplification, have access to the empirical and textual data.

Science has a dual relationship with environment. While its one half conveys that man has the capacity to reshape and control nature, the other half invites man to understand nature, to develop an intellectual discourse with self-sustaining natural transformations. "Understanding through laws", as John Passmore succinctly states, and "transformation through technology" is the dichotomy thrown down by modern utilitarian science. The existing level of environmental history debate and the history of science in India addresses the other half of "colonial science", the transformatory half, the application of science and technology for appropriating natural resources. The idea is to expose the involvement of science in the process by which the colonial "superiors" exploited the unsuspecting indigenous communities. The story line is simple. With the Baconian model of utilitarian science on their side the colonials declared war on nature in order to subdue and exploit it. But every coin has two sides. The Baconian idealism, to quote Passmore, suggests that "through his scientific power man does not rape nature. Rather he seeks to gain intellectual knowledge of her, overcoming her resistance not by force but by his intimate knowledge of her secrets, by seduction" (3). In this framework the colonial periphery was no less a fertile land for the germination of such ideology as the migrant "scientists" employed themselves, at least for their own intellectual satisfaction, in knowing the tropics in their original form. Tracing the limits of environmental history debate in India the paper seeks to place the colonial scientific discourse, especially the discourse that dealt with the physical phenomena, within an environmental perspective. By implication it reveals the extent to which environmental sciences were shaped by the demands of a political regime determined to control nature.

Contours of Global Environmental Debate

Global debate over sources of environmental change (degradation) has been built around three peaks: mandate of religious juriprudence, colonial expansion, and the rise of capitalism. Writing in 1967 Lyne White sought to trace the roots of ecological crisis in the "Christian axiom that nature has no reason for existence save to serve man" (4). It was this axiom which called upon the Christian priests to arrange "the marriage of science and technology", an arrangement which scared away "the spirit in natural objects". Though neither the first nor the last in the tradition of criticizing Christian contemptuous attitude to nature (5), White wrote from the stance of a historian of technology and his treatment of environmental history is restricted only to the technological triumph of the western world.

Lyne White"s concern was not with the damaging effects of Christian faith only. He also criticized Islam for defacing the natural environment, giving a jolt to Islamic scholarship. Ismael al Fariqqi defined the Islamic idea of science with an environmen-

tal perspective. Islam, he argued, judges science on moral grounds and by linking science with religious tenets Islam precludes the Baconian use of science to conquer nature (6). Others despised the "Eurocentric" view of environmentalism. After all a religion like Islam, "a living reality of one billion Muslims was not a statistical illusion". While Z. Sardar speaks of the Islamic "codes of environmental values" that prevent debasement (7), Parvez Manzoor clarifies that it was for the sake of nature alone that Islam "deliberately" shifted technology when it became a threat to natural environment (8). Victor Ferkiss argues that Islam accords "stewardship" to man *vis-a-vis* nature (9).

The modern environmental historian would not be satisfied with a narrow religious explanation which does not explain environmental degradation in the non-Christian societies. The Greeks, the early Romans, the Maya of the jungles of Yucatan, Guatemala and Honduras, the Chinese and the people of the Near East, to paraphrase Keith Thomas, have all managed to destroy their environment without leaning on Christianity (10). Behind all this debasement lies the basic idea of human "progress". Social theorists have (mis) used the stages of gradual deterioration of nature at the hands of man as an objective measure of cultural advance in human history. The march of man from neolithic to atomic age through bronze, iron, and gunpowder ages records a progressive evolution. Nature was not out of this march of humanity. Nature is not a fixed datum; it changes with changing social scenario. Society, as some economic historians define it, is an organism, passing upward from one set of arrangement to another. Each stage is defined by the active relationship between man and his environment (11). Their relationship dates back to the time when man made his third conquest of natural forces" : by learning to cultivate plants and to breed animals in captivity. The neolithic man started his practice of "toying" with nature. First of all he cut and burned down forests that had been around for thousands of years, replacing them with scrub growth or fields, and in places where rain-fall was marginal, started the whole process of soil erosion (12).

Man"s relation with nature, from a historical perspective, is conditioned more by his cultural practices than codified religious values. Social anthropologists, and the Marxian school to some extent, take note of the "social" space (ecological niche in modern terminology) occupied by man in the total hierarchy at a particular historical juncture. "How society views nature", as Michael Dove articulates it, "is in part a function of how society has affected nature and how nature has affected society" (13). Even though the Greeks glorified nature, their landscape was as much affected by mining, canal building, and agricultural practices that caused soil erosion as anywhere at that time (14). A similar pattern comes from the Roman scene: by felling trees, killing animals, the Romans finally ended up destroying themselves. All this took place despite their philosophical and cultural veneration of nature. In the early Hindu society, the "purest of the allegedly "spritual" cultures" (15), religious and philosophical tenets failed to save the environment from being minced by expanding human settlements. The disappearence of the highly urbanized Indus Valley Civilization around 1700 B.C. and the subsequent clearence of the forests of the Ganga-Yamuna region during the Vedic period were all engineered by nature worshippers. Besides, *yaganas*, the large- scale sacrificial rituals involving the burning of vast quantities of wood and animal fat, only mirrored the brahminical contempt for other species (16). Interestingly their religious deities

went after taming the wild beasts and proudly demonstrate their control by riding the hapless animals, from the all-mighty lion to a poor rat (17). A recent example of religious tenets being melted under the pressure of material needs\greeds comes from the Gulf region where wealthy Muslim nations are destroying the environment with the help of western technology (18). All it meant in the end is beautifully captured by Victor Ferkiss: "that simple lip service to harmony with nature at an abstract philosophical level is no answer to the problems of creating and maintaining such harmony on a day-to-day basis" (19).

In the Marxian framework (material) demands decide the level of human knowledge which in turn guides man in his relation with environment. "It was not their religion", Marx had explained, "but the coming of private property and a money economy which helped Christians to exploit the natural world..." (20). Carleton S. Coon explains the behaviour of the industrial West in terms of "an effective mode of energy use" and a "new division of labour" (21). The entire thrust of American environmental history, especially since the Columbian penetration, is on the strong link between the money economy and ensuing massive ecological changes (22).

The historical construction of environmental degradation in different culture-areas also negates the role of technology. The Greeks and the Romans did not depend upon sophisticated technology to destroy their landscape. Rather it was uninterrupted flow of their usual agricultural and mining practices which laid waste the environment (23). Asian society was not a technologically advanced society. They based their economies on an intensive cultivation of cereals and legumes that gave a high yield per acre and thus could support dense populations (24). The overall management depended more upon manual skill and power than on machinery powered by air and water. Technological capabilities became effective in the environment only during the 18th-19th centuries when the money economy replaced the subsistence economy. And this happened not only in capitalist America but also in socialist Russia. Lenin, Trotsky and Stalin all approved human control over nature through technology and industrialization (25).

Colonialism and Third-World Environment

Colonialism as a political ideology also rested on and sponsored the "progressive" ideal of human development, the march from "primitivism" to civil life. Its moral underpinnings were provided by different sets of people. John Locke (1632-1716) and Edmund Burke (1729-1787) both contrasted the "civil and rational" city people with the "irrational and untaught" denizens of "woods and forests" (26). Lord Macaulay declared in *History of England* (1848) that "the history of our country during the last hundred and sixty years is eminently the history of physical, of moral and of intellectual improvement" (27). The physical improvement symbolized clearing of woods for human settlement, moral improvement rationalized control over retrogressive aliens, and intellectual improvement authorized them to judge the merits of other cultures, all collectively encroaching upon the "rights of nature". The progressive model was adopted and used as a political tool by the Whigs to underrate the claims of Tories in the British Parliament. The Victorian Englishman still widely believed that cutting of forests was a path to civilization. Gladstone demonstrated his approval of tree-cutting exhibitions, giving a shock not only to his own

countrymen who had been now inclining toward forest conservation but also to his European counterparts. When he visited Bismarck in 1895, the German Chancellor did not forget to present him a young oak tree for planting back home (28).

The European vision of progress was put on trial with much more enthusiasm on the colonial peripheries. A visiting Frenchman reported from America that "an American has no idea that anyone can admire trees or wooded ground. To him a country well cleared, that is where every stock is cut down, seems the only that is beautiful or worthy of admiration" (29). Marx supported a progressive ideal that rested on stadial theory of civilization. Primitive tribes, being backwards and barbarous, did not deserve his admiration (30). A notorious critic and indeed an enemy of peasantry Marx ridiculed the "idiocy" of rural life (31). The onset of urbanism was, to Marx, one of the blessings of capitalism (Engels, at the same time, was anguished by creeping urbanism) (32). Marx would, therefore, welcome the destruction of traditional Indian economy and social structure by the British colonial penetration as a necessary step toward human progress. Darwin, to whom Marx wished to dedicate *Das Capital,* was satisfied with "the march of improvements" set in motion by the European settlers (33). At philosophical level social Darwinism speculates that the course of evolution was progressive. "The revelation of science" proved that "every generation in life is a step in progress to a higher and fuller life" (34).

European ideals thus became the yardstick for judging cultures in other times and places (35). Environmental historians will call it an ideological tool to subdue nature outside Europe. Different rationales were tried in different locations. In the aboriginal cultures on the American and Australian continents the "civilization" factor helped the European to annex the land ("those who did not themselves subdue and cultivate the land had no right to prevent others from doing so") (36). The idea rested on the Western vision of "wasteland". John Locke thought that things left to nature are true waste (37). Speaking of the colonization of America in *The Winning of the West,* an epic history he wrote in his youth, Theodore Roosevelt, America"s first conservationist president, called it "the spread of the English speaking peoples over the world"s waste space", which could only be condemned by "a warped, perverse, and silly morality" (38).

In the process even the best of the pastoralists in America, Benjamin Franklin and Thomas Jefferson for instance, honoured a belief called "manifest destiny", i.e. Americans had the right, even the duty, to control the whole agreement. Their return to agriculture at this historical juncture did not do much to save the environment. The neo-farmers were in practice capitalists when presented with the opportunity, mining the soil to produce the largest crops possible in the shortest period of time. Erosion and depleted soil meant little to them, they could always move further west (39). In effect they all echoed the ethos of a new class of land-owners which was fast emerging in England in the wake of riches coming from the east. William Cobbett captured the differences between "resident *native* gentry, attached to the soil, known to every farmer and labourer from their childhood,... and a gentry... foreign to their manners, distant and haughty in their behaviour, looking to the soil only for its rents, viewing it a mere object of speculation, unacquainted with its cultivators, despising them and their pursuits..." (40). Early American settlers thus lived with a tradition of "resourceful waste-

fulness". A surveying party led by William Byrd in 1733 allowed its members to cut the trees to get the chestnuts (41).

But the east was different. Faced with a fairly advanced system of settled agriculture, colonialism relied on other control mechanisms: the market economy, new technologies, and a highly developed legal and administrative infrastructure (42). Environmental history debate in India is built around this third peak. Colonial past being the nearest one, much of the debate on the historical construction of environmental change in India is addressed to changes associated with the decisions of the colonial state with regard to the management of land, water and under-ground resources, mega technology missions (railways, steam navigation, hydraulic works, construction of roads etc. (43)) and its epistemological construction of local resource use patterns, "waste" (44), for instance.

The main argument is structured around two of the three layers which constitute Raymond Bryant"s agenda for third-world political ecology: (i) "contextual sources of environmental change", and (ii) "conflicts over access" (45). Some of the judgements have gone too far in the absence of any contextual reference point. This has been the case with respect to the size of woods that had been cleared under different political regimes. The history of forest clearance in India matches with the Greco-Roman experiences. It all began with the neolithic pastoralists who would have provoked forest fires to create areas for domestic animals as also to create land for periodic, low-intensity agriculture. The operation continued with increased efficiency during the urban settlement in the Indus Valley and the downward march of Aryan settlers (46). In the Puranic tradition Prithu, a descendent of Manu Svaymbhu, is hailed as the first king who cleared forest, cultivated the land, and introduced cattle-breeding. The description matches the settling of Aryans in the Ganga-Yamuna region who employed a superior metallurgy to subdue the forest (47).

A similar ambiguity prevails in the debate over the "claims" of "indigenous" peoples and the colonial state over forests, that resulted in continuing "conflicts" over access to resources during the colonial regime (48). State control of forests, however, did not begin with the arrival of the colonials. At least in India it was in operation for many centuries, perhaps since the Mauryan state (fourth century B.C.) which took over "the clearing and settlement of new areas" (49). The hundred and fifty thousand people deported from Kalinga were sent to clear waste land and establish new settlement. Any (waste) land lying beyond the cultivable zone now belonged to the state (50). The Mughal and their dependent feudal states had further intensified state control as they went on to build spacious palaces and forts. The "eco-communities" had thus surrendered their right over forest long before the colonial regime. As for the conflicts between the state power and the "eco-communities" they are reported from non-colonial regimes as well, and some were far more bloody, but the same are interpreted differently. The slaughtering of a few hundred ***bishnoi*** souls by the axe-men of the King of Jodhpur, for instance, has been made out as a clash, not between the dominant state power and defenceless locals, but between the "elites" and the ecosystem peoples (51). Besides, state intervention and the resulting conflicts did not stop with the fall of colonialism. On the contrary actual "bulldozerozoic era" for Indian forests, we are now told, began in 1947

with the effective control of an "iron triangle" involving organized industry, state bureaucracy and the political brokers (52).

Depth of state intervention in forests cannot be measured in terms of the number of logs disappearing in a particular political regime (53). It is, on the contrary, a question of total human perception and control mechanism. There was a basic difference between the perception of the colonial and the ancient state, the difference of cultural demarcation. "Whereas the ancient Aryan state associated *jungala* with the presence of civilization", in the progressive vocabulary of the colonial state it meant the absence of "civil life" (54). As for the displacement of community rights the responsibility is proportionally shared by the pre-colonial, colonial and the post-colonial regimes. While the pre-colonial states accounted for the historical subversion of traditional ecological communities and their local governing authority by more formal "panchayat raj institutions" "conceived in a non-ecological space" (55), the colonial regime removed the last pillar of the Indian social fabric, the village republic which was also an "ecological expression". The industrial model conceived by the Nehruvian vision proved further disastrous for local forests not only in terms of the size of woodlands cleared for industrial and agricultural interests but also at micro-social level, leading to a total breakdown of the traditional society hierarchy (56).

Modern environmentalists question the colonial rationale to direct river water to the arable lands of the Gangetic area, a project which filled up thousands of locally designed *katcha* wells and also caused serious water-logging problems (57). First of all the concept of canal irrigation in the plains of India was not devised by the colonials. It was there for a fairly long time. The Mauryan state built canals for irrigation purposes. The *Arthashastra* refers to a water tax collected by the state where it provided irrigation (58). Later on the Sultanate and the Mughal state gave it a more diverse form by linking the entire plains from the foot-hills of the Himalaya to the capital city of Delhi and Hissar further to the west with irrigation canals. Secondly, any criticism which bunks the human factor, is "unrealistic, narrow and self-defeating" (59).

The technological choices of the colonial state had, in some cases, a positive effect on a local environment. In the event of measuring environmental degradation in terms of technological application, colonialism deserves puddings for slowing down the pace of industrialization, which by implication saved the local environment. Victor Ferkiss has used this explanation for the American episode. Once they lifted the controls on industrial development, American revolutionaries got down to the business of using technology to conquer nature (60). In some cases colonial preference for western technology conversely saved the local environment. A case in point is the import of pig iron from England which led to the "choking" of indigenous iron-smelting furnaces. By doing so the western technology had saved Indian woods which used to feed indigenous furnaces, but in the process they destroyed their own forests back home. Their smelteries moved from southern England to the mountainous regions of the north and the west, where some wood was still available (61).

The debate over colonialism and the third-world environment would be incomplete without a reference to the ideals and agenda of different professional groups in the service of the colonial state, especially those directly associated with nature. State

policy, as Bryant suggests, is not built in an ideological vacuum (62). It takes shape out of the struggle between different pressure groups seeking to influence policy formulation. This ideological framework is provided by the scientific cadre, the "third force of human induced environmental change" (63). In colonial India this third force is conveniently identified with the agenda of scientific forestry. The usual explanation conceives colonial professional foresters as only a "new face of an alien power" (64), advancing state control over the islands of environment (65). An alternative approach calls for interpreting their programme in relation to a global model of scientific forestry (66). Richard Grove articulates state-sponsored conservationism on the colonial periphery. Linking modern environmental consciousness with "trade and territorial expansion", he has proposed various variables to trace its roots on the colonial periphery: speed of ecological change, desiccation theory linking forest cover and deforestation to rain fall patterns built on multiple meteorological and medico-physical reports, mobility of colonial scientific community, and the faith of the colonial state in the wisdom of its sense organs, i.e. the professional medico-botanists and foresters. As for the involvement of the colonial state it was nothing less than taking a bitter pill: "faced by the threat of famine and social unrest, the state became quite willing to accept radical environmental perscription" (67). Conservation then has an uninterrupted, though seemingly uneven, flow with naturalists playing the role of moderators.

The Quest for Science

A mind-boggling question for the student of theories of colonial expansion is to understand the incentives\compulsions that took the Europeans beyond the Atlantic and the Mediterranean limits. Why did it not happen the other way round? Political historians have blended their explanations with the "land-lust" of "noblemen". Economic reductionists trace its roots in the shrinking home markets for factory goods. A few others compliment the non-Europeans, the Asians particularly, for being content with their means. "With their rich material resources", argues social anthropologist Carleton S. Coon, "localized in the smallest of a village settlement, the Asiatics had reached a state of cultural equilibirium. Once they had filled their ecological space to the limit possible under the natural restrictions of their Iron Age material culture, the accent had turned to a refinement of human relations through elaborate ritual and politeness, calculated to cause a minimum of friction. Exploration, trade and conquest interested them little" (68).

Beside material demands of the "progressive" west, the demands of science played no insignificant role in taking the western mind out of the tame temperate landscape. In other words it was the biological impoverishedness of the temperate zones which inspired the emerging natural philosophers to seek their intellectual satisfaction in the tropics (69). The scientific pressure on the tropics was not unexpected as they nurture between 40 and 50 percent of all types of living things on a land area which is barely 2 percent of the globe. Not only the quantity of life but the diversity of that life is equally spectacular here: 20 to 80 species of trees per acre in the rainforests compared to about 4 tree species in the temperate forests (70). Indian rainforests also belonged to

this rich geographical pool. On the Malabar coast for instance "there was no place, not even the smallest, even of the most barren soil which did not display some plants" (71).

Running parallel to the pressing demands of medico-botanists was an imaginary vision of the lost Paradise, the search for the garden of Eden which had taken Columbus across the Atlantics. Columbus, in addition to his quest for the "material paradise" (of spices, incense, jewels, and gold), was "saturated with medieval legends about the location of the earthly paradise" (72). Descending from the Columbian vision, America"s self-image of the "garden of the world" was reiterated by the eighteenth century agrarianism and Jeffersonian ideals. "The gardene, essentially the forested or watered reaches of America,... was raw, untamed, and bountiful" (73). In India, however, things wera different. The "earthly paradise" which Alfred Wallace had desired to create by converting the "virgin forest" of Amazon into "green meadows and fertile plantations (74)" could only be recreated in botanical gardens here (75). The location differed over time and space. While G. Koenig found his Paradise at Tranquebar, William Roxburgh recreated one at Samalcot (76). Wallich turned the Calcutta Botanic Garden into, what Bishop Heber would call, "Milton"s idea of Paradise" (77). J.F. Royle was perfectly placed at Saharanpur, just at the base of the mighty Himalayas. All these tiny locations, as Grove argues, "formed the basis for a new kind of learning, information collecting and networking in the tropical environment", and thus institutionalized environmental ideas on the periphery (78).

"Every generation", as Worster observes, "writes its own description of the natural order, which generally reveals as much about human society and its changing concerns as it does about nature" (79). The chief concern of early science, for example, was the study of the causes of variations in the climate, such as frosts and droughts, floods and rainfall which affected agriculture. Farmers in ancient river valley civilizations needed to know exactly when the river would rise in order to be able to plant their crops at the right moment. Such demands had turned the Egyptians, as they were totally dependent on the course of the Nile, pioneers in the calculation of time and, concurrently in the science of astronomy" (80). Large-scale animal sacrifices in Vedic India was the main reason for Indian expertise in anatomy *vis-a-vis* physiology or pathalogy (81). It was an age of competition between man and the forces of nature, the former desperate to understand the mechanism in its simplest form. But as man entered into competition with other tribes to gain material advantages, the direction of science also changed from understanding natural phenomena to the exploitation of the available resources.

The change in the natural history agenda of colonial naturalists must be addressed in its spatial and temporal context. European naturalists heading for the tropics had a definite agenda, to know such a land in its entirety. But the guiding force had been different for different sets of peoples at different intervals. Garcia da Orta, the Portuguese medico-botanist who settled in Goa in 1534 had interest in the "medical drugs...as well as all the fruits and pepper" growing there (82). Thirty years later Cristovao da Costa landed in Goa "to see the diversity of plants God has created for the human wealth" (83). Viewed against the Baconian model of science, the Portuguese agenda was a mixture of proto-utilitarianism, albeit cut-off from the staple commercial resource, the forest

timber. Besides, it was not loaded with any aggressive language needed to subdue the physical environment.

From an environmental perspective the priorities and methodologies had changed by the time the Britishers came on the scene. In 1783 William Jones left England with a more determined mission, "to know India better than any other European ever knew it" (84). Knowing his own limitations Jones sought to evolve a networking among the vast majority of collectors scattered in different locations. A fresh FRS Jones had the structure of the Royal Society before him on which he modelled the first scientific society on the Indian periphery, the Asiatic Society of Bengal. The "research" mandate of the ASB, as Jones formulated it, was to study "man and nature", whatever is performed by the one, or produced by the other (85). Human interests being the epitome of the Baconian model of science the colonial state would demand that "nothing has been created in vain and as this is true with regard to all objects that live, whether on the land or in the waters, it would be of itself enough to recommend ***the study of nature as a profitable pursuit***" (86). (emphasis added). For people with a more practical imperial agenda the Indian landscape provided an ideal location. Sir Joseph Banks, the man who shaped the course of colonial science in the English dominions, found India "blessed with advantages of soil, climate and population". A "colony yielding that kind of tributes" (raw material), he declared, "binds itself to the mother country by the strongest and most indissoluble of human ties" (87). The Banksian agenda was fully absorbed in the Linnaean model of "ecology" which Banks himself had accepted and promoted in England, despite strong anti-Linnaean feelings among the war-ridden Englishmen (88).

Natural History vs History of Nature

"The new pragmatism of Linnaeus" was accepted by the practical colonials travelling east. The men who promoted the "empire of reason" during Banksian era did not come from Cambridge where Linnaean principles were treated with usual British contempt. They came from further north, mostly from Scotland, and a few from the land of Linnaeus himself. At Edinburgh, for instance, John Hope popularized the Linnaean school of botany among his students. Two of them, William Roxburgh and Francis Buchanan, had their future in India (89). Gerhard Koenig, first to be appointed on job by the colonial state in India, came from Upsalla, the home of Carl Linnaeus. Nathaniel Wallich had his education at Copenhagen under Prof. Martin Vahl and J.W. Horneman (90).

Taking the science of botany away from "druggists" the Linnaeans had added a more specific purpose to the agenda of natural philosophers: identification and classification of other species. Passing curiosity was thus replaced by a scientific awareness. But at the same time it was a direct human intervention in the ordered nature. The logic was simple: nature being unknown it could be "mastered, managed and used in the service of human life" (91). At a more sophisticated level it postulated the empire of reason, "reason defined not mearly as the critical faculty of the mind, but as the aggressive power represented in Active Science" (92). A binding factor for this mandate was "deep respect for concrete facts".

The "concrete facts" belonged to that vast storehouse of raw materials which could augment the wealth of nations. The early colonial naturalists had only mirrored the popu-

lar burgeoning mood: increasing state control over unclaimed resources. As England imported large amounts of Potash (from America and Russia) and basil (from Spain), Roxburgh would suggest clearance of "our impenetrable forests which cover very large tracts of the best lands in India" (93). Buchanan favoured state control of Malabar forests to put an end to their "deification" (94). Otherwise, Roxburgh, like Wallich, was a utilitarian conservationist, and both of them advanced the plantation philosophy. Roxburgh was twice honoured with a Gold Medal by the Royal Society for the Encouragement of Arts for best plantation works (1805, 1814) Wallich, at the same time, was deeply concerned at "the extremely injudicious (native) mode of felling trees", as they "cut and carry away all that is easily accessible, born, young and old plants, without planting anything new in their place, or encouraging the growth of young seedlings" (95). As Secretary of the Plantation Committee (1824), Wallich institutionalized plantations in colonial India (96).

Though outside the purview of this essay, opposition to the penetration of the Linnaean expression (sexual description of plants) and the Latin nomenclature forms an important part of "intellectual" discourse in colonial India. William Jones, for instance, remained a critic of the Linnaean language (97). "The allegory of sexes and nuptials", Jones retorted, "even if it was complete, might have to be discarded, as unbecoming the gravity of men, who, while they search for truth, have no business to influence their imagination" (98). Jones preferred Sanskrit names over the Linnaean nomenclature arguing that Linnaeus himself would have adopted them had he known the learned and the ancient language of this country (99). A more issue-based defiance came from William Griffith (1810-1845), "a real genius" (100), who replaced the Linnaean classification model at the Calcutta Botanical Garden with the "natural" system of Jussieu and de Candolle (101). Cut-off from the mainline the colonial had drawn their own battle-lines.

The possibility of such an intellectual discourse means that the tradition of natural history on the colonial periphery was never a static affair religiously attended to by men cut-off from the mainstream. The journey from da Orta and von Rheede to N. Wallich had already run through different ideological patches. What Philip Rehbock has said of the metropolitan scene is equally true of colonial India: that "for the excitement, curiosity and diversity of its natural history developments, the early 19th century is unequalled by any other period, except perhaps the later Darwinian half of the same century" (102). A decline in the public appreciation of the Linnaean principles in India during the 1830s was compensated by the emergence of an "ecological" model there. Its chief concern being study of vegetation, its character, distribution and relation to environmental parameters, it matched with the much publicized Humboldtian programme (103). In concrete terms this was the beginning of the shift from natural history to history of nature. The man who heralded this shift in India belonged to the land. John Forbes Royle (1799-1858), M.D.; F.L.S.; F.R.S., was born and brought up at Kanpur in central India. He completed his medical education in London and returned to India in 1824 to take charge of the Saharanpur Botanic Garden. It was here at the base of the Himalayan forest range that Royle articulated his ecological agenda.

Royle, as chauvinist botanists would ridicule, was not a "botanist" (104). He himself

disliked narrow specialization. "The objects of Botany", he once lamented, "are in general so little understood, that the naming and classifying of plants are considered... to be its sole objects. While in fact they form only the Alphabates or rather Questionary" (105). Rejecting the meatless taxonomic description of plants Royle, like Humboldt, sought to study them in relation to the geographic conditions. His approach was unmistakably ecological: "Plants being stationary in nature, depend for their subsistence on the soil in which they are placed, or on the atmosphere by which they are surrounded" (106). Ascertaining "the difference of one plant from another and its structure and function in connection with soil and climate" was the basic principle of Royle"s natural history. He developed his model in *The Illustrations of the Himalayan Botany*, 1833-39, which, as J. D. Hooker later noted, "contains the first and only attempt to demonstrate the prominent features of the geographical distribution of northern Indian plants in reference to the elevation and climate they inhabit..." (107).

Royle divides *Illustrations* in two parts. The introductory part describes the physical geography of the plains and mountains of India including their geological structure. It is followed by a comparison of the climate of the tropics with that of India and the Himalaya. Next follows the Himalayan climate, consisting of mildness and equability of temperature and pressure at such elevation as Shimla and Mussoree. There is also a general description on the geographical distribution of plants and animals in connection with the cultivation at different elevations and different seasons. Royle describes the vegetation according to the natural method of arrangement under the head of 207 families of plants. Each family is described in relation to its geographical distribution in different parts of the world. Vegetation natural to different parts of India is compared with that of other countries enjoying similar climates. This plan, in addition to giving a factual appreciation of plant and climate relationship, was also aimed at acclimatizing

Tropical and East Indian Islands, Tropical Africa, Brazil, Guiana, West-Indies and Florida	Travancore, Cochin, Malabar, Ceylon, Malayan Peninsula, Chittagong, Bengal, Lower Assam
East and West Coast of Africa	Coromandel Coast, Northern Circars, Konkan
Southern States of North America, Egypt, North of Africa, Syria	Gujrat, Bihar, Doab, Delhi, Malwa
Mexican Highlands, Lower Mountains of Spain	Mysore, Hilly ranges in Deccan, Rajasthan
South of Africa, Extra-Tropical New Holland, South America beyond 23.5 S lat.	Saharanpur and Northern Doab
Mediterranean Region	Dehradun and Himalayan Valley (moderate elevation)
China-Japan region, Middle Andes, Peru, and Mountains of Brazil	Nilgiri, Upper Assam, Himalayan Mountains
North of Europe, North of Asia, and North America	Himalayan Mountains (the oak and pine regions)
Arctic regions, Mountains of Europe, Elevated Andes	Himalayas (above forest region)

the vegetation of other geographical pools into India. Royle prepared a detailed chart to execute his scheme (108):

It may be noted here that the theory of the geographical distribution of plants and their study in relation to the "total environment" is associated with the works of Alexander von Humboldt (109), and Jochim von Schouw (1789-1852, Professor of Botany at the University of Copenhagen and Director of the Royal Danish Botanic Garden, Copenhagen (110). Whether Royle drew up his plan after reading Humboldt or/and Schouw, is difficult to say. Humboldt"s *Personal narratives...* (111), did not reach British readers before 1821 when Royle left for India. Given the fact that hard material, especially natural history books, travelled at snail pace during the pre-steam days it is quite unlikely that Royle had sufficiently assimilated the Humboldtian programme before he outlined his own model in 1833. Secondly, both Humboldt and Schouw had placed the factor of human needs and interventions over climatic factors in changing the vegetation pattern of a region (112). In fact Schouw speaks of "the mental superiority" of the races which had helped in transferring plants from their original habitats to new environments. Besides, an assessment of Royle"s general views with regard to social forestry and human ecology would confirm that this man on the periphery was not "naive".

Royle"s understanding of social forestry had evolved in a natural way. He sought to explain the human concern for conservation in terms of demand and supply ratio: "the self sown Forests were more than sufficient to supply all the wants of man in the earlier state of society". "As population increases and civilization is advanced, they are looked upon rather as impediments to agriculture, (rather) than as source of wealth" (113). Royle"s notion of human ecology was based on access to these resources:

> *In the earliest state of society man is found with imperfect weapons, depending for his subsistence on the precarious, long continued and fatiguing labours of the chase, assisted by a scanty and uncertain supply of the wild fruits of the forest. In this state a small number of men require for their support a large extent of territory. From pursuing animals, man proceeds to domesticate them, and the pastoral state succeeds to that of hunter. A superabundance of food allows larger number of men to congregate together, and settled habits afford them leisure for other pursuits. The first division of labour takes place when man gives his undivided labour to any one pursuit and thus produce much more than his own needs. He then barters it for the produce of the labour of others. This exchange is further extended to other tribes leading to the establishment of commerce in its real sense* (114).

The logic that explains the division of labour also explains the division of plants: "As most countries have some (plants) which are peculiar to themselves, or to which their soil and climate are best adapted, so it is found that different countries produce very different products. Hence they become objects of desire to other nations" (115).

Humboldtian influence on the agenda of colonial natural history must be taken up with a reference to prevailing ideological orientation and expertise, both in early 19th century England and India. During the Banksian era England had already exhausted its receptive capacity by adopting the Linnaean programme. The British scientific community, as Grove points out, was philosophically hostile to German Naturphilosophie.

Humboldt was first introduced to the "images" of Indian landscape in 1790 at the Warren Hastings"s House, London, where he saw William Hodgson"s paintings (116). Humboldt was tempted by the sprawling sceneries and when he next visited London in 1814, this time as part of a diplomatic mission with Friedrich-Wilhelm III, Humboldt sought Directors" permission to visit India, which he was never granted, most likely due to his strong anti-colonial thinking (117). For the next thirty years India had almost disappeared from Humboldt"s mental frame untill he met J.D. Hooker in 1845 who was to leave for a botanical tour of India two years later. Beside this personal dialogue Humboldt also sent a detailed letter to Hooker before the latter actually left for India. The letter contains details of what to look for and what to ignore in the tropics (118).

Hooker left England in 1847 with copies of Humboldt"s *Personal narratives*, and Charles Lyell"s *Principles of Geology*. Hooker"s methodology, agenda and experiences beyond the metropolis had definite leanings on Humboldt. At Cairo he made observations on the temperature of the soil and dryness of the desert to know "how near the starving and burning point vegetation would exist" (119). Like Humboldt he would use scientific instruments for measurements of physical parameters (120). In the Himalayas Hooker employed himself in preparing a map to show geographical distribution of plants (121). His experiences in India revolutionized current theories about the geography of the Himalayas, which interested Humboldt" (122). It was therefore through J. D. Hooker"s encounter with Indian flora that the Humboldtian programme of plant ecology and regional diversity got a real foot-hold in India.

Conclusion

In the foregoing discussion I have pointed out certain limitations of environmental history debate in general, and about India in particular. The debate is primarily situated in the aggressive postures of Christianity, colonialism, and capitalism, not necessarily in that order. Environmental change or degradation for that matter, is not associated with one particular historical episode. It has been evolved out of a long historical process of interaction between man and nature. At the same time it would be wrong to suggest that a particular set of beliefs, Christian or Islamic, provoked man to subdue nature. It is, on the contrary, a question of basic human needs and man"s capacities to fulfill those needs from a given resource pool. In the end non-Christian peoples, pre-colonial states, and the tenets of Marxian socialism are equal partners in environmental debasement. There might be some difference in the degrees of their penetration in environment but the basic thrust was same: nature is there to serve man.

As for the environmental concern of colonial forces, which constitute the main part of this essay, they travelled in both directions. While material demands provoked colonials to reverse the resource-use practices of "indigenous" peoples, demands of science invited them to harmonize with nature. It was indeed a great paradox of colonialism that at the very time when its one half, "now fully armed with science and technology", was reversing historically tested practices, its other half was becoming more and more aware of the beauties and importance of nature.

In doing so the colonials assimilated local knowledge as well. Both Da Horta and Von Rheede, the Dutch Governor naturalist, had tremendous faith in the local wisdom

and its practical value. Later the British naturalists also involved local people in the indentification of plants as also in understanding plant life. In Nepal Buchanan had "low-caste" gardeners to bring him plants. That faith was more important from the persperctive of knowing local environment, resource management practices and traditional conservation measures. Not only their skills, but also the wisdom, the social pattern, and the outlook of "ecosystem" peoples constitute a fund of knowledge no scientific culture could afford to ignore. The interaction between the western mind and local "collectors" was reciprocal. The western botanists would introduce local collectors to the scientific language of modern botany. Benjamin Heyne had some collectors "who have made such progress in the Linnaean system as to be able to distinguish male flowers from female in the Dioecious clan in plants which they have never seen before" (123).

The paradox of colonialism is true of the mandate of science on the periphery which transformed from simple "stamp-collecting" to a perfect inquiry into the functional arrangement of natural forces. The shift from the Linnaean model of natural history to J.F. Royle"s ecological agenda further confirm that science on the periphery was grounded in local "environment". Royle"s was, however, a solitary achievement that could not be converted into a school of thought. That Royle stopped at formulating the disciplinary framework for his programme is partly due to the limitations of colonial state. Individual genius like Royle were cut-off from new generation because academic interaction was practically impossible in India during the 19th century. In America on the other hand, similar accumulative knowledge was made a base for the disciplinary enlargement with university (the Chicago School of Ecology, for instance) playing a constructive role (124). Beyond 19th century the stage was completely taken over by the institutional hegemony of experimental science.

NOTES AND REFERENCES

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15) *Ibid.*, p. 134.
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120) Hooker"s scientific instruments included 8 thermometers in daily use, 2 barometers, 2 chronometers, 3 compasses, a sextant and Artificial Horizon. L. Huxley, *op. cit.*, p. 280.

121) L. Huxley, *op. cit.*, p.259.

122) L. Huxley, *op. cit.*, p.327.

123) B. Heyne, Facts, *Historial and Statistical on India*, London, 1814, p. 248.

124) R. McIntosh, *The Background of Ecology*, Cambridge Uni. Press, 1987; E. Cittadino, "Ecology and Professionalization of Botany in America, 1890-1905", *Studies in History of Biology*, 4, 1980, pp. 171-198.

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