Planet Dialectics:
Explorations in Environment and Development

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The Blue Planet: On the Ambiguity of a Modern Icon

Discovery of the earth took place during the journey to the moon. When in July 1969 Neil Armstrong uncoupled himself from spaceship *Apollo 11* and touched down in his landing-craft on our neighbouring planet, he found only barrenness, emptiness, and icy silence – but when he looked backwards, he went into raptures. How different the earth appeared! Shimmering blue, it floated like a spherical jewel in pitch-black space. A web of clouds enveloped it in a white vortex, beneath which continents and oceans shone with soft browns and a deep blue. Ever since those space missions transmitted the first picture of the earth rising in the moon's heavens back to our living rooms, discovery of the earth has become the essential revelation of American space flight. Amid the desolate expanses of the universe the old earth reveals itself to be the habitable, the absolutely special, star that is our home.

This image of the earth in space leads the field in the world of contemporary images. It adorns the covers of weighty environmental reports and T-shirts in all sizes, endows television news with a global touch, and leaps out of many commercials. It is to be encountered everywhere. The photograph seems to be a quality mark for all and everything. It is not going too far to say that this image of the blue planet has become an icon for our age.

Sudden awareness of the earth's uniqueness allowed an upsurge of emotion, and the first sight of the earth as a whole signified a leap forward in the history of human self-perception. Peter Sloterdijk writes:

> The view from a satellite makes possible a Copernican revolution in outlook. For all earlier human beings, gazing up to the heavens was akin to a naive preliminary stage of a philosophical thinking beyond

> this world and a spontaneous elevation towards contemplation of infinity. Since October 1957, however, something has got under way and led to reversal of the oldest human gaze: the first satellite was put in orbit above the earth. Soon afterwards the area of space close to the earth was teeming with satellite eyes, which provide technical implementation of the ancient phantasm of God looking down from high in the heavens. Ever since the early sixties an inverted astronomy has thus come into being, looking down from space onto the earth rather than from the ground up into the skies. (Sloterdijk 1990: 57)

The Construction of the Earth through an Image

Human beings have certainly long attempted to gain a mental picture of the earth's shape and form. Two and a half thousand years ago, Pythagoras argued that the earth must be perfectly fashioned – hence a sphere. Some 500 years later Eratosthenes attempted to prove that assumption mathematically by comparing the sun's shadow in various places. Magellan finally succeeded four hundred years ago in sailing around the world. When Mercator constructed a map of the world utilizing a network of longitude and latitude, representations of the earth that were to scale and thus geometrically consistent became the norm. From the time of Martin Behaim's globe, dating from 1492, it has been possible to take a close look at models of the world, and dissemination of such globes, large and small, made the earth an everyday object at school and in the home. Nevertheless, they could not lay claim to being depictions of physical reality. Nothing could obscure their origins on the drawing-board: these were models of the world, showing nothing of the reality of the earth itself.

Visible What is fundamentally new is that the earth has now moved into the realm of visible things by way of satellite photographs. Its overall form is no longer a scientific deduction but an obvious reality, which anyone can see for themselves by looking at a piece of paper. The earth lies before our eyes just like any other object – albeit mediated through photography. Never before was the earth a reality accessible to its inhabitants' senses. The planet's existence may have been an empirical certainty but not an empirical magnitude, since the globe's gigantic mass exceeded anything that could be taken in at a single glance. Only now did the earth truly become something graspable, established as an object through the photograph from space. That photograph endows the earth with tangibility, thereby creating nothing less than a new reality.

It is important that this process involves a photograph, since only photography – among such diverse forms of representation as paintings, sculpture, maps, or models – lays claim to being both similar and to a certain extent identical to the object depicted. Elucidating the difference between a picture and a photograph, Susan Sontag writes: 'Because first of all a photograph is not only an image (as a painting is an image), and interpretation of the real; it is also a trace ... like a footprint or a death mask. While a painting ... is never more than the stating of an interpretation, a photographgraph is never less than the registering of an emanation (light waves reflected by objects) – a material vestige of its subject in a way no painting can be' (Sontag 1977: 154). Even though a photograph always selects, it claims to bear witness to a state of affairs. The photograph from space demonstrates the reality of the earth, and its reproducibility makes that reality omnipresent. That creates the basis for many contemporary variants of global consciousness.

Demarcated Nothing stands out more in the picture than the boundaries setting off the luminous earth from cold, black space.

> 'When I looked out into the blackness of space with its splendour of points of light' – reported astronaut Loren Acton – 'there I saw majesty but no hospitality. The hospitable planet was below me. There below, enclosed in the thin, moving, unbelievably vulnerable sheath of the biosphere, is everything that is dear and precious for you – the entire human drama and the entire human comedy. There is life. All good things are down there.' (Kelley 1988: 21)

The edge of the globe marks an overwhelming contrast. It separates the sphere of life from the sphere of deathly silence. Against the background of space, hostile to life, the illuminated blue earth appears a friendly, protective place. The earth's highly obvious boundaries give rise to a new feeling of inner and outer. What is demarcated there is the place where we live viewed against the nothingness of space.

Considerable disillusionment has set in with regard to the moon: no life, everywhere extreme cold, stony deserts, and an atmosphere hostile to life. Compared with that, the earth seems an oasis in the desert of the cosmos. Light and friendly, green and fertile, it stands out against the endless blackness. Is not the earth unique in the way it floats invitingly in space? The perspective from space made emphatically obvious what distinguishes Planet Earth from all other known planets: the thin layer of air and water, soil and organisms, that allows living creatures to thrive and gives them a home. No thicker than

17,000 metres (or one four-hundredth of the earth's radius), this atmospheric sheath, which bears all life, encircles the earth. That is why the view from space is accompanied by penetration of human consciousness by the idea of the earth as a biosphere. The planet literally reveals itself to be a 'ball of life'.

Small Distance diminishes. Perhaps the most astonishing outcome of the view from space, described by astronauts again and again, was the dwindling of the earth. James Irwin, who flew with *Apollo 15* in 1971, captured that experience in poetic phrases: 'The earth reminded us of a Christmas tree bauble hung in the darkness of space. With increasing distance it became smaller and smaller. Finally it shrunk to the size of a marble, the most beautiful marble you can imagine' (Kelley 1988: 38). A dramatic breach in perception: the earth, once immeasurably large, now presents itself to everyone as a little ball. Truly a reversal of perspective! Human beings previously saw themselves as being surrounded by the earth, for good or for ill. Now they themselves embrace the earth – at least with their gaze.

This reversal of perspective is obviously the outcome of the enormous distance across which the astronauts were catapulted. Rocket-impelled removal from the earth shifted the yardstick hitherto established in the limited capacities of human powers and senses. The perceptions now accessible, and the reality established, are disproportionate to human senses. The correlations between man and earth have been upturned. Astronaut Buzz Aldrin summed up that miraculous, uncanny reversal of relationships: 'The earth finally became so small that I could simply make it vanish from space by holding up my thumb in front of it' (Kelley 1988: 37).

What is involved when – disseminated by television and photography – a diminished earth, no longer bound to human dimensions, becomes the predominant idea? Two reactions are visible at present. On the one hand, people talk about the earth in a language of sentimental trivialization: Look how tiny and fragile it is! It needs our care and attention! On the other, human self-aggrandizement and claims to omnipotence become apparent: Look how easily comprehensible and manageable the earth is! It can be mastered and kept under control! Of course, the motives of 'concern' and 'control' may also coincide. Both ways of speaking seem to find accord in talking of the earth as a 'patient'.

Not all these images were taken during moon-shots. Those from satellite orbits still present the earth as an object – but a beautiful and huge one. All the same, here too the distortion of proportions shapes

perception. The diminution of the planet brought about by the uncoupling of human criteria also results in human concerns becoming irrelevant. The earth depicted in that image is self-evidently and essentially a physical object with oceans, land-masses, and swirling clouds, but not a place where human beings live. What constitutes the reality of human existence vanishes in this picture of the earth. Cultures, races and nations are nowhere to be seen. That state of affairs is supported by the character of photography. A photograph always defines a particular moment and thus blocks understanding of history and the context of what is depicted. The earth thereby appears all too obviously as a physical unity, directly implying social unity because conflict-ridden human reality pales in the face of the earth's grandiose actuality. That is probably why so many astronauts have emphasized how friendly and peaceful the earth looks, time and again stressing that frontiers, differences and conflicts are as if wiped away when viewed from space. The image's strongest message is therefore a naturalistic reformulation of the idea of humanity, maintaining that human unity derives from the shared destiny of floating together on this earthly body in space – or as a poster of the blue planet succinctly states: 'All One People'.

Synoptic Height bestows an overview. The higher one climbs, the fewer obstacles block the outlook; the greater the remoteness of the ground, the further the horizon moves into the distance. The moon, however, constitutes the highest viewing-platform humanity has ever reached. From a spaceship or a satellite a picture of the entire earth (or great parts of it) is available, a synopsis of the world that could not be more comprehensive. A single glance takes in more than ever before, and the overall view across seas and continents reveals vast fields of interrelationships hitherto hidden from the human gaze. Cloud formations and carpets of algae, folds in the earth and patterns of settlement, together form structures within a higher order, which emphatically suggest that apparently geographically scattered phenomena in truth often constitute aspects of larger relationships.

There is no doubt that such an overview gives a great boost to many variants of integrative thinking since superordinate patterns, in which the individual parts interact, force themselves on the observer. The synoptic power of the satellite perspective is strengthened even further by orbiting the earth. In slightly less than 90 minutes, when space shuttle *Columbia* circles the earth, the entire globe moves past far below. In addition, as the days pass, the orbit changes gradually, covering the earth's entire surface. It then becomes clear that the technical

programme that came into being with satellites constitutes a total view rather than just a survey. No blind spots any longer and also no unmapped areas – total observability. In their way satellite-eyes are omnipresent and omniscient.

One can hardly speak of a horizon any longer when looking down on the earth from space. At any rate, the horizon vanishes as the satellite rises and goes into orbit, becoming one with the globe's circumference. The gaze is unrestricted by borderlines and nothing remains hidden – a way of seeing that no longer knows any 'beyond', 'after' or 'behind'. The totality of the satellite's viewpoint allows such distinctions as here/there, inside/outside, and now/later to collapse. The image of the blue earth has thus left behind the limits of the perspectival and panoramic view. The classical central perspective stresses the depth of space, but here the distinction between 'in front of' and 'behind' is superseded in the macroscopic overview. While the panoramic field of vision indicates something 'beyond' the horizon, here the all-round view is no longer trapped within a single horizon but extends behind all horizons. Both perspective and panorama are ways of seeing that imply a movement, an inner dynamic, even an impulse towards transcending area, height, and time: ever onwards in terms of an ever-higher viewpoint with very much more to be seen tomorrow (Koschorke 1989). These two ways of seeing are analogous to the idea of progress, concerned with successively surmounting horizons, whereas the macroscopy of the planet demonstrates a clear-cut relationship to post-progressive thinking, whose main source of fascination is simultaneity of presence. In other words, the satellite image supports systemic perception where attention is devoted to simultaneous interactions in a network of extended relationships – and no longer progressive perception, urging ongoing discovery of new areas of possibility in the future.

Probed 'Two attitudes underlie this presumption that anything in the world is material for the camera', writes Susan Sontag. 'One finds that there is beauty or at least interest in everything, seen with an acute enough eye ... The other treats everything as the object of some present or future use, as matter for estimates, decisions, and predictions. According to one attitude, there is nothing that should not be seen; according to the other, there is nothing that should not be recorded' (Sontag 1977: 176). The aestheticizing view found a grandiose object in the photograph from space. That presentation of the tranquil majesty of the earth generated astonishment among humanity. The other view, instrumental and recording, also emerges, because

historically unparalleled possibilities of exploration and registration are opened up.

Here too war was the father of all things. During the Second World War attempts were made to deploy new technology for dealing with a basic problem in tracking down the enemy: how can what is hidden behind skilful camouflage be seen? Infra-red photography, which records heat radiation, was thus developed. There was hardly time for this technology to be used, but from that moment onwards the search intensified for recording instruments able to register more than the human eye could ever see. Visible light constitutes only part of the spectrum of electro-magnetic waves reflected, absorbed or transmitted by an object. All objects – whether rocks, plants or buildings – have specific radiation, which remains invisible to the eye but can be registered by appropriate sensors.

This exploration of the invisible by way of highly developed sensor technology, pursued from the early 1960s as 'remote sensing', has dominated satellite observation of the earth ever since Landsat's utilization of a multi-spectral scanner in 1972 (Mack 1990). Nevertheless, comprehensive encirclement of the earth with satellite eyes has still to be fully implemented. Only the Earth Observing System planned by NASA will lead, in the next 10 to 20 years, to a kind of reversed panopticon where the centre can be kept under continuous surveillance from the periphery (*Economist* 1991: 23).

Satellites equipped with sensors are veritable heavenly spies, scanning the earth's surface so as to gather information hidden even from people on the ground. That process links a synoptic view with probing. From a great height it becomes possible to discover far-ranging patterns of reality, lying beneath the visible surface of the world of objects. For instance, wooded areas can be surveyed in terms of more than just the species of trees located there. The trees' temperature, cholorophyll content and humidity can also be investigated – all descriptions of states of affairs beyond the concrete materiality of trees, instead involving an abstract 'biomass'. The probing character of remote surveying is obvious in the employment of magnetometers for tracking down hidden mineral deposits, or in the utilization of radar satellites that are unaffected by dark nights or thick layers of cloud. Whatever the satellite eye discovers appears as coloured areas on thematic maps or as a computer screen model of changing processes. In any case, this involves the establishment of a hitherto non-existent reality. The biogeochemical states and flows that lie behind appearances become the true, 'scientifically demonstrated' reality of the planet. What is decisive is the probed reality, not the sensed reality. These phantom images of

the earth, reproduced millions of times over in photographs and on television screens, then move into everyone's awareness.

It may be advisable to speak of 'phantom images' in order to direct attention to the special iconographic status of these pictures. After all, in its progressive form remote surveying produces neither a representation nor a photograph of its object-field: it produces images of synthesized measurements. This has nothing to do with 'seeing', and nothing to do with 'sensing' either. Both words, viewed more precisely, are a metaphorical fraud. In general, sensors scanning an area supply a stream of digitalized signals, which are treated, calibrated, integrated with other data and presented in graphic terms through image processing. Mechanical data-processing plays a decisive part in all this. Remote sensing, with today's data-flow of 100 megabits a second, became possible only with the advent of high-capacity computers. Here 'observation' has long been transformed into the measurement, recording, calculation, blending, modelling and depiction of data. Indeed, these 'pictures' of the earth are nothing other than collages of the outcome of millions of electro-magnetic measurements. 'Seeing', maintains Barbara Duden, 'is no longer a criterion of reality. We have got used to attributing collages with the status of reality' (Duden 1990: 30).

The Invention of the Biosphere

In September 1970, just two years after the blue earth became a celebrated photograph-object, the *Scientific American* published an issue devoted to 'The Biosphere'. The introduction, written by the journal's editors, began with the following sentences: 'Photos of the earth show that it is blue-green in color ... The biosphere – that thin layer of air and water and soil and life, which is only ten miles thick, a four-hundredth of the earth's radius – now constitutes the background to man's uncertain history.'

The scientists writing in this issue took as the object of their research those large-scale bio-geochemical cycles that shape interactions between the living and the non-living world, even at the planetary level: the circulations of energy, water, carbon, oxygen, nitrate and minerals. Their research was particularly directed towards changes in the circulation of matter caused by human production of food, energy and materials. Only with that preoccupation – the large-scale cycles that link atmosphere, rock, water and organisms in the earth's vital sheath – and with interest in describing, analytically and quantitatively, endangerment of the stability of those cycles through human activities, does the concept of the biosphere take shape.

This term had previously turned up from time to time, but basically as a classificatory category so as to distinguish, on the global level, the sphere of living creatures from the abiotic sphere of rock and water, and also of mind. Eduard Süss, the Austrian geologist who first spoke of the 'biosphere' in 1875, and Teilhard de Chardin, the French theologian writing in the 1920s and 1930s, may have aimed at a holistic, planetary understanding of the phenomenon of life, but they limited themselves to comparing the biosphere with the lithosphere, hydrosphere and atmosphere, or in Teilhard's case the noosphere. It was Vladimir I. Vernadsky (in *La biosphère*, Paris 1929) who focused attention on relations between geochemical factors and biota, assigning life – closely related to Vitalism – a paramount place in the overall process (Grinevald 1988). However, only thanks to the influence exerted by the ecosystem theory did it become possible to represent relationships between the biotic and the abiotic as quantifiable cycles of matter, which through feedback processes strive for a balance protecting even against disturbances from outside. After the war, G. Evelyn Hutchinson linked Vernadsky's inspiration with the ecosystem theory developed by Arthur Tansley and Raymond Lindemann. He comprehended nature in terms of the metaphor of a self-regulating machine, and stimulated investigation of the regulatory mechanisms responsible for a system's self-maintenance when subject to adverse external influences (Sachs 1991/92: 83–97). The systems approach gained the upper hand in ecology – mainly within the International Biological Program (1964–74) – because in public perception it accorded well with ideas about social engineering prevalent at the time. This process of clarification achieved a degree of agreement towards the end of the 1960s, as can be seen from *Nature*'s publication in 1969 of a terminological notice, stating that 'the biosphere consists of living and non-living components. It is the total complex of soil, water, air and living organisms that forms a complete ecosystem' (*Nature* 1969, 500–1). It was also Hutchinson who wrote the opening essay ('The biosphere') for the *Scientific American*, allowing the conclusion that within the concept of the biosphere the planetary totality is comprehended as the largest possible ecosystem, which, through cybernetic mechanisms, tends towards a state of stability but is increasingly endangered by human activities.

During the past two decades the concept of the biosphere has been further developed, particularly under the influence of what is known as the Gaia hypothesis (Lovelock 1979). This says that living organisms as a whole play the predominant part among the components that comprise the global ecosystem. Traditionally, geo-physical and geo-chemical aspects (land, oceans, atmosphere) constitute limiting factors

for the world of organisms, which are at most modified by their activity, whereas the Gaia hypothesis insists that the overall activity of organisms – from plankton to poplars, from viruses to whales – regulates decisive characteristics of the lithosphere, the oceans and the atmosphere. To the extent that living creatures control such factors as temperature on earth, oxygen in the atmosphere or the salinity of seas, they created (during the course of evolution), and continue to create, an environment for themselves in which life can flourish. Consequently it is the unflagging effectiveness of the earth's organic sheath that makes it hospitable to life. The earth thus does not simply *have* a biosphere: it *is* a biosphere. Without the planetary interaction of living creatures neither individual forms of life nor the earth as we know it would exist. Our world would be desolate and empty like other planets.

It is hardly by chance that James Lovelock was working for NASA in the 1960s when he picked up the scent of what was later to become the Gaia hypothesis. He was confronted with the question of how to discover life on other planets – its forms and techniques of detection. Investigation of the conditions that make life possible on other planets logically led to the consideration of conditions for life on earth. Only through space flight did viewing various planets within a unified comparative context become inescapable, entailing an observation point (or even just a probe) external to the planets as the basis for such comparisons. The space programme, with flights beyond the earth's gravity, achieved the extra-terrestrial perspective. Space probe, satellite and spaceship opened up zones completely different from the earth. From that distance, attention then turned back to our planet, sparking off an avalanche of questions about the specific differences entailed in Planet Earth and the basis for its existence.

Lovelock was involved in that search during the 1960s and in 1969 he formulated a preliminary version of the Gaia hypothesis. Many times since he has confirmed the context of his discovery:

> It is often difficult to recognize the larger entity of which we are part ... So it was with the Earth itself before we shared with the astronauts vicariously that stunning and awesome vision ... This gift, this ability to see the Earth from afar, was so revealing that it forced the novel top-down approach to planetary biology. (Lovelock 1988)

Lovelock's thesis of the globality of life and its priority over non-organic cycles are the two cornerstones of modern understanding of the biosphere. Both theses derive from a space perspective of earth.

To my mind the outstanding spin-off from space research is not new

> technology. The real bonus has been that for the first time in human history we have had a chance to look at the Earth from space, and the information gained from seeing from the outside an azure-green planet in all its global beauty has given rise to a whole new set of questions and answers. (Lovelock 1979: 8)

These 'questions and answers' really did condense into no less than a reorganization of a whole series of sciences around a new research paradigm and a new research methodology.

> Lovelock's 'Gaia' hypothesis remains disputed. However, whatever fate its details may meet, 'Gaia' offers a comprehensive concept, which unites an entire series of exciting interdisciplinary research by chemists, biologists, geo-physicists, oceanographers, and others. (Clark and Munn 1986: 6)

The picture of the blue planet constituted the earth as a scientific object compelling a reordering of specialized disciplines, inviting the integration of new methods such as remote surveying and computer systems and opening up an extensive arena for large-scale inter-disciplinary research. Since the biosphere is conceived as a system of interactive components where no single part – oceans, atmosphere, rock, vegetation, animal world, human beings – can be adequately understood in isolation from the others, the sciences – and particularly the bio-sciences on one side and the geo-sciences on the other – are challenged to undertake greater integration. At the same time, satellite technology offers a new generation of instruments of exploration, producing a vast amount of new data, which make up a technical infrastructure serving as the basis for institutionalization of new scientific activities. Finally, there was also no lack of social demand for a science devoted to the biosphere – quite the contrary. 'There can be no doubt that the new science of the biosphere is necessary for our survival ... Without a solid scientific foundation we can understand neither the individual nor the cumulative global effects of our local, regional, and global actions' (Botkin 1985). It is therefore not surprising that for some years now, emanating from the USA, there has been a veritable frenzy of establishing global geo-research. The National Science Foundation, for instance, has set up a Global Geosciences programme in order to induce academic disciplines to dismantle some of their delimitations of specialization. The International Council of Scientific Unions, always active on the threshhold of space travel since the memorable 1957/58 International Geophysical Year, is advocating an International Geosphere–Biosphere Programme. UNESCO is re-

orienting its Man and the Biosphere Programme, and NASA, that long-troubled big set-up to which we owe icons of the blue planet, also sees its chance, and is developing an Earth System Science programme (Malone 1986).

The Image and Sentimental Ecology

While Lovelock's hypothesis was still encountering deaf ears among the scientific community, the sudden flash of insight involved in naming his earth 'Gaia' already touched the feelings of a broad public. When taking a walk with Lovelock, William Golding, the writer and Nobel prizewinner, hit on the idea of viewing the scientist's living earth as an incorporation of Gaia, the Greek goddess and Earth Mother. That turned out to be a choice with the power of shaping consciousness, leading to the rare instance of a scientific theorem being forced on scientists by the public rather than slowly making its way from the laboratory into general consciousness. When Lovelock's *Gaia* appeared in 1979, there came to pass a modern epiphany for Gaia within history. For parts of the ecology movement, the profound reason for and the elevated objective of their concern was made manifest in Gaia. The excrescences of industrial society were seen as ultimately threatening not just people living near Lake Erie or asthmatics in smog-ridden areas, but nothing less than the whole of the planetary organism on which all life ultimately depends. 'Save the Earth' would previously have been an absurdly comical battle-cry, but ever since the earth's essence was identified as involving its thin protective sheath, the planet seems vulnerable to human assaults. The picture of the blue planet became a symbol of life-giving nature. From a poster incorporating a photograph of the earth it calls out: 'Love Your Mother'.

That photograph from space was also charged right from the start with the premonitions and hopes of an ecological *Zeitgeist*. Carl Sagan, as a space author not unconcerned about his own interests, remarked just a few years after the moon landing that 'many leaders of the environmental movement in America were originally influenced by the space photographs of earth, by those pictures showing a tiny, delicate, fragile world, which is exceptionally susceptible to human predators – a meadow amid the universe' (Sagan 1975: 60). It can be asked whether Earth Day 1970, the first national manifestation of the environmental movement in the USA, would have been given that name without the satellite photograph. What is certain is that for Earth Day 1990 (the second such occasion) the country was flooded

with devotional motifs of the earth on pennants, posters and postcards. The earth has become an object of post-modern popular piety.

Obviously that image displays a number of characteristics that resonate with ecological sensibility. Above all, the photograph reveals the earth as a physical body viewed as a whole. The earth, it becomes directly apparent, represents that all-embracing totality within which everything takes place. Is it not inevitable that such an image becomes a powerful triumph for a movement that does not tire of insisting, time and time again, on the whole taking precedence over perfecting the parts? After all, on many fronts the main issue is to track down the repressed consequences for the whole of individual decisions. The photograph showing the earth as the largest totality, thus depicts the ultimate and fundamental reference point for ecological commitment. The planet, shimmering in space, impresses itself on contemporary consciousness as a yearned-for expression of collective rationality. Such a way of viewing things is intensified by the striking fact that nothing on this image is to be seen as clearly as the boundaries dividing the luminous earth from the cold blackness of space. This provides visual demonstration that the earth is finite. Such evidence of spherical finiteness endows with photographic credibility the message of environmentalists that nature cannot be exploited indefinitely. Human arrogance must obviously come to grief at the planetary limits, if not earlier.

Moreover, the globe carves a cosy inner space out of the hostile universe, which makes our earth stand out as the place where we live, indeed as our home. The boundaries create a place, and that place creates belongingness. The image constitutes a 'We' involving all human beings. 'Home' is the succinct message printed on many postcards depicting the blue planet. To be sure, the unity of the human race is thus determined as a bio-physical fact, and no longer as an achievement of cultural comprehension, but such a naturalization endows the idea of humanity with the consecration of facticity. The photograph thereby creates a new idea of global interdependence. Worldwide interconnection may also entail money flows and television news, but it is primarily and inescapably brought about by the shared life-giving sheath. Beyond that, the sphere of interdependence has been radically enlarged. It is no longer restricted to humanity but now comprises all living creatures. In earlier times nature provided the background against which humanity stood out in terms of its common features, but now the universe comprises the backdrop against which the unity of nature – inclusive, of course, of humankind – imperiously imposes itself. Humanity primarily appears as a natural being whose

fate and challenge it is to be closely interlinked with the planetary web of life. That is why the environmentalists' call for ecological responsibility becomes something akin to an ontological justification. The demand that we should live in peace with nature is not arbitrarily plucked out of thin air, but is presented as being rooted in the order of being.

However 'Gaia', that genial name, evokes considerably more than rationality. It appeals to a search for ultimate validity and holiness. Lovelock himself opened the way:

> When I first saw Gaia in my mind I felt as an astronaut must have done as he stood on the moon, gazing back at our home, the Earth. The feeling strengthens as theory and evidence come in to confirm the thought that the Earth may be a living organism. Thinking of the Earth as alive makes it seem, on happy days, in the right places, as if the whole planet were celebrating a sacred ceremony. (Lovelock 1988: 205)

Astonishment, awe and a feeling of incomprehensibility are awoken by the picture of the blue planet; an outsized reality becomes visible, upholding and incorporating everything that happens on earth. 'This is why, for me, Gaia is a religious as well as a scientific concept.' Lovelock expresses profound satisfaction about the fact that his religious intuition was confirmed in his scientific work, leading to a language making possible communication of this personal experience in a secularized world. That satisfaction is shared by many people, particularly among an Anglo-Saxon public. Ecological commitment thus stands for radical change in comprehension of the world and life, which places its hopes in a holistic perspective uniting empiricism and ethics, science and religion. The central element in this ecological view of the world is that human beings can no longer lay claim to a privileged place within the universe. The crown of creation has become a particularly complex manifestation of the global life process. The origin of humankind can be told in terms of the history of the planetary evolution of life. Humanity's present existence is upheld by being embedded in the global web of all life, and its future will depend on incorporation in Gaia's process. A prevalent ecological mood thus finds expression in a religious concept that is earth-centred rather than man- or god-centred. The earth, or more precisely the biosphere, becomes an object of veneration. The image of the blue planet can thus also be more strictly viewed as an icon. It is not simply a depiction, but is seen by some people as a symbol of Gaia's life-giving power. Where there is worship, prayer and invocation follow as a matter of course. This invocation is to be found in a New Age publication devoted to practices for meditation on Gaia:

> We ask for the presence of the spirit of Gaia and pray that the breath of life continues to caress this planet home. May we grow into true understanding – a deep understanding that inspires us to protect the tree on which we bloom, and the water, soil and atmosphere without which we have no existence ... We ask for the presence of the spirit of Gaia to be with us here. To reveal to us all that we need to see, for our own highest good and for the highest good of all. (Seed et al. 1988: 2)

The Image and Technocratic Ecology

Almost twenty years after the *Scientific American* proclaimed the biosphere to be a new object of scientific research, the journal once again pointed the way to new shores. The cover of the September 1989 special issue shows America and Europe as seen from a satellite with the imperative 'Managing Planet Earth' set above the outlines of continents and seas. A synthesis of the new perspective is to be found right at the start of the title essay:

> Our ability to look back on ourselves from outer space symbolizes the unique perspective we have on our environment and on where we are headed as a species. With this knowledge comes a responsibility ... the responsibility to manage the human use of planet earth. It is as a global species that we are transforming the planet. It is only as a global species – pooling our knowledge, coordinating our actions and sharing what the planet has to offer – that we may have any prospect for managing the planet's transformation along the pathways of sustainable development. Self-conscious, intelligent management of the earth is one of the great challenges facing humanity as it approaches the 21st century.

High-flying words, to be sure, and also considerable overestimation of humanity, yet such rhetoric, no matter what its prospects for realization may be, creates a new reality that enters people's minds. This is obvious in an epoch where environmental themes have attained the commanding heights of international politics and become an object of worldwide campaigns. This new perception is beginning to colour the language of international debate. With such large-scale events as the Rio UN Conference on Environment and Development its echo will also be heard ever more clearly beyond academic deliberations.

Without the photograph of the earth it would scarcely be possible to view the planet as an object of management. On the other hand, a number of further conditions were necessary for global expansion of the horizon of ecological management strategies towards the end of the 1980s. At the start of the previous decade talk of global

responsibility was still mainly a moral appeal aimed at urging local, or at most national, action in the name of the environment. 'Think globally, act locally' was the slogan of those years. Environmental policy involved regional planning of resources, or was concerned with more quality of life at the local level. Only in the course of the 1980s – with the ozone hole, acid rain and the greenhouse effect – did the border-crossing, global impact of pollution by industrial societies force itself into the foreground. The planet revealed itself to be an all-encompassing refuse dump. At the same time scientific ecology turned its attention to studying the global biosphere, where two decades previously researchers had mainly been concerned with individual spheres of nature, such as deserts, tropical forests and tidal shallows. In recent years scientists have increasingly discovered the biosphere as an all-embracing ecosystem, which links biota with processes in the atmosphere, oceans and the earth's crust. And finally, as so frequently in the history of science, a new generation of instruments and equipment created the possibility of measuring global processes. During the past decade, satellites, sensors and computers have provided the means for calibrating the biosphere and representing it in models. While the environmental crisis took care of the relevance of planetary surveying, ecology promises to provide the cognitive foundations, and technology to come up with the necessary means. Since these factors took effect at the same time, Planet Earth has moved into a managerial perspective in recent years.

After the heroic phase of voyaging to the moon and other manned missions, space-flight technology seems to be consolidating itself with services for managing the earth. Hope of future expansion is directed towards observation of the earth alongside communications technology. For some years now NASA's development work in that area has been coordinated in the Mission to Planet Earth programme, while France's SPOT satellite venture, the European ERS-1 mission and anticipated Japanese activity in space largely place their hopes in demand for earth observation. Satellites serve there as environmental spies in space that register far-reaching changes in the planet's life-giving sheath. Damage to nature can be mapped from a great height. Extensive felling of trees and desertification, clouds of poison and oil slicks, and even army manoeuvre areas cannot be hidden from satellite surveys. For instance, since early summer 1991 ERS-1 has been in an 800 km-high orbit over the North and South Poles, which takes the satellite around the globe six times a day with the earth turning away beneath, gradually offering its entire surface for scrutiny. Sensor technology provides a synoptic, probing viewpoint, enabling recording of the

state of vegetation, movements of the seas and layering within the atmosphere. Apart from such analyses, satellites linked with high-powered computers also supply an ongoing flow of data with which scientists hope to produce models of, and validate, complex natural phenomena such as changes in climate. The purpose of establishing models is the simulation on a screen of the course taken by extensive and highly complex natural processes with a diversity of starting points. For example, researchers used oil spillage in the Persian Gulf for producing a model to predict the course and impact of this catastrophe. The repercussions of a variety of protective measures along the river systems that feed the North Sea can be predicted with regard to overall pollution in this marine area. Even though what will in fact come to pass remains in the lap of the gods, it is nevertheless becoming apparent that coupling space travel, sensor technology and data-processing brings a drastic increase in power for ongoing observation of natural developments on a continental and planetary scale, recognizing human influences and making forecasts. As with a patient under intensive care, this programme's underlying intention is that the earth should be kept under continuous observation so that therapies can be rapidly deployed before the planet collapses.

The projected long-term objective over the next 10–20 years is development of a Global Resource Information Database accessible from everywhere, which will allow so-called decision-makers to appraise the environmental impact of their actions from the local to the planetary level (Gwynne and Mooneyhan 1989: 243–56).

All the data fed in locally are to be labelled in terms of location on the earth's surface (and in some cases time dimension), a procedure that at least in principle opens up the prospect of being able to call up the natural profile of any place on earth from any other location. Just as states have established sophisticated economic statistics since the Second World War, intended to reflect the economic and social situation within that society, so too is a databank – but worldwide in extent - now being established for keeping the biosphere's condition under observation.

The viewpoint of a satellite on an ecological mission is both all-embracing and all-penetrating. The planet's natural covering stretches out beneath it and any region can be called up on a screen, utilizing three-dimensional computer graphics, and be subjected to test assessments. The potential for knowledge and comparative simulation gives rise to expectations of future capacity to shape changes within nature on our planet as a form of rational planning. In fact, an urgent need for these services seems to exist. Does not the environmental crisis

demonstrate that human dominance over nature still leaves much to be desired? Science and technology, it is said, may have changed nature enormously, but – to date at least – in an uncontrolled fashion. What is on the agenda for a technocratic ecology is therefore rationalization of intervention in nature. Viewed from that perspective, the challenge of the current phase of development in industrial societies involves moving on from an epoch of blindness to one of enlightenment in humanity's dominance over nature. In fact, only achievement of conscious control of the unwanted consequences of the exploitation of nature would permit us to talk of a successful dominance of nature. Far from wanting to reduce industrial society's overall consumption of nature, such a policy seeks salvation in optimal regulation of the remodelling of nature. The picture of the blue planet – small and easily comprehensible – suggests the 'planability' of a process that was hitherto the precondition for human existence. Only under the influence of that image could the *Scientific American* in September 1989 raise crucial questions with regard to these key themes:

> Two central questions must be addressed: What kind of planet do we want? What kind of planet can we get? ... How much species diversity should be maintained in the world? Should the size or the growth rate of the human population be curtailed ...? How much climate change is acceptable?

The pictures from space provide documentation of a kind of knowledge based on distance. However, this form of knowledge has a rather fateful history, since our domination over nature is based upon it. A space-rocket taking off provides a vivid illustration of what dominating nature has always involved: detaching the human observer from lived nature and confronting what was previously humankind's own world as a separate and neutral realm, open to intervention. Viewing the earth from space clearly continues this tradition of domination-prone knowledge, which is why the demand for expanded dominance links up so tightly with planetary sciences. For shooting a satellite into space is perhaps the most radical way of implementing that distance from our world. On the basis of their visual characteristics alone, the satellite pictures thus invite fantasies of large-scale planning.

This furtive invitation is underlined by the fact that in the pictures all trace of human reality is dissolved into nothingness and only natural actualities remain to be seen. No traditions, no institutions, no history – the world has vanished into the earth. The way is thus free for covering up humanity's conflict-ridden reality, resolving the social into the biological. A planner's secret dream of not being disturbed in his

proposals for intervention by the contradictory and contrary ideas of the people affected achieves fulfilment in the planet as object. It is thus anything but chance when in the international debate there are more and more biologizing expressions. Human beings become 'populations', citizens 'species'. Quality of life degenerates into 'survival', 'sustainability' replaces general well-being and 'evolution' history. Those terms in the ascendant instead indicate a form of perception that could be called biospheric utilitarianism. New words such as 'biomass', 'biodiversity' and 'bioreservations' betray the same inclination towards declaring the planet and its dynamics to be politics' prime point of reference (Beney 1993).

However, that seems to be precisely the perspective the WCED in the Brundtland Report puts forward for global environmental policy in the 1990s. In its first sentences, the report celebrates the image of the blue planet twinkling as it floats amid the darkness of space, small and vulnerable. Then it states that 'humanity's inability to fit its doings into that pattern is changing planetary systems fundamentally', and concludes the paragraph with a programmatic declaration: 'This new reality, from which there is no escape, must be recognized – and managed' (WCED 1987: 1).

8

Globalization and Sustainability

Symbols are the more powerful the more meanings they are able to admit. They actually live on ambivalence. The Cross, for instance, counted both as a token of victory for conquerors and as a token of hope for the vanquished. That ambivalence raised it above the fray; a single clear message would have meant that it divided rather than united. The same may be said of the image of the blue planet, now a symbol unchallenged by either Left or Right, conservative or liberal. Whatever their differences, they are all fond of adorning themselves with this symbol of our epoch. To fall in with it is to announce that one is abreast of the times, in tune with the world, focused on the future, truly prepared to set off into the new century. In this picture are condensed the opposing ambitions of our age. It is hoisted like a flag by troops from enemy camps, and its prominence results from this plurality of meaning. The photograph of the globe contains the contradictions of globalization. That is why it could become an all-weather icon.

No sooner had it become available, in the late 1960s, than the international environmental movement recognized itself in it. For nothing stands out from the picture as clearly as the round margin that sets it off from the dark cosmos. Clouds, oceans and land masses gleam in the wan light; the earth appears to the observer as a cosy island in a universe unfriendly to life, holding all the continents, seas and living species. For the environmental movement the picture's message was plain: it revealed the earth in its finitude. That circular object made it obvious that the ecological costs of industrial progress could not be shifted forever to Noplace, that they were slowly building up into a threat to all within a closed system. In the end, the externalization of costs belonged to the realm of the impossible. In a finite world, where everyone was affected by everyone else, there was an urgent need for

words, material and non-material satisfaction cannot be maximized simultaneously; there is a limit to material satisfaction beyond which overall satisfaction is bound to decrease. As it turns out, having much contradicts living well. Frugality, therefore, is a key to well-being.

It almost seems that after its breathtaking success the consumer society comes full circle to some of the classical teachings about the good life. Teachers of wisdom in East and West may have had different views about the nature of the universe, but they almost unanimously recommended adherence to the principle of simplicity in the conduct of life. In this tradition, the opposite to a simple lifestyle is seen as being not a luxurious but a fragmented existence. An excess of things is seen as distracting attention, dissipating energies, and weakening the capacity to take control of one's life. Advocacy of simplicity is thus more concerned with the art of living than with morality. Just as in art everything depends on a limited but skilful use of colours and sounds, so too the art of living demands a limited but skilful use of material objects. In other words, this tradition suggests a subterranean relationship between pleasure and austerity.

Particularly in an age of exploding options, the ability to focus, which implies the sovereignty of saying no, becomes an important ingredient in creating a richer life. Anyone who wants to keep his or her head above the flood of goods has no choice but to be a selective consumer, and anyone who wants to remain master of his or her wishes will discover the pleasure of systematically not pursuing options for buying. Consciously cultivating a lack of interest in excessive consumption is a very future-oriented attitude, for oneself and by chance also for the world. Henry David Thoreau put that experience in a nutshell, when he scribbled in his journal at Walden Pond: 'A man is rich in proportion to the number of things he can afford to let alone.'

Bibliography

Adriaanse, A. et al. (1997), *Resource Flows: The Material Basis of Industrial Economies*, Washington, DC: World Resources Institute.

Agarwal, A. and S. Narain (1989), *Towards Green Villages: A Strategy for Environmentally Sound and Participatory Rural Development*, New Delhi: Centre for Science and Environment.

Allen, J. (1991), *Biosphere 2. The Human Experiment*, New York: Penguin.

Altvater, E. (1992), *Der Preis des Wohlstands*, Münster: Westfälisches Dampfboot.

— and B. Mahnkopf (1996), *Grenzen der Globalisierung*, Münster: Westfälisches Dampfboot.

Anders, G. (1980), *Die Antiquiertheit des Menschen*, 2 vols, Munich: Beck.

Anderson, S. and J. Cavanagh (1997), 'The rise of global corporate power', *Third World Resurgence*, 1 (97): 37–9.

Argyle, M. (1987), *The Psychology of Happiness*, London: Routledge.

Arndt, H. W. (1981), 'Economic development: a semantic history', *Economic Development and Cultural Change* 26: 463–84.

Ayres, R. U. and U. E. Simonis (eds) (1994), *Industrial Metabolism*, Tokyo and New York: United Nations University Press.

Beck, U. (1985), *Die Risikogesellschaft*, Frankfurt: Suhrkamp.

— (1997), *Was ist Globalisierung?* Frankfurt: Suhrkamp.

Beney, G. (1993), 'Gaia: the globalitarian temptation', in W. Sachs (ed.), *Global Ecology: A New Arena of Political Conflicts*, London: Zed Books.

Blau, E. and M. Weiß (1997), *Die Reparaturgesellschaft*, Vienna: Österreichischer Gewerkschaftsbund.

Boege, S. (1993), 'The well-travelled yoghurt pot: lessons for new freight transport policies and regional production', *World Transport Policy and Practice*, 1: 7–11.

Boeing (The Boeing Company) (1998), www.boeing.com/commercial

Botkin, D. B. (1985), 'The need for a science of the biosphere', *Interdisciplinary Science Reviews* 10: 267.

Brandt, W. (1980), *North–South: A Program for Survival*, Cambridge, MA: MIT Press.

Brown, L. (ed.) (n.d.), *State of the World: A Worldwatch Institute Report on Progress Toward a Sustainable Society*, pub. annually, Washington, DC: Norton.

Brown, L. et al. (1998), *Vital Signs 1998*, Washington, DC: Norton.

Burckhardt, M. (1994), *Metamorphosen von Raum und Zeit. Eine Geschichte der Wahrnehmung*, Frankfurt and New York: Campus.

Buttels, F. et al. (1990), 'From limits to growth to global change: constraints and contradictions in the evolution of environmental science and technology', *Global Environmental Change* 1 (1), December: 57–66.

Canzler, W. (1996), *Das Zauberlehrlings-Syndrom: Entstehung und Stabilität des Automobil-Leitbildes*, Berlin: Sigma.

Carley, M. and Ph. Spapens (1998), *Sharing the World: Sustainable Living and Global Equity in the 21st Century*, London: Earthscan.

Castells, M. (1996), *The Rise of the Network Society. The Information Age: Economy, Society and Culture*, vol. I, Oxford: Blackwell.

— (1998), *End of Millennium. The Information Age: Economy, Society and Culture*, vol. 3, Oxford: Blackwell.

Cavanagh, J. (1998), 'Background to the global financial crisis', paper presented at the San Francisco International Forum on Globalization, San Francisco.

Clark, W. C. (1989), 'Managing planet earth', *Scientific American* 261, September: 47.

Clark, W. C. and R. E. Munn (eds) (1986), *Sustainable Development of the Biosphere*, Cambridge: Cambridge University Press.

Cobb, C. and J. Cobb (eds) (1994), *The Green National Product: An Index of Sustainable Economic Welfare*, New York: University Press of America.

Daly, H. (1990), 'Toward some operational principles of sustainable development', *Ecological Economics* 2: 1.

— (1991), 'Elements of environmental macroeconomics', in R. Costanza (ed.), *Ecological Economics: The Science and Management of Sustainability*, New York: Columbia University Press.

— (1996), 'Free trade, capital mobility and growth versus environment and community', public lecture given at The Hague Institute of Social Studies, The Hague, 26 September.

Daly, H. E. and J. B. Cobb (1989). *For the Common Good*, Boston, MD: Beacon Press.

Douglas, M. and B. Isherwood (1978), *The World of Goods: Towards an Anthropology of Consumption*, New York: Penguin.

Douthwaite, R. (1996), *Short Circuit: Strengthening Local Economies for Security in an Unstable World*, Totnes: Green Books.

Duden, B. (1990), *Der Frauenleib als öffentlicher Ort: Vom Mißbrauch des Begriffs Leben*, Hamburg: Luchterhand.

Durning, A. (1992), *How Much Is Enough?*, London: Earthscan.

Ecologist (1972), *A Blueprint for Survival*, Harmondsworth: Penguin.

Ecologist (1992), *Whose Common Future?*, London: Earthscan.

Economist (1997a), 'Schools brief: one world?', 18 October: 103–4.

Economist (1997b), 'Schools brief: delivering the goods', 15 November: 89–90.

El Serafy, S. (1991), 'The environment as capital', in R. Costanza (ed.), *Ecological Economics: The Science and Management of Sustainability*, New York: Columbia University Press, pp. 168–75.

Ehrlich, P. (1968), *The Population Bomb*, New York: Ballantine Books.

Esty, D. C. and D. Gerardin (1998), 'Environmental protection and international competitiveness. A conceptual framework', *Journal of World Trade*, 32 (3): 5–46.

Etymologisches Wörterbuch des Deutschen (1997), Munich: dtv.

Factor 10 Club (1995), *Carnoules Declaration*, Carnoules.

Finger, M. (1989), 'Today's trend: global is beautiful', unpublished manuscript.

Flitner, M. (1998), 'Biodiversity: of local commons and global commodities', in M. Goldman (ed.), *Privatizing Nature: Political Struggles for the Global Commons*, London: Pluto, pp. 144–66.

FOE (1995), 'Action Plan Sustainable Netherlands', in J. Spangenberg et al., *Towards Sustainable Europe: A Study from the Wuppertal Institute for Friends of the Earth Europe*, Luton: Friends of the Earth.

French, H. (1998), *Investing in the Future: Harnessing Private Capital Flows for Environmentally Sustainable Development*, Worldwatch Paper no. 139, Washington: Worldwatch Institute.

Fritsch, B., S. Schmidheiny and W. Seifritz (1993), *Towards an Ecological Sustainable Growth Society*, Berlin: Springer.

Fussler, C. (1997), *Driving Eco-Innovation*, London: Pitman.

Gadgil, M. and R. Guha (1992), *This Fissured Land: An Ecological History of India*, Delhi: Oxford University Press.

— (1995), *Ecology and Equity*, London: Routledge.

Garrod, B. (1998), 'Are economic globalization and sustainable development compatible? Business strategy and the role of the multinational enterprise', *International Journal of Sustainable Development* 1: 43–62.

George, S. (1992), *The Debt Boomerang*, London: Pluto.

Goodland, R., S. Daly and S. El Serafy (1991), *Environmentally Sustainable Economic Development: Building on Brundtland*, World Bank Environment Working Paper no. 46, July, Washington: World Bank.

Goodland, R. and H. Daly (1993), 'Why Northern income growth is not the solution to Southern poverty', *Ecological Economics* 8: 85–101.

Gore, A. (1992), *Earth in the Balance: Ecology and the Human Spirit*, Boston, MD: Houghton Mifflin.

Grinevald, J. (1988), 'Sketch for a history of the idea of the biosphere', in P. Bunyard and E. Goldsmith (eds), *Gaia, the Thesis, the Mechanisms and the Implications*, Camelford: Wadebridge Ecological Centre, pp. 1–32.

Gudeman, S. (1986), *Economics as Culture: Models and Metaphors of Livelihood*, London: Routledge.

Gwynne, M. D. and D. W. Mooneyhan (1989) 'The global environment monitoring system and the need for a global resource database', in D. Botkin et al. (eds), *Changing the Global Environment*, San Diego, CA: Academic Press.

Haas, P. (1990), 'Obtaining international environmental protection through epistemic consensus', *Millennium* 19: 347–63.

Haavelmo, T. and S. Hansen (1991), 'On the strategy of trying to reduce economic inequality by expanding the scale of human activity', in R. Goodland, H. Daly and S. El Serafy (eds), *Environmentally Sustainable Economic Development: Building on Brundtland*, Washington, DC: World Bank.

Hajer, M. A. (1995), *The Politics of Environmental Discourse*, Oxford: Clarendon.

Hansen, S. (1991), 'On the strategy of trying to reduce economic inequality by expanding the scale of human activity', in R. Goodland, S. Daly and S. El Serafy (eds), *Environmentally Sustainable Economic Development: Building on Brundtland*, World Bank Environment Working Paper no. 46, July, Washington, DC: World Bank.

Harbordt, H. J. (1991), *Dauerhafte Entwicklung statt globaler Selbstzerstörung*, Berlin: Sigma.

Hawken, P. (1993), *The Ecology of Commerce*, New York: Harper.

Hays, S. (1959), *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement 1890–1920*, 1979 edn, New York: Atheneum.

Heerings, H. and I. Zeldenrust (1995), *Elusive Saviours. Transnational Corporations and Sustainable Development*, Utrecht: International Books.

Hennicke, P. and D. Seifried (1996), *Das Einsparkraftwerk*, Basle: Birkhäuser.

Hentschel, V. (1984) 'Produktion, Produktivität', in O. Brunner, W. Conze and R. Koselleck (eds), *Geschichtliche Grundbegriffe: Historisches Lexikon zur politisch-sozialen Sprache in Deutschland*, vol. 5, Stuttgart: Klett.

Hildyard, N. (1993), 'Foxes in charge of the chickens', in W. Sachs (ed.), *Global Ecology*, London: Zed Books, pp. 22–35.

Hobsbawm, E. (1994), *The Age of Extremes: A History of the World, 1914–1991*, New York: Pantheon.

Hopper, D. (1988), 'The World Bank's challenge: balancing economic need with environmental protection', Seventh Annual World Conservation Lecture, 3 March.

Hörning, K. H. et al. (1990), *Zeitpioniere. Flexible Arbeitszeiten – neuer Lebensstil*, Frankfurt: Suhrkamp.

IBRD (1950), *The Basis of a Development Program for Colombia*, Baltimore, MD: Johns Hopkins University Press.

Illich, I. (1972), *Tools for Conviviality*, New York: Harper & Row.

International Bank for Reconstruction and Development (1950), *The Basis of a Development Program for Colombia*, Baltimore, MD: Johns Hopkins University Press, p. xv.

Johnstone, N. (1997), 'Globalisation, technology, and environment', in *OECD Proceedings, Globalisation and Environment*, Paris: OECD, pp. 227–67.

Jones, T. and R. Youngman (1997), 'Globalisation and environment: sectoral perspectives', in *OECD Proceedings, Globalisation and Environment*, Paris: OECD, pp. 199–221.

Kehr, K. (1993), 'Nachhaltig denken: Zum sprachgeschichtlichen Hintergrund und zur Bedeutungsentwicklung des forstlichen Begriffs der Nachhaltigkeit', *Schweizerische Zeitschrift für Forstwesen* 144: 595–605.

Kelley, K. (ed.) (1988), *The Home Planet*, Reading, MA: Addison-Wesley.

Kennedy, J. F. (1961), Inaugural Address, Washington, DC, 20 January.

Kern, S. (1983), *The Culture of Time and Space 1880–1918*, Cambridge, MA: Harvard University Press.

Kessler, J. J. and M. Van Dorp (1998), 'Structural adjustment and the environment: the need for an analytical methodology', *Ecological Economics* 27: 267–81.

Keynes, J. M. (1972) (first published 1930), 'Economic possibilities for our grandchildren', in *The Collected Writings of John Maynard Keynes. Vol. IX: Essays in Persuasions*, London: Macmillan, pp. 321–2.

König, R. (1989), 'Produktion, Produktivität', in J. Ritter and K. Gründer (eds), *Historisches Wörterbuch der Philosophie*, vol. 7, Darmstadt: Wissenschaftliche Buchgesellschaft.

Koschorke, A. (1989), *Die Geschichte des Horizonts*, Frankfurt: Suhrkamp.

Kothari, R. (1993), *Growing Amnesia: An Essay on Poverty and Human Consciousness*, New Delhi: Penguin.

Lappé, M. and B. Bailey (1998), *Against the Grain: The Genetic Transformation of Global Agriculture*, London: Earthscan.

Lash, S. and J. Urry (1994), *Economies of Signs and Space*, London: Sage.

Lewis, C. S. (1947), *The Abolition of Man*, New York: Macmillan.

Lovelock, J. (1979), *Gaia: A New Look at Life on Earth*, Oxford: Oxford University Press.

— (1988), *The Ages of Gaia*, New York: Norton.

Lummis, D. (1992), 'Equality', in W. Sachs (ed.), *The Development Dictionary: A Guide to Knowledge as Power*, London: Zed Books.

McCormack, G. (1996), *The Emptiness of Japanese Affluence*, St. Leonards: Allen & Unwin.

McCormick, J. (1986), 'The origins of the world conservation strategy', *Environmental Review* 10: 177–87.

— (1989), *Reclaiming Paradise: The Global Environmental Movement*, Bloomington: Indiana University Press.

McLaren, D. et al. (1997), *Tomorrow's World: Britain's Share in a Sustainable Future*, London: Earthscan.

McNamara, R. (1973), 'Address to the board of governors', World Bank, Nairobi, 24 September.

Mack, P. (1990), *Viewing the Earth: The Social Construction of the Landsat Satellite System*, Cambridge, MA: MIT Press.

Malley, J. (1996), 'Von Ressourcenschonung derzeit keine Spur', *Politische Ökologie*, November–December: 46–9.

Malone, T. F. (1986), 'Mission to Planet Earth', *Environment* 28 (8): 6–11, 39–41.

Margulis, L. and D. Sagan (1986), *Microcosmos*, New York: Simon & Schuster.

Mason, M. (1997), 'A look behind trend data in industrialization. The role of transnational corporations and environmental impacts', *Global Environmental Change* 7: 113–27.

Meadows, D. H. et al. (1972), *The Limits to Growth*, New York: Basic Books.

Menotti, V. (1998a), 'The environmental impacts of economic globalization', draft paper presented at the San Francisco International Forum on Globalization, San Francisco.

— (1998b), 'Globalization and the acceleration of forest destruction since Rio', *Ecologist* 28: 354–62.

Moll, P. (1991), *From Scarcity to Sustainability. Future Studies and the Environment: The Role of the Club of Rome*, Frankfurt: Peter Lang.

Morris, D. (1996), 'Communities: building authority, responsibility and capacity', in *The Case against the Global Economy and for a Turn toward the Local*, San Francisco, CA: Sierra Club Books, p. 434.

Myers, N. (ed.) (1993), *Gaia: An Atlas of Planetary Management*, rev. edn, New York: Anchor.

Nisbet, E. G. (1991), *Leaving Eden: To Protect and Manage the Earth*, Cambridge: Cambridge University Press.

Norgaard, R. (1994), *Development Betrayed: The End of Progress and a Coevolutionary Revisioning of the Future*, London: Routledge.

Nørgård, J. (1995), 'Declining efficiency in the economy, *Gaia* 4: 277–81.

OECD (1998), *Kein Wohlstand ohne offene Märkte, Vorteile der Liberalisierung von Handel und Investitionen*, Paris: OECD.

Oppel, N. V. (1999), 'Aus fünf Kilo Fisch wird ein Kilo Zuchtlachs', *Greenpeace Magazin* 1 (99): 40–1.

Opschoor, J. (1992), *Environment, Economics and Sustainable Development*, Groningen.

Pastowski, A. (1997), *Decoupling Economic Development and Freight for Reducing ist Negative Impacts*, Wuppertal Paper no. 79, Wuppertal: Wuppertal Institute for Climate, Environment and Energy.

Pauli, G. (1998), 'No waste economy', *Resurgence*, 182: 20–3.

Pearson, L. (1969), *Partners in Development*, New York: Praeger.

Plowden, S. and M. Hillman (1996), *Speed Control and Transport Policy*, London: Policy Studies Institute.

Polanyi, K. (1944), *The Great Transformation*, Boston, MD: Beacon Press.

— (1977), 'The two meanings of economic', in K. Polanyi, *The Livelihood of Man*, London: Academic Press.

Pörksen, U. (1988), *Plastikwörter: Die Sprache einer internationalen Diktatur*, Stuttgart: KlettCotta.

Rambler, M., L. Margulis and R. Fester (eds) (1989), *Global Ecology: Towards a Science of the Biosphere*, San Diego, CA: Academic Press.

Reed, D. (ed.) (1996), *Structural Adjustment, the Environment and Sustainable Development*, London: Earthscan.

Reilly, W. K. (1990), 'The environmental benefits of sustainable growth, *Policy Review*, Fall: 16–21.

Riedel, M. (1961), 'Vom Biedermeier zum Maschinenzeitalter. Zur Kulturgeschichte der ersten Eisenbahnen in Deutschland', *Archiv für Kulturgeschichte* 43: 100–23.

Robert, J. (1992), 'Production', in W. Sachs (ed.), *The Development Dictionary: A Guide to Knowledge as Power*, London: Zed Books, pp. 177–91.

Rufin, J. (1994), *Das Reich und die neuen Barbaren*, Berlin: Volk & Welt.

Sachs, I. (1980), *Stratégies de l'écodéveloppement*, Paris: Les Editions Ouvrières.

Sachs, W. (1991/92), 'Natur als System. Vorläufiges zur Kritik der Ökologie', *Scheidewege* 21: 83–97.

— (1992a), *For Love of the Automobile: Looking back into the History of our Desires*, Berkeley: University of California Press.

— (ed.) (1992b), *The Development Dictionary: A Guide to Knowledge as Power*, London: Zed Books.

— (1992c), *Satellitenblick: Die Visualisierung der Erde im Zuge der Weltraumfahrt*, Berlin: Science Centre for Social Research.

— (ed.) (1993), *Global Ecology: A New Arena of Political Conflict*, London: Zed Books.

— (1994), 'The blue planet: an ambiguous modern icon', *Ecologist* 24: 170–5.

Sachs, W., R. Loske and M. Linz (eds) (1998), *Greening the North: A Postindustrial Blueprint for Ecology and Equity*, London: Zed Books.

Sagan, C. (1975), *The Cosmic Connection*, New York: Dell Books.

Sanne, C. (1992), 'How much work?', *Futures*, January/February: 23–6.

Sassen, S. (1996), *Losing Control?*, New York: Columbia University Press.

Schallaböck, K.-O. (1996), 'Verkehr und Zeit', in J. Rinderspacher (ed.), *Zeit für die Umwelt*, Berlin: Sigma, pp. 175–212.

Scherhorn, G. (1995), 'Zeitwohlstand versus Güterwohlstand – Über die Unvereinbarkeit des materiellen und immateriellen Produktivitätsbegriffs', in B. Bievertand and M. Held (eds), *Zeit in der Ökonomik*, Frankfurt: Campus, pp. 147–68.

Schivelbusch, W. (1987), *The Railway Journey: Industrialization of Space and Time in the 19th Century*, Berkeley: University of California Press.

Schmidheiny, S. (1992), *Changing Course: A Global Business Perspective on Development and the Environment*, Cambridge, MA: MIT Press.

Schmidt-Bleek, F. (1994), *Wieviel Umwelt braucht der Mensch?*, Berlin and Basel: Birkhäuser.

— (1998), *Das MIPS-Konzept. Weniger Naturverbrauch – mehr Lebensqualität durch Faktor 10*, Munich: Droemer.

Schneider, M., K. Geißler and M. Held (1995), 'Zeit-Fraß. Zur Ökologie der Zeit in Landwirtschaft und Ernährung', *Politische Ökologie*, Special Issue 8.

Schor, J. (1995), 'Can the North stop consumption growth? Escaping the cycle of work and spend', in V. Bhaskar and A. Glyn (eds), *The North, the South, and the Environment*, London, pp. 68–84.

Schulze, G. (1993), 'Soziologie des Wohlstands', in E. U. Huster, *Reichtum in Deutschland*, Frankfurt: Campus, pp. 182–209.

Scientific American (1989), *Managing Planet Earth: Readings from Scientific American*, New York: Freeman.

Seed, J. et al. (1988), *Thinking Like a Mountain*, Philadelphia: New Society Publishers.

Shiva, V. (1989), *Staying Alive: Women, Ecology and Development*, London: Zed Books.

Sloterdijk, P. (1990), *Versprechen auf Deutsch*, Frankfurt: Suhrkamp.

Sontag, S. (1977), *On Photography*, New York: Farrar, Straus & Giroux.

Spangenberg, J. et al. (1995), *Towards Sustainable Europe. A Study from the Wuppertal Institute for Friends of the Earth Europe*, Wuppertal: Wuppertal Institute.

Sprenger, R. U. (1997), 'Globalisation, employment, and environment', in *OECD Proceedings, Globalisation and Environment*, Paris: OECD, pp. 315–66.

Stahel, W. and E. Gromingen (1993), *Gemeinsam nutzen statt einzeln verbrauchen*, Internationales Design Forum, Giessen: Anabas.

Tandon, Y. (1993), 'Village contradictions in Africa', in W. Sachs (ed.), *Global Ecology*, London: Zed Books.

Thrupp, L. A. (1995), *Bittersweat Harvests for Global Supermarkets: Challenges in Latin America's Agricultural Export Boom*, Washington, DC: World Resources Institute.

Tibbs, H. (1992), 'Industrial ecology: an environmental agenda for industry', *Whole Earth Review* 77: 4–10.

Todorov, T. (1984), *The Conquest of America*, New York: Harper & Row.

Truman, H. S. (1950), 'Inaugural address', in *A Decade of American Foreign Policy*, Washington: US Government Printing Office.

— (1956), *Memoirs, Vol. 2: Years of Trial and Hope*, New York: Doubleday.

Turner, T. (1995), *The Conserver Society*, London: Zed Books.

UN (1968), 'Preamble to the Charter of the United Nations', New York: UN Office of Public Information.

UNDP (United Nations Development Programme) (1996), *Human Development Report 1996*, Oxford and New York: Oxford University Press.

UNDP (United Nations Development Programme) (1998), *Human Development Report 1998*, Oxford and New York: Oxford University Press.

UNRISD (United Nations Research Institute for Social Development) (1995), *States of Disarray: The Social Effects of Globalization*, Geneva: UNRISD.

Wackernagel, M. and W. Rees (1996), *Our Ecological Footprint: Reducing Human Impact on the Earth*, Gabriola Island, Canada: New Society Publisher.

— (1997), 'Perceptual and structural barriers to investing in natural capital: economics from an ecological footprint perspective', *Ecological Economics* 20: 3–24.

WCED (World Commission on Environment and Development) (1987), *Our Common Future* (the Brundtland Report), Oxford and New York: Oxford University Press.

Weizsäcker, E. U., A. Lovins and H. Lovins (1997), *Factor Four: Doubling Wealth – Halving Resource Use*, London: Earthscan.

World Bank (1992), *World Development Report 1992*, Oxford and New York: Oxford University Press.

WRI (World Resources Institute) (ed.) (n.d.), *World Resources*, pub. annually, New York: Oxford University Press.

Wrigley, E. A. (1987), 'The classical economists and the Industrial Revolution', in *People, Cities and Wealth*, Oxford: Blackwell, pp. 21–44.

Wysham, D. (1997), *The World Bank and the G-7: Changing the Earth's Climate for Business*, Washington, DC: Institute for Policy Studies.

Zängl, W. (1993), *ICE – Die Geisterbahn*, Munich: Raben.

Zarsky, L. (1997), 'Stuck in the mud? Nation-states, globalisation, and the environment', in *OECD Proceedings, Globalisation and Environment*, Paris: OECD, pp. 27–51.

Zukunftskommission der Friedrich-Ebert-Stiftung (1998), *Wirtschaftliche Leistungsfähigkeit, sozialer Zusammenhalt, ökologische Nachhaltigkeit. Drei Ziele – ein Weg*, Bonn: Dietz.