More recently, a number of fragmentary fossils discovered between 1997 and 2001, and dating from 5.2 to 5.8 E6 years old, have been assigned first to a new subspecies, *Ardipithecus ramidus* kadabba, which was used to define it. This species was named in July 2001 from fossils discovered in western Kenya (Senut et al. 2001). The fossils include fragmentary arm and thigh bones, lower jaws, and teeth and were discovered in deposits that are about 6 E6 years old. The limb bones are about 1.5 times larger than those of Lucy, and suggest that it was about the size of a female chimpanzee. Its finders have claimed that *Orrorin* was a human ancestor adapted to both bipedality and tree climbing, and that the australopithecines are an extinct offshoot. Given the fragmentary nature of the remains, other scientists have been skeptical of these claims so far (Aiello and Collard 2001). A later paper (Galik et al. 2004) has found further evidence of bipedality in the fossil femur.

The teeth are intermediate between those of earlier apes and those of modern man, and leave no doubt that they were bipedal (although adapted to walking rather than running (Leakey 1994)). Their bones show that they were physically very strong. Females were substantially smaller than males, a condition known as sexual dimorphism. Height varied between about 107 cm and 152 cm. The finger and toe bones are curved and resemble those of modern man.

The finding of a partial tibia (the larger of the two lower leg bones) is strong evidence of bipedality, and a lower humerus (the upper arm bone) is extremely humanlike. Note that although the skull and skeletal bones are substantially smaller than those of modern apes, but larger and more pointed than those of humans, and shape of the jaw is between the rectangular shape of apes and the parabolic shape of humans. However their pelvis and leg bones far more closely resemble those of modern man, and leave no doubt that they were bipedal (although adapted to walking rather than running (Leakey 1994)). Their bones show that they were physically very strong. Females were substantially smaller than males, a condition known as sexual dimorphism. Height varied between about 107 cm and 152 cm. The finger and toe bones are curved and proportionally longer than in humans, but the hands are similar to humans in most other details (Johanson and Edey 1981). Most scientists consider this evidence that *africus* was still partially adapted to climbing in trees, others consider it evolutionary baggage.
Conclusion

The skull differs from previous australopithecine found in Kenya with an unusual mixture of features (Leakey et al. 2001). It is aged about 3.5E6 years old. The size of the skull is similar to A. afarensis and A. aethiopicus, and has a large, flat face and small teeth.

Australopithecus africanus: A. africanus existed between 3 and 2.8E6 years ago. It is similar to afarensis, and was also bipedal, but body size was slightly greater. Brain size may also have been slightly larger, ranging between 420 and 500 cc. This is a little larger than chimp brains (despite a similar body size), but still not advanced in the areas necessary for speech. The back teeth were a little bigger than in afarensis. Although the teeth and jaws of africanus are much larger than those of humans, they are far more similar to human teeth than to those of apes (Johanson and Edey 1981). The shape of the jaw is now fully parabolic, like that of humans, and the size of the canine teeth is further reduced compared to afarensis.

Australopithecus garhi: This species was named in 1999 (Aftew et al. 1999). It is known from a partial skull. The skull differs from previous australopithecine species in the combination of its features, notably the extremely large size of its teeth, especially the rear ones, and a primitive skull morphology. Some nearby skeletal remains may belong to the same species. They show a humanlike ratio of the humerus and femur, but an apelike ratio of the lower and upper arm. (Garves 1999; Culotta 1999)

Australopithecus afarensis and africanus, and the other species above, are known as gracile australopithecines, because of their relatively lighter build, especially in the skull and teeth. (Gracile means "slender," and in paleoanthropology is used as an antonym to "robust"). Despite this, they were still more robust than modern humans.

Australopithecus aethiopicus: A. aethiopicus existed between 2.6 and 2.3E6 years ago. This species is known from one major specimen, the Black Skull discovered by Alan Walker, and a few other minor specimens which may belong to the same species. It may be an ancestor of robustus and boisei, but it has a baffling mixture of primitive and advanced traits. The brain size is very small, at 410 cc, and parts of the skull, particularly the hind portions, are very primitive, most resembling afarensis. Other characteristics, like the massiveness of the face, jaws and single tooth found, and the largest sagittal crest in any known hominid, are more reminiscent of A. boisei (Leakey and Lewin 1992). (A sagittal crest is a bony ridge on top of the skull to which chewing muscles attach.)

Australopithecus robustus: A. robustus had a body similar to that of africanus, but a larger and more robust skull and teeth. It existed between 2 and 1.5E6 years ago. The massive face is flat or dished, with no forehead and large brow ridges. It has relatively small front teeth, but massive grinding teeth in a large lower jaw. Most specimens have sagittal crests. Its diet would have been mostly coarse, tough food that needed a lot of chewing. The average brain size is about 530 cc. Bones excavated with robustus skeletons indicate that they may have been used as digging tools.

Australopithecus boisei (was Zinjanthropus bosei): A. boisei existed between 2.1 and 1.1E6 years ago. It was similar to robustus, but the face and cheek teeth were even more massive, some molars being up to 2 cm across. The brain size is very similar to robustus, about 550 cc. A few experts consider bosei and robustus to be variants of the same species.

Australopithecus aethiopicus, robustus and boisei are known as robust australopithecines, because their skulls in particular are more heavily built. They have never been serious candidates for being direct human ancestors. Many authorities now classify them in the genus Paranthropus.

Homo habilis: H. habilis, "handy man," was so called because of evidence of tools found with its remains. Habilis existed between 2.4 and 1.5E6 years ago. It is very similar to australopithecines in many ways. The face is still primitive, but it projects less than in A. afarensis. The back teeth are smaller, but still considerably larger than in modern humans. The average brain size, at 500 cc, is considerably larger than in australopithecines. Brain size varies between 500 and 800 cc, overlapping the australopithecines at the low end and H. erectus at the high end. The brain shape is also more humanlike. The budge of Broca's area, essential for speech, is visible in one habilis brain cast, and indicates it was possibly capable of rudimentary speech. Habilis is thought to have been about 127 cm tall, and about 45 kg in weight, although females may have been smaller.

Habilis has been a controversial species. Originally, some scientists did not accept its validity, believing that all habilis specimens should be assigned to either the australopithecines or Homo erectus. H. habilis is now fully accepted as a species, but it is widely thought that the 'habilis' specimens have too wide a range of variation for a single species, and that some of the specimens should be placed in one or more other species. One suggested species which is accepted by many scientists is Homo rudolfensis, which would contain fossils such as ER 1470.

Homo georgicus: This species was named in 2002 to contain fossils found in Dmanisi, Georgia, which seem intermediate between H. habilis and H. erectus. The fossils are about 1.8E6 years old, consisting of three partial skulls and three lower jaws. The brain sizes of the skulls vary from 600 to 680 cc. The height, as estimated from a foot bone, would have been about 1.5 m. A partial skeleton was also discovered in 2001 but no details are available on it yet. (Vekua et al. 2002; Galunia et al. 2002)
**Homo erectus**: *H. erectus* existed between 1.8E6 and 300E4 years ago. Like habilis, the face has protruding jaws with large molars, no chin, thick brow ridges, and a long low skull, with a brain size varying between 750 and 1225 cc. Early *erectus* specimens average about 900 cc, while late ones have an average of about 1100 cc (Leakey 1994). The skull is more robust than those of modern humans, implying greater strength. Body proportions vary; the *Turkana Boy* is tall and slender (though still extraordinarily strong), like modern humans from the same area, while the few limb bones found of *Peking Man* indicate a shorter, stouter build. Study of the Turkana Boy skeleton indicates that *erectus* may have been more efficient at walking than modern humans, whose skeletons have had to adapt to allow for the birth of larger-brained infants (Wills 1989). *Homo habilis* and all the australopithecines are found only in Africa, but *erectus* was wide-ranging, and has been found in Africa, Asia, and Europe. There is evidence that *erectus* probably used fire, and their *more tools are more sophisticated* than those of *habilis*.

**Homo ergaster**: Some scientists classify some African *erectus* specimens as belonging to a separate species, *H. ergaster*, which differs from the Asian *H. erectus* fossils in some details of the skull (e.g. the brow ridges differ in shape, and *erectus* would have a larger brain size). Under this scheme, *ergaster* would include fossils such as the *Turkana boy* and 137333.

**Homo antecessor** was named in 1977 from fossils found at the Spanish cave site of Atapuerca, dated to at least 780E3 years ago, making them the oldest confirmed European hominids. The mid-facial area of antecessor seems rather modern, but other parts of the skull such as the teeth, forehead and browridges are much more robust. Many scientists are doubtful about the validity of antecessor, partly because its definition is based on a juvenile specimen, and feel it may belong to another species. (Bermudez de Castro et al. 1997; Kazuji 1997, Carbonell et al. 1995)

**Homo erectus (archaic) (also Habilis/Bergenensis)**: Archaic forms of *Homo sapiens* first appear about 500E3 years ago. The term covers a diverse group of skulls which have features of both *Homo erectus* and modern humans. The brain size is larger than *erectus* and smaller than most modern humans, averaging about 1200 cc, and the skull is more rounded than in *erectus*. The skeleton and teeth are usually less robust than *erectus*, but more robust than modern humans. Many still have large brow ridges and receding foreheads and chins. There is no clear dividing line between late *erectus* and archaic *sapiens*, and many fossils between 500 and 200E3 years ago are difficult to classify as one or the other.

**Homo sapiens neanderthalensis (also H.unanderthalensis)**: Neandertal (or Neanderthal) man existed between 230 and 30E2 years ago. The average brain size is slightly larger than that of modern humans, about 1450 cc, but this is probably correlated with their greater bulk. The brain case however is longer and lower than that of modern humans, with a marked bulge at the back of the skull. Like *erectus*, they had a protruding jaw and receding forehead. The chin was usually weak. The midfacial area also protrudes, a feature that is not found in *erectus* or *sapiens* and may be an adaption to cold. There are other minor anatomical differences from modern humans, the most unusual being some peculiarities of the shoulder blade, and of the pubic bone in the pelvis. Neandertals mostly lived in cold climates, and their body proportions are similar to those of modern cold-adapted peoples: short and solid, with short limbs. Men averaged about 168 cm (5'6") in height. Their bones are thick and heavy, and show signs of powerful muscle attachments. Neandertals would have been extraordinarily strong by modern standards, and their skeletons show that they endured brutally hard lives. A large number of tools and weapons have been found, more advanced than those of *Homo erectus*. Neandertals were formidable hunters, and are the first people known to have buried their dead, with the oldest known burial site being about 100E3 years old. They are found throughout Europe and the Middle East. Western European Neandertals usually have a more robust form, and are sometimes called "classic Neandertals". Neandertals found elsewhere tend to be less-excessively robust. (Trinkaus and Shipman 1992; Trinkaus and Howells 1979; Gore 1996)

**Homo floresiensis**: *H. floresiensis* was discovered on the Indonesian island of Flores in 2003. Fossils have been discovered from a number of individuals. The most complete fossil is of an adult female about 1 meter tall with a brain size of 417cc. Other fossils indicate that this was a normal size for *floresiensis*. It is thought that *floresiensis* is a dwarf form of *Homo erectus* - it is not uncommon for dwarf forms of large mammals to evolve on islands. *H. floresiensis* was fully bipedal, used stone tools and fire, and hunted dwarf elephants also found on the island. (Brown et al. 2004, Morwood et al. 2004, Lahr and Foley 2004)

**Homo sapiens sapiens (modern)**: Modern forms of *H. sapiens* first appear about 195E3 years ago. Modern humans have an average brain size of about 1350 cc. The forehead rises sharply, eyebrow ridges are very small or more usually absent, the chin is prominent, and the skeleton is very gracile. About 40E3 years ago, with the appearance of the Cro-Magnon culture, *sapiens* started becoming markedly more sophisticated, using a wider variety of raw materials such as bone and antler, and containing new implements for making clothing, engraving and sculpting. Fine artwork, in the form of decorated tools, beads, ivory carvings of humans and animals, clay figurines, musical instruments, and *spectacular cave paintings* appeared over the next 20E3 years. (Leakey 1994)

Even within the last 100E3 years, the long-term trends towards smaller molars and decreased robustness can be discerned. The face, jaw and teeth of *Mesolithic* humans (about 10E3 years ago) are about 10% more robust than ours. Upper Paleolithic humans (about 30E3 years ago) are about 20 to 30% more robust than the modern condition in Europe and Asia. These are considered modern humans, although they are sometimes termed "primitive". Interestingly, some modern humans (aboriginal Australians) have tooth sizes more typical of archaic *sapiens*. The smallest tooth sizes are found in those areas where food-processing techniques have been used for the longest time. This is a probable example of natural selection which has occurred within the last 10E3 years (Brace 1983).
Hunger rather than the kick for adventures forced us to become mobile and to spread out into the world (especially if the population is affected by some catastrophic change in their environment). Environmental Changes: Emigration out of a population is a major factor that reduces population size. This dispersal factor allows organisms to migrate into new areas. Emigration can help to protect species, excess resource allocation, and favors recovery of a depleted habitat. Regardless of the process (radiation vs. parallel), their genes as well as locally acquired knowledge and experience are exported into new territories. It was not a problem back then (except few cultures felt the consequences, e.g. Easter Island) as it happened gradually and slowly (also 'cause of low population densities), thereby adapting to the new situation and by applying more or less sustainable methods (which led to the acquisition of the "wisdom of the elders") the impact compared to the modern capital-oriented societies was rather low.

Even among progressive nature people there was rather none which was conscious of her/himself as an individual. Everyone felt as being member of the horde/hurdle (part of the whole group) – maybe one or the other was aware of it in a nebulous manner. For the individual, the clear feeling of oneself must have been completely absent.

The agro-revolution made us sessile, thereby enabling communities to establish villages, cities, and ultimately larger urban aggregations.

The explosive burst of highly developed urban civilizations - after millions of years without a face – and which spread over the whole world (so far known to them; e.g. Egypt, Sumer & Akkad in the Hindu valey, Xia dynasty at the HuangHo, the indigene cultures on the american Continent among others) is remarkable. It must have been this development in which humans finally have left the line of animal ancestors. Thereby a genuine reflective feeling of oneself must have occurred and outlined the actual birth of the human concept as we know it today. Thus it happened that humans were born as "humans and their religions". All the large advanced cultures of that time were THEOKRATies, forms of governance that were firmly rooted in the foundations of religions and Priesthood.

Cornelssen, 1985:
Food plants exemplify the most fundamental values of biodiversity. Originally, plants were consumed directly from the wild, and gathering of wild produce continues throughout the world today. Only a few of the many species of flowering plants have been treated as direct food sources though others provide food for animals which in turn are hunted or farmed by people. Around 200 species have been domesticated as food plants, and of these about 20 are crops of major international economic importance. Relatively few botanical families account for the world's main food plants: *Gramineae* (grasses, including cereals) and *Leguminosae* (legumes, including peas, beans and lentils) are foremost among these.

Cunningham & Saigo, 1993: 142
The human success story based on agro-, industrial-, and technological revolutions;

Burst of growth was stimulated by scientific and industrial revolution, progress in agricultural productivity, engineering and information technology, commerce, medicine, sanitation and other achievements of modern life have made it possible to support approximately 1000 times as many people per unit area as was possible 10^3 years ago.
Since about 1000 CE, the world population curve has assumed an exponential pattern (J-shaped). Are we on the upward slope of a population overshoot? To face a dieback as it oscillates around the Carrying capacity? Will we be able to adjust our population to an asymptotical approach, so characteristic for a logistic pattern (S-curve). In order to understand the implications resulting from such a scenario, we should briefly focus on some basic issues.

- **atmo-, hydro-, geo-/lithosphere**: these are the three basic foundations that make up our planet;
- **biosphere**: the biosphere constitutes the manifold diversity of life – be it aquatic, terrestrial or a combination of both.
- **antroposphere**: the successful colonization of the entire globe of Homo sapiens, along with the capabilities to produce tools, utilizing natural energy sources for his purposes (animals, wind, water, later on even slaves, and machines) made this species so successful in exploiting the vast but limited natural resources of this planet.

**Growth patterns**: curves for exponential growth (left) and logistic growth (right). The difference between them is a measure of environmental resistance. **Webner-Fechner Law**: Sensation increases arithmetically as a stimulus increases geometrically; the least perceptible change in stimulus intensity above any background bears a constant proportion to the intensity of the background; i.e. the smaller the stimulus, the larger the reaction – or to put it in simple terms: the 1st piece of cake tastes excellent, the 2nd piece is superb, the 3rd piece goes with fatigue, the 4th piece turns you pale-green, the 5th piece causes your stomach to revolt - you will threw up.

**Logistic growth**: experienced to a certain extend exponential growth, but intuition tells us that even this must flatten out to logistic growth (**sigmoidal path**).

- i) agricultural food supply
- i) population growth;
- i) ecosystem stability (climax community);
- i) even in economical terms (some ones gains is some one else's loss);

Carrying capacity needs to be understood:

- as the maximum load an environment can permanently support (i.e., without reduction of its ability to support future generations), with load referring not just to the number of users of an environment but to the total demands they make upon it.
- The carrying capacity of a territory is defined as the maximum number of animals that can be supported year after year without damage to the environment.

Cunningham & Saigo, 2003: 138
Myth of Limitlessness (e.g. Bacteria)  

Madigan et al., 1997 & Dorit, 1991

Valid for R-strategists (like bacteria, protozoa, simple metazoa, etc)

Only partially applicable to K-strategists like humans, whales etc. (strongly dependant on social factors such as education, health, status, stress, etc.)

Lag P.: population is inoculated to a fresh medium, growth does not begin immediately but only after a given period of time.

Exp.P.: growth begins with each single organism having doubled during each unit of time.

Stat.P.: exponential growth cannot occur indefinitely but is the limited by the supply of essential nutrients, eventually waste products build up (turbidity) to inhibitory levels, growth ceases.

Death P.: cells still viable at the S.P. continue to metabolise but the uphill gradient of resource limitation and metabolic waste products render survival more and more difficult.

The terminology LP, EP, SP and DP do not apply to individual cells but only to the population as a whole.
What are humans doing to extend the exponential Growth Phase?

- The Principle of Scope enlargement: Pollution is left in the country of origin, refinement is done in the 1st world or is simply reduced to distribution and profit making.
- So far we tend to use technology as our extended arm to perform tasks originating from a brain that more or less is still confined to the stone age. Brainpower wasted to perfectionize archaic thinking patterns.

**Entropy**: the degree of DISORDER increases as we excavate raw materials (resources), during processing and after disposal. Although recycling also increases Entropy it does so to a much lesser extent (kind of shortcut).

*Entropy* and the second law of thermodynamics

The second law of thermodynamics is a **tendency**

Obstructions to the second law make life possible

The second law of thermodynamics and **evolution**

*Entropy* and Gibbs free energy, \( dG = dH - TdS \)

**1st Law of Thermodynamics**, states that in all processes, the total energy of the universe remains constant (energy conservation - energy cannot be lost or gained, just transformed). Einstein's famous equation (\( E = mc^2 \)) describes the relationship between energy and matter.

The **2nd Law of Thermodynamics**, states that entropy, or the degree of randomness, tends to increase; i.e. heat can never pass spontaneously from a colder to a hotter body. Or in simpler terms, neither capital nor labour nor technology can "create" energy. Instead, available energy must be spent to transform existing matter (e.g., oil), or to divert an existing energy flow (e.g., wind) into more available energy. **There are no exceptions to the thermodynamic laws.**

**3rd Law of Thermodynamics**, states that if all the thermal motion of molecules (kinetic energy) could be removed, a state called absolute zero would occur (absolute zero results in a temperature of 0 Kelvin or -273.15° C). The Universe will attain absolute zero when all energy and matter is randomly distributed across space. The current temperature of empty space in the Universe is about 2.7 Kelvin, compared to the average 293 K on the surface of our planet.
i) **Trophic pyramid:** itself, it delimits the nutritional borders (i.e. the top predator cannot simply become larger than the assigned area – these limits are related to the trophic base represented by the primary producers). The energy transfer is from the bottom up; plants and other photosynthetic organisms from the 1st trophic level receive the sunlight needed (1%) to convert CO₂ to sugars (and other chemical bonds like ATP, cellulose etc.). The amount of energy trapped, or fixed, in new biomass is called the **net primary production.** Organisms that feed on these producers constitute the 2nd trophic level of all food chains. If the tertiary consumer eats animals, it is called a carnivore. Because biomass stores energy, only a fraction of the biomass of one trophic level becomes part of the next trophic level. On average only 10% of the biomass in one trophic level becomes biomass in the next. The 90% biomass loss is basically the result of metabolic activity (respiration), faecal losses, and reproductive losses. A reason why meat consumption constitute a huge burden onto the entire ecosystem.

ii) **alternative food webs** include, agriculture, livestock (fish farming, cattle farming), or even **insects**! The advantage of farming is obvious as we no longer depend on yields in hunting and gathering, but can plan ahead as stocking food provides long term survival to overcome droughts, and harsher periods of the year (compare with 7 year drought during ancient times). Hunting is probably a trait left by our ancient grand-grand-fathers of the paleolithicum. Nowadays we show that feature when we want to impress our neighbours with a hunter’s trophy nailed onto the wall, a tiger carpet spread out over the floor, a brand new car in front of the driveway….  

iii) **arrows:** currently, humanity extracts more biological resources than nature is capable to substitute. The collapsing numbers in top predators eventually forces us to harvest on the trophic level below. In order to counterbalance the lower energetic content of the trophic level below, even larger amounts of biomass has to be extracted to level out the losses experienced with the collapse of the uppermost trophic level; i.e. more has to be fished even though stocks are dwindling.

iv) **fishing down the food web:** **Pauly et al,** has proven that this trend is in fact occurring. For all marine areas, the trend over the past 50 years has been a decline in the mean trophic level of the fisheries landings, from slightly more than 3.3 in the early 1950s to less than 3.1 in the late 90’s. A dip in the 1960s and early 1970s occurred because of extremely large catches [>12·E₆ metric tons per year] of Peruvian anchoveta (**sardellen**) with a low trophic level of 2.2 (±0.42). Since the collapse of the Peruvian anchoveta fishery in 1972–1973, the global trend in the trophic level of marine fisheries landings has been one of steady decline. Fisheries in inland waters exhibit, on the global level, a similar trend as for the marine areas:
World Energy production 1890-1999 in Exajoule (1 E18 J), distributed by fuel source. The figure only represents the energy distributed in a market. It is estimated that about a fourth of all energy in developing countries derives from wood. Including traditional, non-commercial energy sources would add about 7% to the commercial production.

Lomborg, 1998: 122
Lake Vostok Ice-core samples and direct atmospheric measurement were used to plot these diagrams.
Stratospheric ozone and Ground surface Temperature increase
**Agro-Industry**: since the discovery of Liebig’s law (1850), agricultural productivity skyrocketed – so did the collateral effects of airborne relocation of essential minerals such as phosphorous and nitrogen.

In 1840 Justus von Liebig proposed that the single factor in shortest supply relative to demand is the critical determinant in the distribution of that species (be it bacteria, plant, animal, fungi)
**Threatened animal species**: Bar chart shows total number of threatened animal species by region. Most are land-based but freshwater habitats and marine habitats such as coral reefs are increasingly vulnerable.

- **Alien species (see slide 26 & 27)** A further major cause of biodiversity loss is the widespread introduction of animal and plant species outside their natural range, resulting in change at the community and ecosystem level, and sometimes total destruction of some of the species originally present (UNEP 1995). For example, some 18 per cent of 119 threatened mammals in Australia and the Americas, and 20 per cent of world threatened birds, were affected by introduced predators or competitors in 1992 (WCMC 1994). The effects of alien species are especially pronounced in closed systems such as lakes and islands. For example, at least 60 per cent of the cichlid fishes in Lake Victoria are estimated to be extinct as a result of the introduction of Nile perch (Keenleyside 1991).

- **Environmental pollution (see slide 28 & 32)** is an increasingly major threat to biodiversity in many countries. Pesticide residues have reduced the population of several bird species and other organisms. Air and water pollution stress ecosystems and reduce populations of sensitive species, especially in coastal zones and wetlands. Rapid environmental change, such as El Niño events, can also have significant impacts on natural habitats, as can the longer-term effects of climate change, for example reductions in the volumes of water bodies after persistent dry weather. The effect of events such as forest fires can be multiplied many times wherever habitats are already fragmented and species depleted.
i) **Rate of species extinction:** The world's species face an unprecedented crisis. The rate at which they are being lost is alarming, even when compared with the extinction episode of 70 million years ago when the dinosaurs disappeared. No one knows exactly what the current extinction rate is, but recent calculations by leading scientists put it at between 1,000 and 10,000 times greater than it would naturally be. The rate of extinction also appears to be increasing. Species are threatened in every habitat on every continent, though the severity of threat varies from place to place. Evidence suggests that freshwater habitats, particularly rivers, and oceanic islands are very severely affected by species extinction. Tropical Asia and Australia appear to suffer particularly high extinction rates.

ii) This world catch of whales shows a series of harp peaks as each in turn is hunted until commercially unprofitable. Some species such as minke, gray, and bowhead have rebounded since commercial whaling has stopped. Other species, such as blue and fin, remain rare and endangered.

iii) *Balaenoptera musculus* (Blue whale - Endangered): The largest creature ever known to have existed on earth is the present-day blue whale. Today’s blue whale, even larger than its ancestors, may reach a total length of 33 m and a weight of 145 tons. The life span of a blue whale is about 30 years. The calves measure 7 m at birth and weigh about 2 tons. By the time they are a year old, the youngsters measure 18 m. Blue whales comprised about 90 percent of the whaling industry’s total catch during the early part of this century. In 1931, more than 30,000 of these majestic creatures were killed. Since then, the blue whale population has declined and was on the brink of extinction. Today about 11,000 are suspected to exist.
Habitat degradation - Almeria (Spain):

- This pair of satellite images shows the impact of massive and rapid agricultural development in Almeria Province along Spain’s southern coast. In the earlier image, the landscape reflects rather typical rural agricultural land use.
- In the 2000 image, much of the same region - an area covering roughly 20,000 hectares - has been converted to intensive greenhouse agriculture for the mass production of market produce. (Greenhouse-dominated land appears as whitish gray patches.)
- In order to address increasingly complex water needs throughout Spain, the government adopted the Spanish National Hydrological Plan (SNHP) in 2001. Initially, this water redistribution plan involved the construction of 118 dams and 22 water transfer projects that would move water from parts of the country where it was relatively abundant to more arid regions.
- In 2004, the Spanish government announced it would begin exploring more environmentally friendly water-saving technologies, such as wastewater recycling and seawater desalination.
Habitat degradation - Golf Fonseca (Honduras):

- Honduras is second only to Ecuador in the production and export of cultured shrimp from Latin America. Vast areas of the delta have been converted into farms for the cultivation of shrimp.
- The rapid growth of shrimp aquaculture in Honduras has caused both environmental and social problems. Shrimp farmers are depriving fishers, farmers and others of access to mangroves, estuaries and seasonal lagoons; destroying mangrove ecosystems, altering the hydrology of the region, destroying the habitats of other flora and fauna and precipitating declines in biodiversity; contributing to degraded water quality; and exacerbating the decline in Gulf fisheries through the indiscriminate capture of other species caught with the shrimp post larvae that are used to stock ponds.
- These two images provide a visual comparison of the increase in coverage by shrimp farms in the Gulf of Fonseca over time. It is evident from the images that between 1987 and 1999, a period of about 12 years, the total area under shrimp farming has increased tremendously.
Habitat degradation - Iguazu (Argentina):

- Iguazu National Park, located in Argentina near its borders with Brazil and Paraguay, contains remnants of the highly endangered Paranaense Rain Forest.

- Isolated from other rain forests by natural barriers, the Paranaense developed a distinct and highly diverse ecosystem with thousands of species of mammals, birds, reptiles, and amphibians unique to the area. The famous Iguazu Falls are located within the boundaries of the National Park and are shared by Argentina and Brazil. Between 1973 and 2003, dramatic changes to the landscape occurred in this region.

- In 1973 the forested area spread across the borders of the three nations. By 2003, however, large areas of the forest in Paraguay and Brazil, and smaller amounts in Argentina, had been converted to other forms of land cover, creating a mosaic of differently colored land use areas. Note the variation in land cover patterns among the different countries—reflections of different land use polices and practices.
**Habitat degradation** - Lac Hamoun (Iran/Afghanistan):

- Iran’s Lake Hamoun is fed primarily by water catchments in neighboring Afghanistan. In 1976, when rivers in Afghanistan were flowing regularly, the amount of water in the lake was relatively high. Between 1999 and 2001, however, the lake all but dried up and disappeared, as can be seen in the 2001 satellite image.
- The “dry phase” of Lake Hamoun is a striking example of how competition for scarce water resources can transform a landscape. When droughts occur in Afghanistan, or the water in watersheds that support Lake Hamoun is drawn down by other natural or human-induced reasons, the end result is a dry lakebed in Iran. In addition, when the lake is dry, seasonal winds blow fine sands off the exposed lakebed. The sand is swirled into huge dunes that may cover a hundred or more fishing villages along the former lakeshore. Wildlife around the lake is negatively impacted and fisheries are brought to a halt. Changes in water policies and substantial rains in the region saw a return of much of the water in Lake Hamoun by 2003.
Habitat degradation - Las Vegas (Nevada):

- Las Vegas is the fastest growing metropolitan area in the United States. Its growth was fairly slow during the first half of the 20th century, but as the gaming and tourism industry blossomed the population increased more rapidly. In 1950, Las Vegas was home to 24,624 people.

- Today, the population of the Las Vegas Valley tops one million, not including the tourists. According to one estimate, it may double by 2015. This population growth has put a strain on water supplies.

- Satellite imagery of Las Vegas provides a dramatic illustration of the spatial patterns and rates of change resulting from the city’s urban sprawl. Las Vegas is shown in the central portion of these images from 1973 and 2000. Note the profound modifications to the landscape—specifically the proliferation of asphalt and concrete roads and other infrastructure, along with the displacement of the few vegetated lands.

- By 2000, Las Vegas’ growth had sprawled in every direction, with the greatest expansion to the northwest and southeast. As the city expanded, several new transportation networks emerged to serve the city’s inhabitants.
Habitat degradation - Copsa Mica (Romania):

- Copsa Mica is a large industrial city located in the very center of Romania and is classified as an "environmental disaster area." The environmentally damaged area covers hundreds of square kilometres of land. The main industries in Copsa Mica are non-ferrous metalworking and chemical processing plants, and their effect on the environment has been devastating. Air pollution by heavy metals is 600 times the allowed levels.

- To make matters worse, a lead-smelting facility emitted fumes containing sulfur dioxide, lead, cadmium, and zinc on the town and surrounding area for 50km². The entire town and much of the surrounding area were covered with a blanket of black soot daily until the facilities were forced to close in 1993.

- In 1989 Copsa Mica was exposed as one of the most polluted places in Europe. It has the highest infant mortality rate in Europe, 30.2% of children suffer reduced “lung function” and 10% of the total population of 20,000 suffer “neurobehavioral problems.” The soil and the local food chain probably will remain contaminated for at least another three decades.
Habitat degradation - Yellow River, (China):

- The Huang He (Yellow River) is the muddiest river on Earth and is China’s second longest river, running 5475 km from eastern Tibet to the Bohai Sea.
- The Huang He’s yellow color is caused by its tremendous load of sediment, composed primarily of mica, quartz, and feldspar particles. The sediment enters the water as the river carves its way through the highly erodable loess plateau in north-central China. (Loessial soil is called HuangTu, or “yellow earth,” in Chinese.)
- Centuries of sediment deposition and dike building along the river’s course has caused it to flow above the surrounding farmland in some places, making flooding a critically dangerous problem.
- Where the Huang He flows into the ocean, sediments are continuously deposited in the river delta, where they gradually build up over time. Between 1979 and 2000 - as these satellite images show - the delta of the Huang He expanded dramatically. Several 100km² of newly formed land were added to China’s coast during this period.
Habitat degradation - Dead Sea (Israel/Jordan):

- For decades, heavy demands have been placed on the land-locked Dead Sea to meet the needs of growing populations in the countries that border it. Both Israel and Jordan draw water from rivers that flow into the Dead Sea, reducing the amount of water that would naturally replenish it. The amount of area devoted to evaporation ponds for producing salt has greatly expanded over the past three decades.

- The creation of salt works tends to accelerate evaporation, further contributing to the reduction in water level. Currently, it is estimated that the water level of the Dead Sea is dropping at a rate of about one metre per year.

- These two images, from 1975 and 2001, reveal dramatic changes in the Dead Sea over a period of about 30 years. Declining water levels, coupled with impoundments and land reclamation projects, have greatly increased the amount of exposed arid land along the coastline. The near-complete closing off of the southern part of the Sea by dry land (2001 image) reveals the severity of water level decline.
Rabbits cause severe damage to the natural environment and agricultural areas. They compete with native wildlife for food and shelter, and contribute to a decline in the numbers of many native plants and animals. They can also enhance negative impacts on native species by supporting large populations of predators such as cats and foxes. They cause extensive erosion through browsing and loss of plant cover and often destroy the habitat of many small animals. Rabbits also compete with livestock for food.

Caulerpa taxifolia is an invasive marine alga that is widely used as a decorative plant in aquaria. A cold-tolerant strain was inadvertently introduced into the Mediterranean Sea in wastewater from the Oceanographic Museum at Monaco, where it has now spread over more than 13,000 hectares of seabed. *C. taxifolia* forms dense monocultures that prevent the establishment of native seaweeds and exclude almost all marine life, affecting the livelihoods of local fishermen. *C. taxifolia* aquarium strain in the Mediterranean Sea is extremely invasive and smothers other algal species, seagrasses and sessile invertebrate communities. It does this by either out-competing them for food and light or due to the toxic effects of its caulerpenyne compounds. Its large monospecific meadows have vastly reduced native species diversity and fish habitat (NIMPIS, 2002a). Effects on humans are mostly related to the reduction of catches for commercial fishermen due to the elimination of fish habitat by *C. taxifolia*, although the entangling of nets and boat propellers with this weed also affect efficiency (NIMPIS, 2002f). Fish which are able to eat *C. taxifolia*, such as the Mediterranea bream (*Sarpa salpa*), accumulate toxins in their flesh that make them unsuitable for human consumption (Meinesz & Hesse, 1991). *C. taxifolia* outcompetes the seagrasses *Posidonia oceanica* and *Cymodocea nodosa* in Mediterranean ecosystems (NIMPIS, 2002g).

Economic impacts resulting from the cost of eradication included approx $US 6 million spent in Southern California up to 2004 (Anderson, 2004) and $AUS 6-8 million in South Australia.

Radioactive and biohazardous materials: The tragedy of the commons reappears in problems of pollution. Here it is not a question of taking something out of the commons, but of putting something in: sewage, or chemical, radioactive, and heat wastes into water, no one owns the earth’s biosphere.

Therefore, our planet is treated as a common dumping site into which everyone may discharge wastes, noxious and dangerous fumes into the air (acid rain, the greenhouse effect, and the erosion of the earth’s protective ozone layer), toxic effluents that poison rivers, lakes and near-shore and off-shore fishing grounds (municipal sewage discharge into deep-water pipelines of the Mediterranean are just the minor offences). Yet, solid waste and hard-to-come-by hazardous waste (from nuclear to chemical and biohazardous) are still stored in underground deposits that require surveillance for decades (if not centuries) to come.

Industries and even nations are apt to regard the cleansing of industrial discharges as prohibitively expensive. And in extreme cases even the deep-trenches of our oceans are utilized as dumping sites.
The tragedy of the commons reappears in problems of pollution. Here it is not a question of taking something out of the commons, but of putting something in!

EMR-Pollution: There are numerous biological effects at athermal levels of radiation:

- Structural damage of DNA in brain and testis isolated from mice following athermal RF exposures (Tenforde, p. 69)
- A low-intensity RF exposure can affect an elementary biological process (Chiabrera, p. 91.)
- Effects of continuous microwaves on isolated membrane vesicles have been shown at much lower SAR values than those believed to cause even microscopic heating effects (i.e. below about 4 W/kg). (Luben p. 103.)
- Effects on Ca²⁺ efflux from nerve cells or brain tissue in vitro were reported to be strongly dependent upon the ELF modulation frequencies, most prominently around 15 or 16 Hz modulation of 4147 - 450 MHz microwave carrier (Adiey 1980, Joines and Blackman 1980, Blackman and Benane 1985). It is well known that the cell membrane is a primary site for the transduction of various extracellular chemical and physical signals. RF radiation-induced altered membrane signal transduction could thus be anticipated to cause a variety of cell physiologic changes. Effects of RF radiation on membrane transport of cations such as Na⁺, K⁺, and Rb⁺ provided an early indication of cell physiological alterations that were not due to heating. There are several significant aspects to these findings: 1) they were obtained at very low SAR levels, in the mW/kg range; 2) the effect was entirely dependent on the ELF modulation frequency, with no effect being observed for unmodulated CW EMR at a variety of frequencies or power levels.” (Cleary p. 121 & Luben p. 103-4.)
- The production of low level local electric fields by microwaves at the cell membrane. Effects of low-SAR microwave radiation include changes in membrane ion transport, membrane enzyme activities, membrane structure, nerve cell activity, cell proliferation, and neoplastic transformation. Cellular alterations were reported under a variety of exposure conditions: (1) SARs from <0.1 mW/kg to > 100 W/kg; (2) frequencies of from 27 MHz to 50 GHz; (3) both CW and ELF-modulated EMR exposure. In general, effects were noted at much lower SAR values when the MW-EMR was modulated at ELF frequencies.” (Luben p. 106.)
- The most likely locus for effects of ELF-EMF on human and animal cells is a series of biochemical reactions known as signal transduction processes. Signal transduction processes in cells regulate intracellular metabolic processes such as enzyme activities, gene expression, differentiation, cell cycle progression, and cell proliferation to response to the signals received. An important characteristic of these signal transduction systems is that they are often exquisitely sensitive, with the ability to respond to very small changes in the external environment. Another important property of signal transduction systems is that they may amplify the signal by many orders of magnitude; for example, a single photon of light in the eye can induce the synthesis of millions of molecules of neurotransmitters in the optic nerve (Stryer, 1986 & Luben p. 107-8.)
- Any environmental influence (e.g. electromagnetic fields) that modifies signal transduction pathways in normal cells could also influence the potentially tumorigenic pathways in susceptible cells, either by enhancing the likelihood of transformation by other tumorigenic stimuli or by acting in a directly tumorigenic manner. By influencing signal transduction pathways, which in turn can regulate cell proliferation, cell differentiation, and even transformation to a cancer phenotype, ELF-EMF can potentially be involved in a host of disease processes without ever penetrating the cell membrane in any significant manner (Adiey, 1992 & Cleary p. 120 & Luben p. 112.)
- Substantial body of data exists describing biological responses to amplitude-modulated RF or microwave radiation at SARs too low to involve any response to heating. These data challenge the conventional assumption that the likelihood or severity of an effect increases as some function of “dose” (Saunders, p. 145.)
Noise-pollution:

- noise in the range of 60–80 dBA is one of the main causes of the declining quality of life. 60 dBA is ordinary speech, an air conditioner, 80 dBA is alarm clock, hair dryer (Alexandre 1991. OECD 164:23-26).
- noise pollution leads to physical and psychological problems. It's annoying and detracts from environmental ambiance that many desire (Shapiro. 1993. Sci Tech 9(3):73-79).
- This study found a threshold for effects on sleep quality to occur around 10 events per night at the 60 dBA level. At the 50 dBA (rainfall) level a significant decrease in sleep quality occurred at 64 events per night. They observed physiological effects on heart rate and body movements as correlated with noise effects (Oehrstoem, et al.’s 1999).
- people's sleep is disturbed even without waking them up, as noise prevents them from entering the REM sleep, that is so necessary for real rest (Boyd, 1993).
- unwanted sounds at low levels lead to heightened stress and if the sounds are sustained it will lead to cardiovascular problems and ulcers as well as interfering with fetal development (Bronzaft, 1989.).
- hypertension was positively correlated with chronic ambient noise and that noise may be one of the most important environmental factors being neglected in the political arena (Duncan, 1993).
- official standards for permissible levels of noise at work assume that the worker has 16 hours of relative quiet in which to recuperate from job noise. Granting the noise variance will add to the sound stress load of residents (Boyd, 1993).

WHO has shown noise along with air and water to be the three most dangerous pollutants.

http://www.efn.org/~jpreed/NoiseV.html
The tragedy of the commons reappears in problems of pollution.

Here it is not a question of taking something out of the commons, but of putting something in!

Light Pollution: Urbanization and our 24h-lifestyle disrupts the brightness-darkness pattern, so essential for most fauna – especially nocturnal species, migratory species, etc. The distracting and unpleasant advertising signs in the line of sight.

- circadian rhythms and reproductive cycles are impaired by artificial light at night. Light at night disrupts melatonin production. Melatonin and its derivatives are present in all animals from algae to humans. Normally-nocturnally active animals are the most sensitive to this light. For mammals, including humans, melatonin concentrations drop to half maximum value within 10 minutes of a short acute exposure to light. In animals, melatonin imparts important time of day information and seasonally, it controls reproductive behavior (Reiter, 1993 in Experientia 49:654-664).

- In humans, melatonin, among its many other functions, has been shown to be an anti-stress and sleep producing agent. Melatonin is used to synchronize disrupted rhythms such as jet lag. Melatonin plays an important part in the psychological depression associated with Seasonal Affective Disorder. In this case, bright lights in the morning are used to readjust the melatonin cycle back to 24 hours. Midnight levels of melatonin in schizophrenics are characteristically low.

- planaria, which are much lower on the evolutionary tree, will not reproduce by fission in the presence of continuous light. This has implications for potential disruption of at least portions of the food web cycle in the wetlands that are onsite and at the nearby Nature Conservancy Lands.

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Animated: http://www.bbc.co.uk/science/space/solarsystem/earth/spacejunk.shtml

Space pollution: Space debris and junk can pose a tremendous danger to satellites and spacecrafts, whether these spacecrafts are manned or not. In a book entitled, "Orbital Debris," authored by the Commission on Engineering and Technical Systems, spacecrafts travelling in the lower Earth orbit (LEO), are more susceptible to collide with smaller particles, with a one-millimeter diameter. However, there is also a big chance that big-sized particles will collide with spacecrafts and satellites travelling along the LEO region. Collisions between spacecrafts and space junk usually happen in the LEO region because this particular region is highly-populated with space debris and junk. This is logical since most of the space programs and explorations that were conducted by nations on Earth are usually located in the nearest region away from the Earth, which is on the lower Earth orbit.

The tragedy of the commons

philosopher Whitehead used it: "The essence of dramatic tragedy is not unhappiness. It resides in the solemnity of the remorseless working of things. This inevitability of destiny can only be illustrated in terms of human life by incidents which in fact involve unhappiness. For it is only by them that the futility of escape can be made evident in the drama."

- Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit - in a world that is limited.
- Ruin is the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all.
- The tragedy of the commons develops in this way. Picture a pasture open to all. It is to be expected that each herdsman will try to keep as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.

Sacred Earth: We are "Killing our World" wrote botanist Peter H. Raven (1993). Our feeling of alienation in the modern period has extended beyond the human community and its patterns of material exchanges to our interaction with nature itself. Especially in technologically sophisticated urban societies, we have become removed from that recognition of our dependence on nature. Since our cultural domain facilitates excessive behaviour in almost any field, it is time to ask ourselves whether we have the right to be so invasive … in regards to ourselves, to the others, to entire ecosystems and eventually to the entire biosphere? Can Earth’s ecosystems cope with our uncontrolled expansion – or can we simply consider this sort of growth devastating for us and future generations - (only to be rivalled when comparing it with a terminally ill patient suffering from a fatal cancer)?

Unfortunately, we have substituted idealistic values with materialistic ideals – and these have become our points of references.

We always will remain children
And however old the world might be,
humans will remain the kids they are!
smash their toys with utter force and jubilee,
just as kids like to do near and far!
Once everything is done to pieces
and nothing left to spoil,
with fresh delight and as it pleasesto play with what is left across the soil!

Wir bleiben alle Kinder
Und wird die Welt auch noch so alt,
der Mensch, er bleibt ein Kind!
zerschlägt sein Spielzeug mit Gewalt,
wie eben Kinder sind!
Wann alles erst mal klein zerstückt
und nicht mehr zu verderben,
so sucht er wieder - neu beglückt
und spielt dann mit den Scherben!
(Carl Spitzweg, 1808–1885)
How many Earths are we wasting?

Sustainability requires living within the regenerative capacity of the biosphere. In an attempt to measure the extent to which humanity satisfies this requirement, we use existing data to translate human demand on the environment into the area required for the production of food and other goods, together with the absorption of wastes. Our accounts indicate that human demand may well have exceeded the biosphere’s regenerative capacity since the 1980s. According to this preliminary and exploratory assessment, humanity’s load corresponded to 70% of the capacity of the global biosphere in 1961, and grew to 120% in 1999.

Wackernagel et al., 2002
## Threats (1)

- Exploration-Mania

Rees, 2003

### The last Experiment: … Should we really do whatever we are capable of doing?

Physicists collide atoms in gigantic underground particle accelerators. Experiments hundredfold stronger than today’s particle accelerators are conceivable. Thereby, scientists could produce unparalleled energy concentration. Researchers assume that a tear in space could develop, a kind black hole, which destroys or devours all subject. This would be the end not only for mankind. The probability for such a scientific achievement is **1:100,000**.
i) The Large Hadron Collider (LHC) at CERN, Geneva (Swiss) is a particle accelerator which will probe deeper into matter than ever before. Due to switch on in 2007, it will ultimately collide beams of protons at an energy of 14 TeV. Beams of lead nuclei will be also accelerated, smashing together with a collision energy of 1150 TeV. (A TeV is a unit of energy used in particle physics. 1 TeV is about the energy of motion of a flying mosquito. What makes the LHC so extraordinary is that it squeezes energy into a space about a million million times smaller than a mosquito).

ii) The Antimatter Factory(by Django Manglunki): Over the past 20 years scientists at CERN have been using antiparticles in many different ways for their daily work. Antiparticles can be generated by colliding subatomic particles. Before being delivered to the various physics experiments, they must be isolated, collected and stored in order to tune their energy to the appropriate level. Until now, each of these steps has been carried out by a dedicated machine with the main purpose of providing high energy antiparticles. But now the first "self-contained antiproton factory", the Antiproton Decelerator (or AD), is operational at CERN. It will produce the low energy antiprotons needed for a range of studies, including the synthesis of antihydrogen atoms - the creation of antimatter.

Deep Impact: If it occurs, hardly any form of life will survive. The last huge impact of a reasonably-sized asteroid happened approx. $6.5 \times 10^6$ years ago. It is assumed that this one was responsible for the fall of the dinosaurs. Asteroids, which fell into the sea, could release gigantic tsunamis, which devastate coastal regions even 1000s of km away. Land-based impacts lead to dust-clouds that cut us off from solar radiation, thereby generating hostile climatic conditions. The number of asteroids in the solar system are almost uncountable. Most are located in the inter-planetary belt, between Mars and Jupiter. Their impacts are hardly predictable, also because these are very hard to detect and fragmentize. The probability of such an impact is about $1:1000$. 

- Exploration-Mania
- Deep Impact

Rees, 2003
As Jupiter accreted into a giant planet, its gravitational pull began to disturb the orbits of the nearest planetesimals so that collisions became more violent. As a result, the larger, differentiated protoplanets tended to be shattered into smaller asteroids, and so many asteroids are believed to have formed from their rocky or metallic debris based on spectral analysis of meteorites that landed on Earth. In contrast, the asteroids found farther out are thought to be made from planetary bodies that are less well differentiated, if at all. Given the huge mass of Jupiter, it acts as a great “vacuum cleaner” thereby sucking in most errantly flying objects.
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**Degenerated Nano-Machines:** nano-machines have the potential to exterminate all life. Technical progress allows to construct ever smaller and more intelligent machines. Soon high-intelligent nano-machines can be built from individual atoms. These will be able to reproduce like bacteria. The industry will use it, in order to accelerate possible production processes. The horror scenario: A mutation. By utilizing solar energy and with an optimised metabolic pattern such nano-machines are capable to rapidly extinguish all organic life. The chance for such a scenario within the next 100 years amounts to 1:1000.

**One of the new properties of nano-sized particles is their extreme mobility.** They have "almost unrestricted access to the human body"; they can enter the blood stream through the lungs and possibly through the skin, and seem to enter the brain directly via olfactory nerves. Ingested nano-particles can be absorbed through "Peyer's plaques," part of the immune system lining the intestines. From there, nano-particles can enter the blood stream, be transported throughout the body, "and behave in ways that may be detrimental to the organism." While in the blood stream, nano-particles have been observed entering the blood cells themselves. Once in the blood stream, nano-particles can "move practically unhindered through the entire body," unlike larger particles that are trapped and removed by various protective mechanisms.

**Nano-particles can enter the heart, bone marrow, ovaries, muscles, brain, liver, spleen and lymph nodes.** During pregnancy, nano-particles would likely cross the placenta and enter the fetus. The specific effects in any given organ would depend upon the surface chemistry of particular particles, which in turn would be determined by their size and surface coating. "It is likely that in the course of its entire evolution, humankind has never been exposed to such a wide variety of substances that can penetrate the human body apparently unhindered".

**Nano-particles may disrupt the immune system, cause allergic reactions, interfere with essential signals sent between neighbouring cells, or disrupt exchanges between enzymes.** Some of these characteristics may be harnessed for benefit -- for example, in experiments a carbon nano-crystal has been able to disrupt one of the processes that allows the AIDS virus to multiply.

**The brain is one of the best-protected of all human organs.** A guardian "blood-brain barrier" prevents most substances in the blood from entering the brain (alcohol and caffeine being two well-known exceptions). However, nano-particles have repeatedly been shown to pass into the brain, where their effects are unknown. Will they accumulate and, if so, to what effect?

Montague, 2005; Rachel’s Environment & Health News
** If Nano-particles become airborne, nano-particles can float for very long periods because -- unlike larger particles -- they do not readily settle onto surfaces. In water, nano-particles spread unhindered and pass through most available filters. So, for example, current drinking water filters will not effectively remove nano-particles. Even in soil, nano-particles may move in unexpected ways, perhaps penetrating the roots of plants and thus entering the food chains of humans and animals.

** Huge surface area. The smaller the particle, the larger its surface in relation to its mass. A gram of nano-particles has a surface area of a thousand square meters. Their large surfaces give nano-particles some of their most desirable characteristics (highly reactive in a chemical sense). For example, drug-coated nano-particles may one day transport pharmaceuticals directly to specific sites within the human body. Unfortunately, their large surface also means that nano-particles may collect and transport pollutants. The surface reactivity of nano-particles gives rise to "free radicals," which are atoms containing an "unsatisfactory" number of electrons (either too few or too many for stability). Free radicals swap electrons with nearby atoms, creating further instabilities and setting off a cascade of effects. Free radicals give rise to inflammation and tissue damage, and may initiate serious harm, such as growth of tumors. On the other hand, some free radicals are beneficial, destroying invaders. So the role of nano-particles in producing free radicals remains to be clarified.

** Nano-particles would normally tend to clump together, forming larger, less dangerous particles -- but nanotechnologists take pains to prevent clumping by adding special coatings. As a result, nano-particles in many commercial products, sprays and powders remain reactive and highly mobile.

** Nano-particles in disposable products will eventually enter the environment. In the environment, nano-particles represent an entirely new class of pollutants with which scientists (and nature) have no experience. Via the water cycle, nano-particles could spread rapidly all over the globe, possibly also promoting the transport of pollutants. What would happen if certain nano-particles did exert a harmful influence on the environment? Would it be possible to withdraw them from circulation? Would there be any way of removing nano-particles from the water, earth, or air?

** Turning to workplace hazards, will nano-particles become the next asbestos. To protect workers, effective face masks are "not a very realistic prospect at present, since the requisite design would render normal breathing impossible." New designs may be possible but remain unproven.
Threats (3)

- Exploration-Mania
- Deep Impact
- Nanotechnology

Yip, 2003

05-07-17 Madl 41

i) Path of the particle into the organism (left image, after Donaldson)

Emerging Diseases & MDR: Killer viruses could be easily assembled by terrorists. Two years ago, scientists tested how easy it is to download from a genetic blueprint for a dangerous virus from the WWW. According to this instruction, they could synthesize a virus from individual DNA sequences (gene). Already today, such harmless gene sequences are readily purchasable. In few years time the genetic blueprints of a large number of viruses, which are currently archived in lab data bases, will be accessible to other scientists over the Net. The blueprint of the Ebola virus is already available and accessible. Without any major difficulties would it then be possible for a trained biotech-specialist to assemble a HIV virus that could spread like a flu. Lab incidents and accidents do happen; as with Chernobyl, it is just a question of time until a major leak occurs with severe consequences for mankind. Since 1970 smallpox is considered as eradicated, but instead of eliminating the virus completely, two laboratories in the USA and Russia still keep it on stock. Surely always? The researchers are sceptical and see the probability for a final killer virus at $1:10$. 
Threats (4)

- Exploration-Mania
- Deep Impact
- Nanotechnology
- Emerging Diseases & MDR

Rees, 2003

Widespread use of antibiotics in animal farming, intensive care units, and careless use in private favours MDR thereby forcing microbial organisms (in their drive to survive) to adapt their invasive properties to even more pathogenic potentials.

Levin, Genetics 154:985, 2000

05-07-17

i) Missuse and careless prescription of antimicrobial substances;

ii) Effect of Bottleneck on Emergence of Compensatory Mutations: microorganisms are living beings, thereby capable to respond to externally imposed stimuli. Being R-strategists (very short live cycles, within hours) the obvious result is comparable with an accelerating evolutionary time-machine (i.e. multiple drug resistant diseases strains which will affect a huge proportion of the global population);

2004 data of the US reveals that the USA alone uses

- 12 E6kg of antimicrobial substances annually in livestock
- animal use is 8 times human use
- 6.5 E6kg of prohibited in Europe but still used annually in the USA

i) **Retroviral therapy**: So far gene therapy does not only repair the immune deficiency, but also - like already before with other children – has led to an uncontrolled release of leucocytes .... Usually, retroviral vectors place their genetic code relatively nonspecific into treated cells .... Due to the random incorporation of foreign genetic material it is impossible to predict its future role within the cells transcription process. The coincidental insertion of such vectors not only interferes not only with genes that slow down the cell division (tumor suppressor genes), but may also curb cell-cycles by inducing cellular division (proto onkogenes). Since gene-therapy deals with approximately $100 \cdot 10^6$ cells, the likelihood that such vector genes are inserted into several genes is very high. The multiple insertion of the vector copy also increases the risk that self-induced apoptosis cycle of an otherwise unaffected cell is blocked. While the insertion of one gene does not necessarily pose a threat to the cell, multiple copies of the inserted gene disrupt the balance between cell-death and cell-proliferation and therefore must be considered a cancer risk.

NZZ, 2005:126;
i) **The Nuclear Threat:** The next nuclear war will definitely be the last war to be fought and the end of civilization as we know it. As the most dangerous moment in recent human history has shown (Cuba crisis of 1962), a nuclear exchange is just a push-button away. The cold war has gone, but the nuclear arsenals are still around. The former Soviet Union alone is still equipped with some 70,000 atomic war heads. With Israel, Pakistan and North Korea as the most recent nation to join the nuclear club, nuclear proliferation is helping Syria and Iran to follow soon. Potential terrorists could try to get hold of them, or corrupt officials may attempt to sell them on the black market. Although the nuclear holocaust will not necessarily mean the immediately end of mankind, it is very unlikely that the few survivors will be able to persist for long. Scientists see the probability for an atomic exchange with 1:3.
Threats (5)

- Exploration-Mania
- Deep Impact
- Nanotechnology
- Emerging Diseases & MDR
- Nuclear Menace

Rees, 2003

i) Average binding energy per nucleon for the nuclides that occur naturally (including short-lived 4Be, the second spike near He) versus mass number; the differences between fusion and fission become evident as there is much more energy to gain in fusion than in fission (by a factor of 6).

ii) The first few elements (all the way up to Lithium) have been synthesized during the "bing bang" cataclysm, the following elements (till Ca, Fe, etc) are generated during the fusion reaction in stars (e.g. our sun); the higher elements though (till U) can only be generated during the final stages of a star’s life, i.e. supernova where such enormous amounts of energy are available.
 Threats (5)

- Exploration-Mania
- Deep Impact
- Nanotechnology
- Emerging Diseases
  & MDR
- Nuclear Menace

Rees, 2003

\[
\begin{align*}
\text{Nuclear fusion of } ^3\text{He} & \rightarrow 2\text{He} + 2\gamma + 2\nu_e \\
\text{Nuclear fusion of } ^1\text{H} & \rightarrow 2\text{He} + 2\gamma + 2\nu_e \\
\text{Nuclear fusion of } ^1\text{H} & \rightarrow 2\text{He} + 2\gamma + 2\nu_e \\
\text{Nuclear fusion of } ^1\text{H} & \rightarrow 2\text{He} + 2\gamma + 2\nu_e \\
\text{Nuclear fusion of } ^1\text{H} & \rightarrow 2\text{He} + 2\gamma + 2\nu_e \\
\end{align*}
\]

i) The nuclear chain reaction … in comparison an average nuclear power plant has a capacity ranging from 500MW to 1GW of electricity.

ii) 120m$^2$ home in Sweden consumes roughly $25 \cdot 10^3$ kWh of energy per year for space heating, hot water and household electricity. In other words, 1GWh is enough to supply 40 such homes for a year, while 1TWh suffices for about 40 $\cdot 10^3$ such homes.

**Cycles in fossil species diversity:** It is well known that the diversity of life appears to fluctuate during the course of the Phanerozoic, the eon during which hard shells and skeletons left abundant fossils (0–542 million years ago). Using Sepkoski’s compendium of the first and last stratigraphic appearances of 36,380 marine genera, a strong 62.63-million-year cycle, which is particularly evident in the shorter-lived genera. The five great extinctions enumerated by Raup and Sepkoski may be an aspect of this cycle. Because of the high statistical significance we also consider the contributions of environmental factors, and possible causes.

As geo-physical impacts do influence species diversity so does human impact, it is expected that the sinusoidal fluctuation will experience a sudden and stark phase shift resulting in aperiodic fluctuations.

Rhode & Muller 2005
Biodiversity since the onset thawing after the “Snowball Earth” event (some 600·E^6 years ago)
the self-organizing principles of biodiversity established a web of life in which its “mesh-size” tended to become smaller and smaller as more adapted species occupied selected niches. The permanent inter- & intra-specific interaction further stimulated this process (mutual positive feedback) resulted in an explosion of species diversity as well as adaptation.

*Since about ???????????????????!
Threats (6)

- Exploration-Mania
- Deep Impact
- Nanotechnology
- Emerging Diseases & MDR
- Nuclear Menace
- Ecosystem collapse

“Web of Life” (animated)

Astrophysicist Brian Swimme:
“We are currently making macrophase changes to the life system of the planet with microphase wisdom.”

05-07-17 Madl 50

Any loss of species corresponds to a collapse in a node of the “Web of Life”; once too many nodes are broken, the system becomes unstable and flip-flops into a new equilibrium (chaos theory).

Our scientific and technological achievements have grown out of cultural attitudes toward an almost universally held concept. Despite Copernicus, Kepler, and Galilei, in our heads all the cosmos still rotates around our little globe. Defying Darwin, Einstein and Feynman, we still consider ourselves as separate from the natural process. We feel superior to nature, contemptuous of it, willing to use it for our slightest whim.

We cannot wait for hard scientific proof that we are inducing irreversible damaging to this planet, we have to radically modify our thinking and behavioural patterns – not in 10 20 50 years time – it must be done now.

**Better Safe than Sorry**: Since we never can prove anything absolutely, scientific uncertainty ought not to be used to avoid environmental action. The precautionary principle incorporated in the EU-Commission paper underlines a very Anglo-Saxon approach. The proposals presented therein have also been enshrined in the 1992 Rio Declaration (EU, 2000, online).

It states: “where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.” A more far-reaching interpretation originates form the German Vorsorgeprinzip, which essentially includes a safety margin into all decisions; i.e. *Giving Nature and the Environment the Benefit of the Doubt* - or in blunt English: to be better safe than sorry (Lundmark T.; 1997; 4(4):43-4).

**Species Making & Chaos**: a system exhibits variability (not necessarily random) but of a complexity in which patterns are not always observable over a human life span. In such a system, minute differences in initial conditions and after many iterations, it can lead to dramatically different outcomes (Butterfly effect, Lorentz, 1979)

Thus the insertion or removal of a better adapted species eventually reverberates through the entire ecosystem (see seeweed *Caulerpa taxifolia* and the common rabbit *Oryctolagus* sp.). In any case, such a removal results in a negative response function.

A harmounously tuned ecosystem tends to have a positive response function and es even maintained when it asymptotically approaches climax conditions.
Alternatives (1)

**Education** can counteract the natural tendency to do the wrong thing, but the inexorable succession of generations requires that the basis for this knowledge **be constantly refreshed**.

We seek the definite **social arrangements** that will keep it from becoming a commons.

We must **cease to treat the commons as commons** or they will be of no value to anyone.

- Coercion Laws
- Taxing Laws
- Introduction of entrance fees
- Allocation might be on the basis of wealth
- By the use of an auction system
- It might be on the basis of merit
- Agreed upon standards
- It might be a lottery
- It might be on a first-come, first-served basis  
  *(Hardin, 1968)*

**So what can we (humans) do?**

- to **educate** the common people
- to treat the common property not as commons, otherwise they will have no value to all.

we are locked into a system of "**fouling our own nest,**" so long as we behave only as independent, rational, free enterprisers.

Common roads are financed by common taxes; therefore, the government

Yet continuing to defend the freedom to pollute will ultimately lead to ruin for all. Nations are just beginning to evolve controls to limit this damage.

The tragedy of the commons as a food basket is averted by private property, or something formally like it. But the air and waters surrounding us cannot readily be fenced, and so the tragedy of the commons as a cesspool must be prevented by different means, by **coercive laws or taxing devices** that make it cheaper for the polluter to treat his pollutants than to discharge them untreated. We have not progressed as far with the solution of this problem as we have with the first. Indeed, our particular concept of private property, which deters us from exhausting the positive resources of the earth, favors pollution. The owner of a factory on the bank of a stream -- whose property extends to the middle of the stream -- often has difficulty seeing why it is not his natural right to muddy the waters flowing past his door. *The law, always behind the times, requires elaborate stitching and fitting to adapt it to this newly perceived aspect of the commons.*

The pollution problem is a consequence of population. It did not much matter how a lonely American frontiersman disposed of his waste. "**Flowing water purifies itself every ten miles,**" my grandfather used to say, and the myth was near enough to the truth when he was a boy, for there were not too many people. But as population became denser, the natural chemical and biological recycling processes became overloaded, calling for a redefinition of property rights.

For Thomas Malthus population growth must be checked as population growth soon outstrips resources. He argued that excess population growth is the ultimate cause of many other social and environmental problems.

For Karl Marx social organisation, not overpopulation, led to starvation and poverty.

Dass die Bevölkerungsexplosion das wichtigste Problem der Welt heute ist. Solange die Bevölkerung weiter wächst, müssen wir mit dem ständigen Auftreten neuer Überlebensbedrohungen rechnen (gegen die Hawai noztaken kann). Wir bieten hier keine Lösung für die Bevölkerungsexplosion an, aber wir stellen fest, dass jede Lösung, die wir uns vorstellen können, durch das Denken und die Einstellungen der abendländischen Kultur schwierig oder unmöglich gemacht wird.

Dass zwischen diesen grundlegenden Faktoren sicherlich eine Interaktion besteht. Das Bevölkerungswachstum heizt den technologischen Prozess an und schafft die Angst, die uns unsere Umgebung als etwas Feindliches sehen lässt; während die Technologie sowohl das Bevölkerungswachstum begünstigt, als auch unsere Arroganz oder »Hybris« gegenüber der natürlichen Umgebung verstärkt. Abb.1 zeigt, dass jedes von ihnen ein sich selbst steigerndes (oder, wie die Wissenschaftler sagen, »autokatalytisches«) Phänomen ist: Je grösser die Bevölkerung, desto schneller wächst sie; je mehr Technologie wir haben, desto höher die Rate neuer Erfindungen und je mehr wir an unsere »Macht« über eine feindliche Umgebung glauben, desto, mehr »Macht« scheinen wir zu haben und desto boshafter scheint die Umgebung zu sein.

Dass ein weiterer technologischer Fortschritt zwar jetzt nicht zu verhindern ist, dass er aber in geeignete Richtungen gesteuert werden kann, die von den vorgeschlagenen Stellen erforscht werden müssen.

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Thinking versus Thought: we are what we think, and therefore the victims of our own thoughts. Just like entropy tends to increase, the disorder created by our way of thinking is coming back to further increase the confusion of our thoughts (Bohm D; 2003: 42-86). Capra F.; 1992: 323-342; its nothing else than a crisis of perception. One way to break this loop could be achieved by the integration of different but holistic worldviews, opening ourselves to different ways of reasoning which eventually would increase the possibilities of a peaceful common as well as balanced future. In any way, the ultimate goal should be a holistic (system), organic (ecology), and monistic (unity of humans and nature) worldview that enhances the quality of life rather than accumulating material things (being rather than having - Fromm E.; 1977; 118-124;).

Language: it is a practical language but it separates everything in subject and object, not allowing too much space for transitions, movements and changes; According to Bohm, mindful choice of vocabulary and awareness of the message behind verbal and written communication should pave the way for a new mode of language, the *rheomode*. Such language will be freer, more informal, even “poetic” and properly communicates the truly fluid nature of the difference between relevance and irrelevance. Thus, we may say that it is an undivided field of movement, involving sound, meaning, attention-calling, emotional and muscular reflexes.

Behaviour: Our mental reflexes that have conditioned our day-to-day behaviour are imprinted in our thoughts. Over millennia, we acquired knowledge, stored them as thoughts and without seriously questioning them, we constantly reapply them regardless if they are appropriate or not. Nationbuilding is a typical example of such reflex-driven, possessive reckoning with the aim to spread one’s influence and power, to control the land, people and resources.

Religion: worshipping gods that are external, outside of us - to be found in churches, temples, synagogues, mosques, etc. Since about 1000 years, organized and collective religions (the Veden, old testament, Yi Qing, and representatives such as Jesus, Sakyamuna, Zarathustra, Mohammed) are stagnant. Since that time nothing really particular has happened. The time of the organized and collective religions is gone. These developmental stages (basic experiences between I and God) had their time. Instead technological and intellectual aspects become the key-note protagonists and gradually replaces them (Cornelssen, 1985).

Values: distinction between good and bad, putting too much emphasis on one while ignoring or condemning the other. One can not but cultivate both aspects - too much emphasis on one automatically strengthens the other; i.e. good vs. bad: where there is a lot of light there is also a lot of shadow). English professor and poet, Gary Snyder, came up with three aspects that should be at the center of a reinhabitory ecological ethic: (1) feeling gratitude generates humility and a sense of awareness of the wider self; (2) taking responsibility for your own acts, thus minimizing destructive human impact on the land and allowing room for the flourishing of non-human others; (3) knowing from within - the body as a whole is nothing but the results of thoughts.

Science: we tend to split everything up into bits and pieces, without putting it properly back together. In particular medicine. So far, contemporary western medicine regards infectious diseases as something to fight against. Approaching a disease from a western perspective assigns medical treatment the form of a cosmetic rather than holistic aspect. Often physicians do not ask for a likely cause but rather enquire about the symptoms. Doing so is not aiming at a cure; it is rather seeking a bypass-procedure. Again, the fragmentised perception in western thought is left unaltered. By just focusing on the invasive mechanism of a microbiological pathogen, allopathy ignores the possibilities of brainpower to reestablish the dynamic equilibrium beforehand. This is especially noteworthy in diseases with chronic or even progressive character, which are commonly treated by premature administration of medication to remove symptoms rather than initiating a holistic recovery; i.e. a therapy by which one symptom is substituted by another one (incl. side-effects). Townsend, 2004. In order to eliminate physical disturbances, one must first uproot mental disturbances. Both originate from thoughts – the body as a whole is nothing but the results of thoughts.
Fragmented Science - Our technical capabilities far exceed our current mental capacities. Our theories are not descriptions of reality but rather ever-changing forms of insight – as repeatedly demonstrated by Galileo, Kepler, Newton, Maxwell Einstein, Planck, Feynman, Bohm etc. Our understanding of the world around us has soared, but does this make us any more conscious about what we are really doing, or are we still as ignorant as before?

Knowledge: Our Research and scientific investigation should not be completely condemned, but placed into the proper context. By investigating certain natural phenomena, technical challenges, their social implications of new discoveries, we tend to exceed our competence by releasing it to the world not knowing about the long-term consequences – be it the military or on-the-edge scientific research. The intellectuals who come up with new discoveries in the first place overestimate the capacity of those who later apply and make use of these innovations. Indeed, what makes science unique and special, the great strength of science, is also its tragic flaw or weakness. Current scientific approaches are still reductionistic. In order to render a scientific problem comprehensible, experts must focus on a tiny fraction of nature. From a western scientific perspective there exists an external world, whose properties are independent of any individual human being and indeed of humanity as a whole. These properties are encoded in "eternal" physical laws in which experts can obtain reliable (albeit imperfect and tentative) knowledge of these laws by hewing them to "objective" procedures and epistemological structures prescribed by the (so-called) scientific method; i.e. scientists bring it into the laboratory and isolate it from everything else. But in the process from separating it from the context that made it of interest in the first place, we loose all sense of where it fits and why it matters. Science must remain distant from it, must look at it through a microscope, and give it numbers so experts can feed it into a computer. Scientists are not allowed to feel emotional or passionate about it because that may color the way we interpret the data.

- In our western society, science, technology, and human work in general, are split up into specialities, each considered to be separate in essence from the other. Thus, from a human perspective the process of division is a way of thinking about things that are convenient and useful mainly in a practical, technical and fictional sense.

- Today, science and technology are the driving forces in western societies and aim to objectify human’s insight bringing about fragmentation and general confusion. But from the general theory of relativity we know that dimensions such as length, mass, and velocity are illusory, and attain a totally different aspect when different frames of reference are chosen. Apparently, the illusion that the self is separated from the whole has its origins within our way of thinking (Bohm, 2004);
Double Pendulum: schwingt es wie ein Pendel in der Uhr so ist es mit den klassischen Gesetzen der Fysik bis auf die xte Kammastelle berechenbar. Steht es allerdings am Wendepunkt (180° zur Ruhelage, quasi kopfüber) so ist es ein Instabilitätpunkt höchster Sensitivität und spricht auf die kleinsten Abänderungen an. Das ist jener Punkt indem es wirklich frei ist und drückt es mit der Umkehrung oder Nichtumkehrung in die eine oder andere Schwingungsrichtung aus. Das Chaospendel (= Trippelpendel, es besteht aus 3 ineinander geschobenen Schwingungszägen) hat nun 3 dieser Instabilitätpunkte mit denen es mit der Welt kommunizieren kann. Und das sind zwei zu viele, es lässt sich mit der klassischen Fysik nicht mehr bestimmen. Weiters erkennt man dass unlebenige (abiotische) im Schwingungstotpunkt (unten) aufgehängt ist, das lebende hingegen im Instabilitätpunkt (oben) sich befindet (auch wenn es am Schluss auch unten hängt, aber das bringt der Tod so mit sich).


http://folk.uio.no/nielspc/pendel.htm
Continuum: our so-called independence is an illusion as we are all dependent on each other and the planet, yet even the universe as a whole. We are part of the continuum, we are all one with nature, as nature is part of us, therefore we have to re-evaluate the RISKS of our undertaking.

Tree: in a living organism, each part grows in the context of the whole, so that it does not exist independently, nor can it be said that it merely interacts with the others, without itself being essentially affected in this relationship – compare GAIA Hypothesis

Living systems (entities) possess the property of maintaining their organization by continual renewal or production of components by themselves. Based on this self-maintenance ability, they reproduce systems of similar organization. This two-fold property forms unique hierarchical organizations, foreign to physical systems. The living world is organized by the two-fold property, where two types of hierarchical organizations, or part–whole relationships, are distinguished: one is synchronic participation in organizing an entity; the other is diachronic. The former implies that the composition of an entity is fixed through time, regardless of organizational patterns, while the latter involves changes in composition to maintain a pattern. Both types of organization are mathematically formalized, and organizational hierarchies of the living world are analyzed in biological space–time. This analysis reveals that biological systems are arrayed in a complex two-dimensional hierarchical matrix of synchronic and diachronic organization.

Warum ist nicht alles lebendig? Leben ist nur möglich wenn es energetisch gefüttert wird damit es in diesem instabilen (Schwebezustand bleibt). In der Evolution des Lebendigen ist wesentlich dass es aus 2 Stücken besteht:

i) das eine ist die Differenzierung i.e. neue instabile Konfiguration auszubilden welche dynamisch stabilisiert sind und in einer kooperativen Integration zusammenhängen müssen,

i) erst damit kann ein Zustand auf höherer Daseinsebene erreicht werden bzw. erst dann wird das verschiedenartige immer neu eingeordnet, gemischt und in einem neuen Gleichgewicht aufgebaut.

Daher hat es auch 3.5·E⁹ Jahre gedauert bis der Mensch es schaffte aus der Erdgeschichte empor zu tauchen.
Dance of mind: Thoughts function indicatively and when properly carried out flows and merges into a harmonious and orderly sort of overall process in life as a whole. It should be considered and art form, like poetry. It has no beginning nor end, it is rather one unbroken totality of the moment, not belonging to any particular person, place, time or group of people. Bohm, 2004: 70,71

Suzuki D.; 1992; transcript; those who now have seen the human genome project - the project to decipher the 3 billion letters in a human cell - the genetic blueprint of human kind, who think that within that blueprint then resides a complete understanding of what it is to be a human being, they have lost the essence of what Bohm and Einstein were saying. One simply can't have that kind of description without the spiritual sense that goes with what a human being is. Einstein was once asked: "Do you believe that absolutely everything can be expressed scientifically?" Now remember that's what scientists are taught - and certainly early in a scientists' career, that's what a scientist believes. Give them upgrant money and time and we'll answer anything you want to know. …. And Einstein’s answer was Yes, it would be possible, but it would make no sense, it would be description without meaning, as if you would describe Beethoven's symphony as a variation of wave pressure. A physicist could describe a Beethoven symphony very precisely as the sequence of wave pressure striking your ear, but he would absolutely miss the spiritual sense that makes that symphony of any meaning to all of us.

Lattice vs. DNA: Kristallgitter – Symmetrien (eine regelmässige Anordnung ist keine höhere Ordnung)


Leider leben wir in einer technischen Welt die alles nur vereinfachen will und diese höhere Ordnung rationalisieren möchte …. Und das Ergebnis: eine monotone Abfolge von immer wiederkehrenden Sätzen, Tönen, Geräusche, etc.

Alternatives (2)

- Thinking
- Knowledge
- Continuum
- Holomovement

Holomovement: the actual state of affairs is unbroken wholeness of the universe, we only perceive the explicate order, whereas it is the hidden implicate order out of which everything is borne.

Hologram: **Top:** This is how a photographic image would appear if you look at it with magnifying glasses of increasing strength. If you were to cut away the pieces of the picture that are outside the frame shown, the pixels containing the information would be lost and the image could not be reconstructed. **Below:** This is the principle of information storage in the hologram. As mentioned before, the actual image would not be visible on the film, but the smaller sections of the film still contain the information about the complete object. If you cut it in half or even smaller pieces, you can still use each of the pieces to create a projection of the whole kitten (probably even with its ears intact - they have not been on the original photo used for the demonstration, so we will never know how they looked...)

The world as we perceive it is like a movie. The world stands for the pictures with the canvas representing consciousness. Hence, the objective world must be nothing else but subjective. Just as an astronomer discovers a new star at an immeasurable distance and announces that its light requires 1000s of lightyears to reach us. Thus, where is the star actually? It possibly exists only in the observer (Cornelson, 1985: ).

The EXPLICATE world grows out of the IMPLICATE Order, while we only perceive the former and can only guess about the latter.
Alternatives (3)

i) Relativity versus Quantum-world

E = m·c² = h·ν

The act of observing produces uncertainty in either its position or its motion (the so-called smeared electronic cloud of charge). Thus we are embedded in-between two extremes of this spectrum. The idea that opposites are components of a wholeness is not new. Ancient Eastern sultures incorporated it as an integral part of their world view (as "Hintergrundstrahlung" reagiert. Nebenbei gesagt, das lässt sich auch lernen, ein guter Lehrer macht nichts anderes als diesen empfänglichen Geist optimal auf diese Resonanzfrequenz einzustellen (soweit zum wahren Zweck eines Lehrers).

If this was not yet challenging enough, consider this: Since deBroglie we know that every particle of matter is somehow endowed with a wave to guide it as it travels. Under proper conditions, every particle will produce an interference or diffraction pattern. All bodies, e, p, atoms, mice YOU, me, planets, suns have a wavelength that is related to their momentum (λ = h/p). As a result, in the sub-atomar range we no longer can predict the whereabouts of "particles" (e.g. an electron) without altering its momentum & πλ. The act of observing produces uncertainty in either its position or its motion (the so-called smeared electronic cloud of charge). Thus we are embedded in-between two extremes of this spectrum. The idea that opposites are components of a wholeness is not new. Ancient Eastern sultures incorporated it as an integral part of their world view (as illustrated by the ultimate great, TaijiTu - only the union of Yin and Yang forms a whole, where ther is low there is also high, where there is night there is also day. A whole person (individuum) integrates both and each has the aspect of the other. This concept is also reflected in the currently accepted physical theories as they allow those two obviously contradicting world-views to exist next to each other (Quantum theory is not compatible with Einstein’s basic approach to relativity).

E = m·c² = h·ν: Einstein’s famous equation (E = mc²) = h·ν is more than a formula for the conversion of the rest mass into pure energy, or vice versa (it states that energy and mass are the same. Mass is simply congealed energy). Furthermore, it also states that frequency and energy are likewise the same (Hecht, 1994).

Spacetime Our 3 dimensional perception of space makes us believe that we can freely move within it.

Theory of Relativity (ToR): However, since Einstein we know that space and time form a 4-dimensional block (our universe) that contains past-present and future …. All at one! With time being part of spacetime, this implies that it is frozen, as all times (past, present and future) exist together. According to ToR, there cannot be such a thing as “Flow of Time”. Since the future is already out there, the block of spacetime demands to abandon FREE WILL. As the future is preordained (it already happened), whatever we do, it already happened (stone thrown into a pond will result in a splash and a circular wave pattern – that’s what we expect to see and hear!). Thus when we perform a travel in time, for us it’s still the NOW that we are referring to, for the people and places we visit, it is likewise their NOW; but in relation to us and them it is either future or past – depending which way we traveled. Based on ToR, we no longer have control of the future as it is already laid out. However, if the future is already laid out though, it is not under our control anymore (here comes the relativistic notion of death: one’s death as we witness it is only valid for us, but in a different spacetime this person is still alive). At the time as scientists became acquainted with the relativistic notion of ToR, another theory popped up, the theory of Quantum Mechanics (QM): According to QM, the future is not predetermined (preordained). At the atomic and more so at the subatomic level familiar laws fail, and give way to probabilities. This poses the question of: how can the entire universe be out there if a single particle is so utterly unpredictable? Undisturbed the atom can attain an infinite number of choices, only to make a choice once we decided to look at it (the measurement forces it to do so – the probe alters the dynamic equilibrium of the atomic neighborhood, forcing it to respond to the induced change). Hence, in the Quantum world the future is not predetermined. With the notion of free will being incompatible with ToR, so must QM be not be compatible with it (ToR). Consider Music: music is impossible without memory. Music enfolds in time, memory conditions us what to expect in music. We feel there is a subjective feeling of time flowing. With science strongly objecting the concept of subjectivity, the flow of time must be an illusion. However, the reality we experience must be somewhere in-between the extreme view of ToR on the one side (where the flow of time is frozen) and QM on the other side (flow descends into uncertainty). As a result, large scale QM is taking place within large areas of our brain, resulting in consciousness, action, and will. Consciousness has a different relationship with time. “Time flows” for everyone of us differently, as does the biological clock differ from the chronological clock. If quantum-events are at the root of consciousness, than the same principle of uncertainty, which governs the subatomic world, might explain our ability to make random choices. Thus feeling the time flowing is strongly related to consciousness and that’s the point. (BBCworld, 2001)

Am Anfang ist die Wirklichkeit (es wirkt), die Realität kommt erst viel später dazu; d.h. die Materie ist dass wenn Wirkung mit Wirkung wirkt, dann kommt unter umständen auch das heraus was wir Materie und Energie nennen – bzw. dass was wir messen können (EXPLICIT ORDER). Aber das was im Hintergrund steht (IMPLICIT ORDER) das ist die eigentliche “software” und das was Materie ausmacht könnte man als die “hardware” besser noch als die “firmware“ (ROM-Programme, die quasi fest verdrahtet wirken) bezeichnen. D.h. die Welt ist nur eine EINHEIT.

Quantentheorie – sowohl als auch: die modulare Logik besagt dass es nur Wahrscheinlichkeitsamplituden gibt, d.h. zwischen Ja und Nein gibt es alle unendlichen Zustände (Ja, Jaja, Nein, NeinJa, Nein, Nein, NeinJa, etc sind alles logische Zwischenschritte, Potentialität). Die Quantenmechanische Verfeinerung besteht nun darin dass man Materie als auch Kraftfelder als Teilchen sowie Wellen ansieht (Wavicle);

- Es gibt keine Objekte mehr, nur noch Potentialität für Realisation
- Ganzeitliche Struktur, Fragmentierung nicht möglich
- Der Beobachter ist Teil des Gesamtsystems, Auftrennung ist nicht mehr streng möglich
- Keine Determination zukünftiger Ereignisse
- Strenge Erhaltungssätze (entsprechend Formqualitäten nicht materieller Eigenschaften) Symmetrie Eigenschaften

Daraus resultiert das der Beobachter (die objektive Sichtweise) gar nicht existiert, und stattdessen verschmolzen ist mit dem was er beobachtet. Mehr noch es ist alles Information, ohne feste Form. Lediglich die Gestalt am Anfang ist ausschlaggebend und nur die Gerinnung von Gestalt gibt so etwas wie Materie und Energie her.

Das Quantenphysikalisch-holistische Weltbild ist daher ein Immaterielles Fundament in dem i) die Materie nicht auf Materie basiert (software und firmware statt hardware), i) eine Beziehungsstruktur besteht, nicht-Objektivierbarkeit (Gestalt fundamental als Stoff, besser noch Liebe als attributiver Faktor) i) es eine Nicht-ontische Struktur der Welt aufzeigt (i.e. darzwischen, Was passiert ist wichtig, die Frage nach der Existenz ist sinlos, Rheomode, Sprache die rein auf Verben passiert).

Das Quantenphysikalisch-holistische Weltbild hat daher eine Ganzheitliche Struktur in welcher i) die Wirklichkeit, die Potentialität statt der Realität herrscht (Möglichkeit, ahnen statt begreifen), i) die Nicht-Auftrennbarkeit und Ganzheitlichkeit Geltung haben (kein Reduktionismus möglich), i) der Kosmos als Ganz-Eines (Advaita=nicht-2-heit, alles hängt mit allem Zusammen) gesehen werden muss.

Das Quantenphysikalisch-holistische Weltbild hat daher eine Offene der Zukunft, in der die Schöpfung nicht abgeschlossen ist (offene, gestaltbare Zukunft), i) die Kreativität als Wesenselement bedingt (lebendiger Kosmos), j) und ein Gestalteter Indeterminismus nicht Willkür vorherrscht (kooperative Evolution).

• M-Theory:
  • Wormholes:

In other words: it makes no sense to understand physics, we just have to learn to live with it.

• Perspective:

Viele Menschen denken sie seinen die Krone der Schöpfung und tollen auf dem Kartenhaus herum. Dabei sehen sie nicht dass Karten herausfallen und so das eigene Fundament in Mitleidenschaft gezogen wird. Wir verstehen gar nicht das wir Teil eines Gedichtes sind welches auf dieser Sensibilität aufgebaut ist …. Und das ist unser Problem heute!

Geben sie statt dessen das Gefühl der Täterschaft auf, dann wird ihr run automatisch vor sich gehen – oder allmählich ein Ende finden (in der Raumzeit gibt es keinen Zufall, keinen freien Willen; die Quantenmechanik ist jedoch von Wahrscheinlichkeiten geprägt, woraus sich schliessen lässt dass der Mensch schon durch die Denkfähigkeit alleine in beiden regim in zu hause ist – demgemäß ist der freie Wille den Quantenphänomenen des Gehirns zuzuschreiben). Cornelsen, 1985:

Ich bin ein Mensch, aber ich begrenze mich nicht auf den Körper. Das ist der Unterschied.