BEES, BIRDS AND MANKIND

Destroying nature by “electrosmog”

Ulrich Warnke

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For different protection of mankind, environment and democracy

Preamble by the publishers at the launch of the series of papers: *Effects of Mobile Radio and Wireless Communication*

The bio-scientist Ulrich Warnke is more familiar with nature's electromagnetic housekeeping than most. In this paper, he shows how wise and sensitive nature was about using electrical and magnetic fields in the creation of life. But he can for this reason also convincingly criticise the present foolish and irresponsible interference in nature's house-keeping. It is clear from his paper that the powers that be in politics, the economy and science are in the process of destroying what nature has built up over millions of years. The traces of this destruction have long been evident in our living environment. The paper shows, however, how short-sightedly we are treating not only our health and the economy, but especially also future generations' right to life.[1] All of the above is documented not as probabilities but based on reproducible effects. This should give pause also to those who regularly justify their actions with the argument that they are unaware of any proof of damage.

Under the term "radio communication", we combine all wireless communication technology, increasingly flooding our residential zones and the environment with electromagnetic fields. A recent, comprehensive research report by the *BioInitiative Working Group*, a consortium of renowned international scientists, shows how many of the damaging effects of such fields have already been proven (www.bioinitiative.org). The report evaluates the present limiting values as a useless edifice, protecting nobody. Based on this, the European Environment Agency (EEA), the top scientific environment authority of the EU, has warned of the possibility of looming environmental disasters following the increasing density of electromagnetic fields. And the coordinator of the European Reflex project, Prof. Franz Adlkofer, has informed the public on the new research results, proving the high degree of gene-toxicity of UMTS radiation.

The public is little aware of these risks because they are hardly addressed in the "enlightenment" provided by officialdom and industry. The public is given the assurance that they are well-protected by the limits and the compliance-assuring measurements and that UMTS radiation is as harmless as GSM radiation – more antennae in residential areas are recommended in principle.[2] And whilst Ulrich Warnke demonstrates how vulnerable man and environment are, we are told that we are more robustly organised than our machines.[3] The original "radiation protection" has deteriorated to the protection of commercial interests.

The involvement of government in industry and the high percentage of industry-financed research and industry-beholden panels and consultants, have spawned a questionable system of environment and consumer protection. Only that which does not seriously endanger common commercial interests is noted and supported. The rights of the citizen to protection and the suffering of the people are flatly ignored. Those with political responsibility have apparently still not realised that their negligent handling of the obligation to take precautions has long since been proven to be one of the main causes of past environmental disasters and scandals.[4]

As a result of their quarrel with politics of carelessness, an interdisciplinary association of scientists and physicians founded the *Competence Initiative for the Protection of Mankind, Environment and Democracy* in May 2007 (www.kompetenzinitiative.de). This paper is the first in a new scientific series. The reported results are intended as a correction to trivialising "enlightenment" that does not protect, but endangers. The series intends to maintain a high level of technical information, without being unreadable to the interested layman.

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[1] On injury to the health of children and the youth refer also to the collection published by Heike-Solweig Bleuel *"Generation Handy... grenzenlos im Netz verführt"*, St. Ingbert 2007.

[2] Quoting scientists of the Jacobs University Bremen-Grohn under Prof. Alexander Lerchl: *"UMTS doch nicht schädlicher als GSM", www.pcmagazin.de*, 2.7.2007, and A. Lerchl at a presentation in Ritterhude acc. to a newspaper report of the Osterholzer Kreisblatt dated 16.6.2007: *"More radio masts in the centre of town". Professor Lerchl appeals to all communities not to spend further tax money on mobile radio studies*

[3] Statement at the end of a brochure: *Mobilfunk und Funkwellen: Information, Fakten, Antworten;* published by the Saarland Department of Justice, Health and Social matters, Saarbrucken 2005 (copy of a brochure of the LfU Baden-Wurtemberg).

[4] Compare the paper published by the European Environmental Agency and its German translation published by the Federal environmental office: "Späte Lehren aus frühen Warnungen*: Das Vorsorgeprinzip 1896-2000",* Copenhagen and Berlin 2004.

[5] *"Die große Gier. Korruption, Kartelle, Lustreisen: Warum unsere Wirtschaft eine neue Moral braucht"*; Berlin 2007.

Preamble

Placing economic interests above culture and morality has contributed significantly to turning Germany into a country of declining education. As the journalist Hans Leyendecker so tellingly describes in his book *Die große Gier*[5], it started Germany too on a new career on the ladder of corruption. There is nothing that the business location Germany needs more, he concludes, than "new ethics". But this also requires a different perception of progress. Whether we can watch TV via our mobile telephone, is irrelevant to our future. Our future will depend on whether we can return to more human, social and ethical values again in the shaping of our lives and our relationship with nature.

Everyone who thinks beyond today and who inquires about what it means to be human is, in our opinion, called upon to contribute to this future: politicians guided by values rather than economical and tactical election issues; scientists and doctors more often remembering their obligation to the wellbeing of society and mankind; companies understanding, also in Germany, that profit and morality must be in harmony if they wish to remain successful in the long term.

But what we need above all is critical citizens, who can spot the difference between technical progress and consumer foolishness: Citizens who, in both their roles as voters and consumers, remember that democracy once meant rule of the people, not ruling the people.

The dramatic escalation of recorded degradation challenges those with political responsibility to take to heart the protection directives of the constitution and the European Convention on Human Rights. To base your actions affecting millions of your protégés on a half truth, at best, appears to us a political crime affecting health and the future – considering the state of our knowledge.

Religious and ethical cultures still profess to the mandate of conserving creation. But its actual treatment is guided by the pseudo culture of a new class of masters who ruthlessly exploit and manipulate the organisation, finally destroying it.

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Electromagnetic fields as prerequisite and hazard to life

Author's introduction to this paper

The question of causal effects and biological relevance of electrical and magnetic parameters is generally posed without simultaneous reference to their relevance to life's organisation. These questions cannot, however, be considered in isolation of each other. What role have the electrical and magnetic fields played in the evolution of life on earth? What role are they playing in the individual development and physiological capacities of an organism? Whoever investigates these questions must sooner or later conclude: Not only did the electrical and magnetic fields of our planet exist before all life, but they have had a decisive hand in the evolution of the species – in water, on land and in the near-earth atmosphere. Living creatures adapted to it in the development of their kind.

Biological experience teaches us that life will use the energy pool in which it finds itself to its best advantage. Advantageous not only because the absorbed energy is a carrier of information, useful for orientation in the environment (see glossary; hereinafter GL). But advantageous also because the organism developed to make use of gravitational and electromagnetic interactions, creating decisive functionalities of life. The biological system expresses itself just as the environment does and unity and coordination with its environment is its guiding principle.

But if bees and other insects disappear, if birds are no longer present in their traditional territories and humans suffer from inexplicable functional deficiencies, then each on its own may appear puzzling at first. The apparently unrelated and puzzling phenomena actually have a common trigger, however. Man-made technology created magnetic, electrical and electromagnetic transmitters which fundamentally changed the natural electromagnetic energies and forces on earth's surface – radically changing million-year-old pivotal controlling factors in biological evolution.

This destruction of the foundations of life has already wiped out many species for ever. Since this extinction of species mostly affected ecological niches and hardly ever own life, most of us were not interested. But now, the endangerment of animals is also threatening the survival of man in a new and unexpected way.

Animals that depend on the natural electrical, magnetic and electromagnetic fields for their orientation and navigation through earth's atmosphere are confused by the much stronger and constantly changing artificial fields created by technology and fail to navigate back to their home environments. Most people would probably shrug this off, but it affects among other one of the most important insect species: the honeybee.

Because the bee happens to be the indispensable prerequisite for fructification: without bees, the fruit, vegetable and agricultural crops will fall short.

We are, however, not only affected by the economic consequences of our actions. It can also be proven that the mechanisms evidently affecting birds and bees are also affecting the human organism. An all-round unnatural radiation with an unprecedented power density (GL) is also harming human health in a novel way.

But, unless mankind reminds itself of the basics of its existence and unless the politicians in charge put a stop to the present development, the damage to health and economic fundamentals is predictable and will fully manifest itself not now, but in the next generation.

The reasons for this are explained in this paper. It endeavours to quantify natural electrical and magnetic signals provided to men and animals as guiding signals throughout evolution. The paper, however, places particular emphasis on what happens when these natural signal amplitudes are suppressed, changed and distorted on an unprecedented scale by technically generated artificial fields. Mankind can only take successful countermeasures if the damage mechanisms are understood.

The following analyses are intended to remain readable also for interested laymen. This approach has its limits where experimental fundamentals or specific technical descriptions must be included. The following text therefore offers three options for reading. In its totality, it is intended for readers with a scientific background. It has, however, also the interested layman in mind, by allowing him to skip identified parts containing specific technical justification and arguments. And the parts against a coloured background are intended as a first overview.

I thank Prof. Dr. Karl Richter for the editorial supervision of the paper and Dipl.-Met. Walter Sönning, medical meteorologist, for his technical comments on the sferics question and the compilation of a glossary for the interested layman.



If all the functions bees perform for natural life and its preservation are observed holistically, their importance cannot be overstated. Without the bees, we humans will also suffer major deficiencies.

1. The organisation of life underlying its vulnerability

1.1 We should have known long ago

The relationship between life and the physical parameters of earth's surface and atmosphere have been known for many decades. Those responsible therefore had the opportunity long ago to question to what extent the excesses of technically created electrical and magnetic fields might have the potential to destroy nature's housekeeping.

There are only two types of energy capable of transmitting information over great distances: electromagnetic and gravitational energy. Any forces acting beyond the boundaries of an atom can be traced back to these two energies; ultimately they have an infinite reach. Both energies are universally present and can be modulated in many ways (GL). This is true, for instance for light, the earth's magnetic field, cloud charges, atmospheric electric fields and changes in atmospheric pressure. Together with atmospheric moisture and olfactory particles, they are recognised as orientation aids to mobile organisms.

In the natural environment, there are "oscillating" electromagnetic fields of many orders of magnitude and with frequencies ranging over a virtually unlimited spectrum covering many frequency decades. They manifest themselves as a continuous and enormous "hiss" – like an unlimited ocean, the surface of which is agitated by waves of any imaginable amplitude and extent. Nature has created senses that filter out very specific frequencies and intensities from this ocean of waves, analyse them and convert them to forces. These filtered frequencies identify a specific sphere of life for specific life forms.

Only those energies that are important to the life of an animal are transformed. The forces generated from these energies control nerve cell membranes and protein structures such as enzymes – creating patterns, images and impressions that we call experience. Sensory organs are organs functioning as frequency analysers (GL), information amplifiers (GL) with gains up to a million, sometimes including contrast enhancement and noise suppression. Eyes, ears, sense of smell, taste, sensitivity of touch, light, warmth, chemical, electrical, magnetic and pain receptors. The living world perceives stimuli such as light (including ultraviolet and infrared), sound (including ultrasound and infrasound), electrical fields and currents, magnetic fields and also smells and water currents. And the sensory performance of animals is often comparable to our technical measurement apparatus, sometimes even far superior. Physiologists can prove this by some astounding numbers: Snakes, for instance, can sense temperature variations of a thousandth of a degree centigrade; long-horned grasshoppers and cockroaches can register mechanical surface vibrations with amplitudes (GL) down to 1/25th of the diameter of a hydrogen atom.

The high "intelligence of the systems" is particularly obvious, however, with orientation, navigation and early warning systems. In this regard, the earth's magnetic field has an important role to play. The local geographic position and time of day can be established from the density, direction and inclination of the field lines and their temporal variation.

Every location, together with other physical information, has a specific identifiable pattern. The sensitive reception apparatus of animals use the magnetic field information for orientation and navigation, among other (WARNKE, 2006).

1.1.1 Magnetic fields as global parameter for space and time orientation of all life

To the best of our present knowledge, biological organisms depend less on static magnetic fields than on the very important intensity variations of sufficiently high frequency. If we take a closer look at such variations, the earth's magnetic field cannot be considered in isolation. Other magnetic fields must also be included in the analysis: such as the ionospheric field, for instance, and the field of the Van Allen belt – a radiation belt of very high intensity with rotational symmetry around the magnetic axis and mirror symmetry around the magnetic equator around the earth. Both the ionosphere and the Van Allen belt are held together by earth's magnetic field. The protons and electrons captured from the cosmic radiation or the solar wind (= stream of ionised particles emanating from the sun) by earth's magnetic field, create a protective shield for all life on earth – the Van Allen radiation belt.

The external magnetic fields act as moderators (GL) on the earth's magnetic field. They exhibit both a pronounced solar and also a lunar (moon-dependent) diurnal variation. The reason for the solar-induced variation lies in the diurnal warming of the atmosphere through solar radiation. This is accompanied by horizontal eddy currents with amplitudes up to 90 000 Ampere in the ionosphere, that generate magnetic fields again. These daily variations also have a pronounced annual cycle.

The moon-dependent variations are furthermore only evident during the day. These are also generated by electrical currents at about 100 km altitude, but they have current amplitudes of "only" 10 000 Ampere. These eddy currents cannot be explained by temperature gradients as with the solar effects, but they are influenced by the gravitational remote action of the moon. The earth's atmosphere is rocked to and fro inside the earth's magnetic field in the rhythm of the tides, inducing electrical currents in the ionised layers of the upper atmosphere where the conductivity is high through the presence of the negatively and positively charged particles (ions). It appears that the conductivity of the ionosphere is too low at night to maintain induction processes (GL) – due to reduced ion densities (WARNKE 1993).

Within the realm of the conventional variations of the magnetic field that have been explained so far, electromagnetic oscillations that occur in mainly two frequency bands also deserve to be mentioned: 10 Hz and 10-25 kHz. On the one hand, there is a resonating electromagnetic oscillation between earth and ionosphere in the 10 Hz region (Schumann resonance, 7.83 Hz) and on the other, thunderstorm activities on earth constantly reinforce certain electro-magnetic oscillations. The dominant frequency of approximately 10 kHz generated by vertical lightning flashes corresponds to a transmitter dipole of cloud-to-earth length, whilst horizontal cloud-to-cloud lighting generates about 20 kHz.

These characteristics may be exploited for the design of thunderstorm warning apparatus. Our device measures the thunderstorm activity in a range of at least 800 km and simultaneously also the activity within a range of 200 km .Under favourable conditions, we can therefore register thunderstorms over the Mediterranean from our location in Saarbrücken.

Lightning also simultaneously generates very low frequency electromagnetic oscillations. Under certain conditions, these oscillations are all guided through the ionosphere along the magnetic filed lines, travel far into space and return to earth along the opposite magnetic field lines. They are reflected at the ground and the waves travel the same way again and again until their energy is dissipated. The higher frequencies are propagated somewhat faster than the lower ones. If this process is made audible through an amplifier, a whistling noise is heard, continuously decreasing in frequency down to a hum, as in a switched-off siren, but much faster, typically for approx. 1/3 of a second. This phenomenon was therefore called "Whistler".

The so-called earth-magnetic storms (magnetic induction ß~ 1μT) are triggered by the magnetic shock waves escaping from the solar flare region at 2000 km/sec and still have a speed of 100 km/sec as they reach earth. This induces unusually high currents in the earth's magnetic field, which in turn change the earth's magnetic field and generate secondary currents. Such currents manifest themselves in long conductive paths such as pipelines, transmission lines etc. and routinely cause technical headaches.

The most important parameters, constant over millions of years, are: earth's static magnetic field: 31 μT (geomagnetic equator); resultant diurnal variation of the earth's field: 60 nT; magnetic storms: 500 nT; sferics field strengths: 0.25 – 3.6 pT per $\sqrt{}$Hz.

The natural high frequency radiation sources have far less energy than the technically generated transmission powers and energies. This is a precondition for transmission of news and communication.

The integrated power density over all frequencies is 600-800 pW/m^2 at the earth's surface. The power density of the microwave solar radiation is about 0.1 μW/m^2, escalating to several 100 μW/m^2 during solar flares.

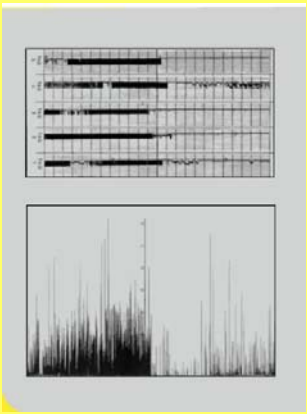


Fig. 1 Top: *The "midnight phenomenon". The activity of the electromagnetic impulses (shown on 5 different days) abruptly ends at midnight.*
Ref. Hans Baumer: (1987) Sferics. Die Entdeckung der Wetterstrahlung. Rowohlt, Hamburg

Bottom: *Our original recorded activity cycles of 20 caged bees in a laboratory experiment. The vertical axis (ordinate) shows the total electrical field arising from the electrostatic charging of the wings. It is clear that the bees suddenly all come to rest at midnight.*
Acc. to Warnke (1982), published in Baumer's book (1987)

1.1.2 Examples of the utilisation of earth's magnetic field parameters

For a period of millions to a billion years, life on earth had the time in the evolution of the species to adapt to the magnetic and electromagnetic conditions of their environment. They learned to use the natural magnetic field parameters also as conveyors or carriers of a diversity of information:

- The geographic location can be established by the density of the field lines, their direction and variation in time.
- Time of day and annual seasons can be deciphered in the daily, lunar and solar periodic magnetic signals.
- Frontal weather systems and air mass movements transmit characteristic electromagnetic signals, the so-called sferics. These are short oscillations comprising just a few cycles (= impulses) in the range between approx. 3 kHz and 60 kHz (= very low frequency) with a repetition frequency of up to 100/sec or more, depending on the intensity and type of atmospheric processes.

The biosphere at the earth's surface is in contact with the electromagnetic fields of the universe via two narrow frequency windows through the atmosphere. One of these windows is in the narrow medium to long wavelength UV radiation region, including the visible light spectrum and the near (short wave) infrared radiation (average 1milliwatt/m^2); another window is in the high frequency radiation region at wavelengths of 0.1 to 100 m (average 1 nanowatt/m^2 up to 1 milliwatt/m^2 (GL) during solar flares).

Effects of the earth's field and of its compensation or effects of weak artificial fields have been detected in life at all levels of development: with bacteria, single and multi-cellular algae, higher plants, protozoa, flatworms, insects, snails and vertebrates:

Magneto bacteria (Aquaspirillum magnetotacticum) in the bottom sludge of the oceans utilise the intensity of the earth's magnetic field for orientation. Magnetite crystals (Fe_30_4) in their bodies form a chain of "compass needles" creating a magnetic moment that the bacteria align against the thermal movement of the water molecules. (The earth's magnetic field applies an energy of 1.4×10^{-18} J (GL) to the bacteria – 200 times greater than the energy of the thermal movement at 22°C).

- Fish navigate in the earth's magnetic field. When sharks and stingrays, for instance, move in earth's magnetic field, they experience induced electrical fields of varying strength. The field strength is a function of the direction of movement relative to the direction of the magnetic field. Local physical water currents also generate direction-dependent electrical fields that can be detected. The sensory organ for electrical fields is highly sensitive. (So-called Lorenzian ampoules responding to voltage gradients of less than 0.1 microvolt/m).
- Compass termites (Amitermes) build their metre-high mounds in a north-south direction. With other termites and the woodlouse, the feeding activity is subject to natural magnetic alternating fields (sferics) and the earth's magnetic field.
- Bees make use of the earth's magnetic field and its daily fluctuations for their orientation and communication. They also gain information on weather developments through the natural impulse signals in the atmosphere, i.e. the sferics already mentioned above.
- Whales can sense the magnetic field of the earth.
- Carrier pigeons are affected by variations in the earth's magnetic field down to flux densities in the nano-Tesla region.
- Migratory birds have a mechanism acting like a compass.

Humans react to atmospheric alternating electromagnetic fields between 10 and 50 kHz through various symptoms of the central nervous system. There are also correlations between activities in earth's magnetic field and sleep-affecting factors, circadian rhythms (HECHT 2005, 2006, 2007), enzyme conversion and hormone production in the central nervous system, the vitamin level in the blood serum, the average skin temperature, vision in half-light and iron content in the blood serum.

All the examples support the existence and the vital control functions of biologically active magnetic and electromagnetic fields with a specific frequency structure and corresponding information content, "arranged" to suit biological systems.

They are characterised by, among other:

- *specific flux densities and gradients ("amplitude windows"), i.e. weak fields may have a greater effect than strong fields,*
- *specific impulse frequencies and impulse sequences ("frequency window"),*
- *specific impulse shapes and a certain complexity of the impulse spectrum,*
- *specific vector characteristics with respect to the body,*
- *minimum effective duration of coherency and specific co-factors, e.g. light.*

Life forms, even of the same species, may be quite differently organised, but coordinated in a collective or social group (fish shoals and flocks of birds). In an isolated form of life, the instantaneous interaction with its environment is therefore exceedingly varied. Reproducible magneto experiments in or between individuals are therefore unlikely in the case of complex organisms, including humans; the specific metabolism parameters are, for instance, also too varied. None of these parameters can be kept as constant as required for reproducibility. "Proof", in the sense of classical scientific criteria, is therefore illusory.

1.1.3 Technical wireless communication is only possible because the transmission is stronger than the natural high-frequency radiation

Technical wireless communication such as mobile radio, radio, TV and satellite communication is only possible because the power density of the utilised technical high frequency spectrum far exceeds that of natural radiation. Natural radiation at the surface of the earth in the 300 MHz to 300 GHz range is approximately 0.001 microwatt/m^2 (=0.001 $\mu W/m^2$); today's typical technically created radiation level in cities is 10 000 $\mu W/ m^2$. And the legal German limits even allow values up to 4.5 million $\mu W/m^2$ for the D-grid, up to 9 million $\mu W/m^2$ for the E-grid and up to 9.8 million $\mu W/m^2$ for UMTS.

As we evolved, we were of course also exposed at times to strong static and low-frequency electrical fields (typical voltages: cloud electricity up to 10 000 V, volcano electricity up to 20 000 V, lightning 500 000 V, sferics 10 V), in addition to constant static and low-frequency magnetic fields (earth's field, Ionospheric field, cosmic field, lightning). But there were never fields as constant and with as many superpositions of different frequencies from different sources as we are now generating with our technology.

1.1.4 Radiation by organisms themselves could be established in the evolution, because there was no interference by continuously changing external radiation

The same high frequency radiation that technology utilises for communication is also copiously generated inside our bodies. The body also requires it for communication purposes: for biological communication through functional oscillation of our molecules.

Provided there is no interfering external radiation, the body can utilise its built-in frequencies for its internal organisation.

The body internally radiates frequencies in the 1 to 1 000 gigahertz (GHz) range at power densities of about 0.1 $\mu W/m^2$, i.e. lower than those of average solar radiation. If we add up the total range of high frequencies (HF and VHF) present within our organism, we arrive at natural power densities of about 10 000 $\mu W/m^2$. The power generated by our internal electromagnetic oscillations, that we describe as heat (wavelengths around 3 – 10 μm), corresponds approximately to that of a 100 Watt globe.

To understand the natural oscillation of our functional molecules (enzymes and other proteins, nucleic acids, hormones and many more) it is important to realise that what we generally describe as "chemistry" is actually pure physics. All the bonds and their modulations (changes) between atoms on the one hand and molecules on the other are based on physical phenomena. In this context, the electrostatic Coulomb forces (= force between different electrical charges) and the electromagnetic force (e.g. van der Waal force = force between dipoles with different moments and fast oscillations) are prominent. DNA and all the enzymes, for instance, can only carry out their functions through their natural electromagnetic oscillations.

Resonances are of particular importance here. Chain molecules, for instance, can be excited to so-called wring-resonances by high-frequency electromagnetic fields. Proteins exhibit such natural resonances in the range of 1 - 10 GHz; DNA resonates at 10 MHz to 10 GHz. Both of these therefore fall into the spectrum of common mobile radio frequencies. Wring frequencies (modes) cause wringing of the molecular chains that directly affect
the structure of the individual molecules. The structure of the molecules (conformance and configuration) is essential, however, for their specific functionality. Even minor displacements render the molecule useless. The chains may even break apart under energetic external influences.

Biological systems are obviously very sensitive in their reaction to microwave fields. For instance, Belyaev et al, 1996, reported resonance effects on the DNA structure at extremely low power densities of 0.000001 $\mu W/m^2$ in the 40 – 50 GHz frequency range. This surprising result must still be confirmed by other working groups. Nevertheless, it must be stated that: The ultra-weak, but biologically very effective natural electromagnetic fields are contrasting strangely with the technical radiation fields permitted in Germany. On recommendation by the ICNIRP association (Munich), technical radiation fields up to power densities of 10 000 000 $\mu W/m^2$ were legalised – still considered as harmless by the experts. The population, animals and plants may therefore be legally subjected to radiation in the critical frequency spectrum that is more than 10 orders of magnitude higher than the natural fields.

But organisms are not only sensitive to high frequencies; the following examples show that very high sensitivities evolved also in the low frequency ranges.

2. About the disappearing bees and birds

2.1 The bees as evolutionary force and indispensable economic factor

Honeybees existed on earth from about 40 million years ago; a "primal" honeybee encased in amber was found on the coast of the Baltic Sea. Man soon realised the usefulness of animals. And we know today that the enormous development of earth's vegetation, comprising about 200 000 species of a variety of flowering plants, is based on animals. Because about 85% of these flowers are pollinated mainly by bees and propagate through the formation of fruit and seeds.

Since also fruit trees (such as cherry, apple, pear and plum) and agricultural crops (such as rap, sunflower, red clover, lucerne, horse bean as well as vegetables such as tomato, cucumber, pumpkin) fall under these, it is not difficult to understand that bees are one of mankind's most important production animals.

In central Europe the commercial benefit of bees is estimated at 4 billion euros per annum, in the US it is estimated at over 15 billion dollars. These figures are from the *New York Times*. It quotes estimates by Cornell University, New York State. This included the pollination of fruit and vegetable plants, almond trees and fodder such as clover. That said, however, even the global honey production of 25 000 tons per annum is an important economic factor already.

But if we aggregate all the functions the bees are performing for nature's life and the preservation thereof, their significance can hardly be overestimated. Their industry cannot be substituted either by other insects or by technical measures. If the bees should disappear, we humans will also suffer major deficiencies.

2.2 No chance of survival: Colony Collapse Disorder (CCD)

In some countries there are reports of mysteriously dying bees. It appears as if the losses are at their worst in the northern American states and in neighbouring Canada. 25% to 50% of the American bee-keepers report losses through "Colony Collapse Disorder" (New Scientist, 2007). They reported 50% to 90% of their bees to have disappeared within the previous 6 months, and the remaining bee colonies were said to be so weak they can produce hardly any honey (CNN, 2007).

But unusual losses are also reported in Germany, Switzerland, Austria, South Tyrol, Spain, Poland and New Zealand. In Germany, for instance, the beekeeper associations last winter recorded a loss of about 13% in over 7 000 bee colonies - double the previous year's figure (http://orf.at/070416-11296/-index.html). In accordance with a report in the *Stern* magazine edition 34/2007, German bee monitoring did not confirm this number, only acknowledging an average loss of just on 8%. A 10% loss over the winter months is not regarded as unusual. What is completely unusual, however, is the statement by the president of the DBIB *(German Federation of Occupational and Purchasing Beekeepers*), Manfred Hederer, in the *Deutschlandradio Kultur,* on the Federal territory: "The beehives are empty." He paints a picture of bee colonies reduced by 25% - in some cases even 80% (Spiegel 12/2007).

In 2006, the Swiss federal research institute for production animals and dairy farming, Agroscope, (Federal office for agriculture), reported that also all of Switzerland was affected by bee deaths, to a regionally more or less severe degree (Zürichseezeitung, 5. May 2006). Roughly 30 percent of the bees were lost without a trace after winter – about half a billion animals in this year alone (http://www.heute-online.ch/wissen/play/artikel 60601).

Beekeepers from Styria are also reporting a mysterious disappearance of bees. Beekeepers in Vienna estimate a 30% loss. They agree on the following: *"The bees are not developing properly anymore. They do survive the winter, but in spring they disappear as if by magic. The hives are simply empty."* (This according to beekeeper Hermann Elsasser of Fladnitz in the Raab valley; http://oesterreich.orf.at/steiermark/stories/184609/). Only the brood remains in the hives, and without the care of the older bees, they will die.

Ferdinand Ruzicka, scientist and beekeeper himself, reports: *"I observed a pronounced restlessness in my bee colonies (initially about 40) and a greatly increased urge to swarm. As a frame-hive beekeeper, I use a so-called high floor, the bees*

did not build their combs in this space in the manner prescribed by the frames, but in random fashion. In the summer, bee colonies collapsed without obvious cause. In the winter, I observed that the bees went foraging despite snow and temperatures below zero and died of cold next to the hive. Colonies that exhibited this behaviour collapsed, even though they were strong, healthy colonies with active queens before winter. They were provided with adequate additional food and the available pollen was more than adequate in autumn. The problems only materialised from the time that several transmitters were erected in the immediate vicinity of my beehives" (RUZICKA, 2003).

Ruzicka organised a survey through the magazine *Der Bienenvater* (2003/9):

- Is there a mobile radio antenna within 300 m of your beehives? - This was confirmed in 20 replies (100%).
- Are you observing increased aggressiveness of the bees compared to the time before the transmitters were in operation? - 37.5% confirmed this.
- Is there a greater tendency to swarm? – 25% confirmed.
- Are colonies inexplicably collapsing? - 65% confirmed.

Such colony collapses, heralded by "angry" swarming of the bees, were also reported in New Zealand (FIR-STENBERG, 2007).

Other reasons possibly explaining the disappearance of the bees are also under discussion: Monocultures, pesticides, the Varroa mite, migratory beekeeping, dressed seed, winters too severe, genetically modified plants. There is no doubt that some problems can be attributed to this. But the fairly sudden and country-spanning appearance two to three years ago of the dying bees



About 85% of these flowers are pollinated mainly by bees and propagate through the formation of fruit and seeds. We have the utility of animals to thank for the enormous development of earth's vegetation, comprising about 200 000 species of a variety of flowering plants.

phenomenon cannot be convincingly explained by any of the aforementioned causes. Should the bees simply be too weak or ill, they should also die in or near the hive. But no ill bees were found in the research into this phenomenon.

2.3 **Some bird species are disappearing**

But not only are bees and other insects disappearing – birds as well. The house sparrow, for instance, has become clearly scarcer in England and some western European countries. An investigation carried out between October 2002 and May 2006 in Valladolid in Spain, was launched to examine whether this decline in the sparrow population was related to electromagnetic radiation by mobile base stations. The result showed with a high decree of statistical confidence that the number of sparrows was reduced when the electrical field strengths of the antennae exceeded certain values. (BALMORI, HALLBERG, 2007).

A similar investigation was carried out in Belgium. The numbers of house sparrows were counted in the vicinity of several mobile radio base stations, during their breeding season. This confirmed a significant relationship between the electrical field strength in the 900 and 1 800 MHz bands and the diminishing numbers of birds (EVERAERT et al. 2007).

It was noticed even earlier that storks that built their nests within a 200 metre radius of base stations could not rear any chicks, remaining without offspring. The results improved at distances of 200 to 300 metres. From a distance exceeding 300 m, the storks bred with a success rate of 96.7%. The electrical field strength at a distance of 200 metres averaged 2.36 ± 0.82 V/m, and only 0.53 ± 0.82 V/m at 300 metres. From their results, the authors concluded that the electrical fields of base stations are damaging to the reproduction of the white stork (BALMORI, 2005).

3. **Mechanisms of disorientation and damage**

3.1 **Magnetic field sensitivity in the animal world**

Birds, insects, fish and snails are assumed to have a specific organ for sensing magnetic forces. It is questionable, however, whether it is always necessary to assume such a specific magnetic sense. Electrical fields do not penetrate deep into living organisms and currents follow only certain paths. A magnetic field, however, fully penetrates the organism, without major changes. It is too short-sighted to conclude from this that such fields have no effect because they are not absorbed. To start off with, even weak magnetic fields in the body are more energetic than strong electrical fields. As such, the energy in earth's magnetic field inside us is 10 000 times stronger than the strongest possible electrical field in the atmosphere (3 Megavolt/m; WEISS, 1991). Such penetrating forces as the quasi-static magnetic field and the low-frequency electromagnetic field do not theoretically need an own amplifying reception organ. Inside the organism, they can also directly couple into aggregates of orderly paramagnetic molecules or into the electro-mechanical (photon-phonon) code of the endogenous information transmission and storage.

Magnetite was found in all animals that can navigate using their own compass, sometimes in the form of ferritin-proteins (KIRSCHVINK et al. 1981). But it is also present in our brains (KIRSCHVINK et al. 1992). And it reinforces the external magnetic fields in both cases. In the tissue of birds, bees, fish and whales (WALKER et al. 1992), the magnetite concentration exceeds that in the human brain. Most areas of our brain nevertheless contain about 5 million magnetite crystals per gram and even 100 million in the brain membrane.

Because magnetite reacts about 10 000 000 times stronger to external magnetic fields than normal dia- and para-magnetic tissue, the trans-mission of information separate from the neurons must be considered. Oscillating magnetite excited by ELF fields could, for instance, play a role in transport channels or cell-interconnection channels, raising the possibility of interference by communication and other negative effects of technically created electro-/magneto-smog.

It is easy to prove mechanically acting forces in insects subjected to relatively strong magnets. Own experiments with bees and flies yielded the following results (WARNKE, not published):

- *A newly captured swarm of bees is exceptionally sensitive to magnetic forces. If a magnet with only a few mT field strengths is brought close to the swarm in a dark wooden hive, the entire swarm becomes excited.*
- *Captive bees assume a horizontal rest position at night, aligned to an artificial magnetic field of several mT in the environment.*
- *Dead bees, flies and a range of other insects can be made to float on an electrostatically neutral water surface and in this condition an electrostatically neutral strong magnet can be used to attract them, drag them across the surface and in some cases repel them.*

In the laboratory, bees can sense not only the compass direction but also the intensity and the gradient of this magnetic field (SCHMITT et al. 1993). It was found in a 1982 publication (KUTERBACH et al. 1982) already that the magnetite found in bees is the source of this sensitivity to magnetic fields, and this theory was recently checked and finally confirmed (HSU et al. 2007).
We also found ferrite particles together with pollen lodged in the bristles of the body surface; these might also be responsible for the abovementioned magnetic moment.

It has been demonstrated that the birds' magnetic compass only functions in a certain range of intensities between 43 μT and 56 μT – precisely in the range of the earth's magnetic field intensity. After a three-day adaptation period the animals could, however, also orientate themselves in fields of 16 μT and 150 μT (SCHNEIDER et al. 1992) – interpreted as an adaptation to the environment.

The platypus of Australia (Ornit-horhynchus anatinus) has the electrical receptors for detecting its prey, in its bill. The receptors can sense direct and alternating voltages in the range of 20 mV and have a connection to the Trigeminus nerve. Fish with similar receptors use the acoustical nerve for transmission of the electrical stimulus. This shows that evolution exploited the electrical and magnetic environment in different ways. The Lorenzian ampoules of fish are capable of distinguishing between stimuli of magnetical or electrical origin (BROWN et al. 1978). It has not been established whether the receptors of platypus also have this capability. This question is of interest because ducks also have bill receptors. Although these are specialised to react to mechanical stimuli, they are so sensitive that the mechanical Coulomb forces accompanying electrical fields might well be detectable as well.

When magnetic fields penetrate an organism, two fundamentally different aspects must be clarified:

1. *Is the organism merely subjected to a large increase in energy - or*
2. *does the organism gain information?*

In various insect species we are aware of a time function based on magnetic field variations. In particular, the feeding habit of termites is correlated with the 27-day solar cycle (BECKER, 1973), and there is also an increased building activity for a few days around new and full moon in laboratory experiments – as it is with bees. It is also known that termites show directional behaviour under the influence of extremely low field strengths (BECKER 1976, 1979). Time triggers via similar channels sensing sun and moon appears a reasonable assumption.

The changes to the circadian activity rhythm of the house sparrow (Passer domesticus) can be correlated with cyclical changes of the earth's magnetic field. The sparrow reacts down to 200 nT in laboratory experiments.

Without doubt, light is the dominant timing mechanism of life. But also the earth's magnetic field is meanwhile recognised as a timing mechanism.

3.2 **Bees and other small life forms under investigation**

Insects have many aids for their navigation and orientation in space: sunlight, also polarised (WARNKE, 1975), gravity, aromatic molecules, colour as electromagnetic oscillation in a specific frequency range, variations in air pressure, occasionally also the degree of ionisation of the air (ALT-MANN et al. 1971, WARNKE, 1976). Many species, however, cannot do without the magnetic field.

In this respect, bees are welcome objects for experimentation. Because different modalities of their orientation are inseparably linked to the magnetic field of the earth and to electromagnetic oscillations (LINDAUER and MARTIN 1968; HÜSING et al. 1959, SCHUA 1952, WARNKE, 1976).

In our working group, we recorded the directional behaviour of captive bees in an artificial field and during the night. A preference to assume rest positions with the body either parallel or orthogonal to the field lines was evident.

They share this alignment reaction with other insects such as various termites (BECKER, 1963), diptera (BECKER et al. 1964) and Drosophila (WEHNER et al. 1970).
The behaviour of termites (BEKKER, 1963) was studied particularly intensively in Germany, that of the Christmas beetle (SCHNEIDER, 1961, 1963) in Switzerland and that of insects, worms, snails, snakes and other small creatures in the USA. The investigations concentrated on the influence of cosmic physical fields in which the magnetic field time and again played a pivotal role. All experiments confirmed the existing relationships. They also all showed, however, that constant laboratory conditions are impossible in practise, because cosmic influences change the magnetic component in any normal room and cage, thereby affecting the orientation behaviour of the animals.

The experiments with Christmas beetles and termites may be termed spectacular. In accordance with the above literature, Christmas beetles not only determine their rest position by magnetic and electrostatic fields, but also by interference patterns of gravitational waves of terrestrial and cosmic matter. In the final analysis, the evidence points to the influence of a physical field or radiation, varying in space and time in accordance with an unknown programme, that is registered through an unknown organ in the Christmas beetle for an unknown purpose, but the existence of which physicists doubt because it cannot be measured by any instrument. The Christmas beetle therefore becomes the instrument for measuring this unknown agent. The effect is often intimately coupled to that of the magnetic fields (SCHNEIDER, 1974). The orientation at rest is based on the Christmas beetle choosing the position of least or most symmetrical stimuli when awakening from the rigor of cold. Using interference patterns and models resonating with gravitational Earth-Sun waves, complex combinations of dynamic stimuli were constructed, to which the Christmas beetle responded by changing its position (SCHNEIDER, 1972).

Also termites (Isoptera), whose feeding activity and 0_2 consumption are important indicators, react to more than just magnetic components. Their communication modes also include natural electromagnetic sferics impulse patterns, gravitational influences and electrical fields. The statistical correlation between the feeding activity of termites in the laboratory and the number of deaths in Berlin is described in detail; the consequences of this are as yet unfathomable. There is an increased frequency of human deaths on the days on which termites feed less.
The authors point to the magnetic field of the earth and its variation with solar influences as the common factor linking the apparently unconnected facts. Further down, other and earlier literature is cited in which an increased incidence of human death is described during unusual variations in the magnetic field.

3.3 **Birds as prototypes of magnetic field orientation**

This research shows that birds' orientation by magnetic fields has been a frequently discussed topic for decades. Thanks to the thorough and meticulous work of a number of researchers (WILTSCHKO, WALCOTT, MERBEL), it is today beyond doubt that several species of birds sense the earth's magnetic field and use it to establish their position during migration. As described for insects and snails, some species of birds are also particularly sensitive to a range of magnetic field strengths corresponding exactly to the earth's magnetic field – the robin, for instance. When the field is attenuated or amplified, the birds become disoriented. Setting on a certain field range could, however, change through adaptation.

The mechanism by which birds sense magnetic fields has meanwhile been largely explained. An area with iron-containing tissue was discovered in the skull of pigeons. Strangely, only one half of the skull contains material that is permanently magnetic. But opposite to this, material was found that is only very weakly permanently magnetic. Measurements indicate magnetite inclusions - the same crystal that was found in bees, bacteria, snails, whales and humans. The magnetite-containing tissue of the pigeons is even supplied with nerve ends that can sense the orientation changes signalled by the crystals (WARNKE, 1993).

It could be demonstrated at the Zoological institute of the University of Frankfurt/Main that the top half of the pigeon's bill has three magnetite-containing bodies, with a neuron ending at each of these. They constitute a three-channel system enabling the brain to construct a spatial picture of the surrounding magnetic field the pigeon can use to orientate itself in flight (source: TV programme *Planet Wissen* in BR on 18.09.2007 at 16.15 on carrier pigeons. Reference by W. Sönning).

Birds also have magnetite in the edge of the bill. In addition, light and magnetic fields result in an increase of certain free radicals in the eye, the concentration of which can obviously be accurately registered by the animals (WARNKE, 1995). This relationship will be dealt with again further on.

3.4 **Animals with a navigation system are extremely sensitive to electrical and magnetic fields**

Birds having a navigation system are extremely sensitive to the weather. A thunderstorm changes the magnetic field, light and many other characteristics – potentially causing the orientation to collapse. Birds and other animals are particularly sensitive to a solar eclipse. They exhibit an abnormally changed behaviour: sometimes lethargic, sometimes restless. Research attributes the reactions to the suddenly occurring electromagnetic long and medium wave radiation, typical for night time, but surprising with the suddenly occurring darkness of a solar eclipse. The lack of ionisation in the ionosphere by light has the effect of many oscillating impulses propagating 100 times better on the surface of the earth.

This unexpected electromagnetic impulse effect may also, in principle, explain the early warning system animals have for earthquakes.

The so-called sensitivity to weather or inclement weather, traceable to short electromagnetic impulses with a certain frequency content and rapidly decreasing amplitudes, has also been known for a long time.

These impulses originate at frontal weather systems, where colder air from sub-polar regions undercuts warm subtropical air masses. In the regions where warm or cold fronts mix, thermodynamically driven turbulent air currents with vertical and horizontal components are created. This is in essence where the abovementioned natural electro-magnetic impulse radiation of the atmosphere, also known as sferics, is created. Many life forms such as insects, frogs, birds and various mammals react to this meteorologically based impulse activity in the atmosphere. By receiving and frequency-analysing these "weather code" signals of changes in the weather or approaching thunder-storms, they can then dive for cover or fly around these thunderstorm regions (WARNKE, 2006).

Walter Sönning: "These weather signals or sferics are indicators of unstable processes in the troposphere – the weather-creating layer of the atmosphere -, since their source is in the weather centre. They originate in invisible discharges between positive and negative space charge clouds, created and maintained by different processes of ionisation such as cosmic radiation, UV radiation, natural radioactivity or the Lenard effect (= spray electrification or break-up of droplets or ice crystals with opposite charges). In terms of physics, our air could therefore also be described as a "plasma" gas. When differing space charges of possibly predetermined magnitude are electrically equalised, the ion-front of this basic plasma or gas discharge propagates at velocities of about 200 km/s along a tubular channel of about 40 cm diameter in the direction of the maximum potential difference, covering distances between 40 and 100 metres, until the electrical potentials are equalised. If the ion density in the air is sufficiently high, the following discharge impulse follows immediately. Each of these invisible and "quiet" discharges that occur at varying intensities in all weather conditions, is the source of an electro-magnetic, three-dimensional impulse or space wave, a so-called EMP or primal impulse, similar in its waveform to impulses from other sources (nerves, atmospheric nuclear explosions etc.). This 3-dimensional wave propagates at the speed of light. When recorded on an oscilloscope, for instance, it vaguely resembles a sinusoidal half-wave, but has a steeper rise time and an exponential decay of the amplitude. In a Fourier analysis, it is therefore not equivalent to a sine wave of a certain frequency.

Depending on the meteorological and atmospheric electrical propagation conditions, these EMP's are dampened at a distance of 60 to 100 km from the source to lower frequency sinusoidal Fourier components with a continuous spectrum between approx. 3 kHz and 60 kHz. True to their origin in an impulse discharge, these "impulses" have waveshapes of a few oscillations with rapidly decaying amplitudes from a maximum down to zero. Particularly well-defined impulse shapes in the total collection of atmospheric impulses convey, through their resonating sinusoidal oscillations at certain frequencies and also in the subsequent impulse frequencies up to 100 Hz, the meteorological information on their origin and propagation conditions – like a kind of code. These impulses can be displayed after suitable electronic filtering and are known in the technical literature as CD sferics a.t.B. (CD = convective discharge, i.e. created in atmospheric convection or turbulence without luminosity; a.t.B. = according to BAUMER). They gained special significance, however, at the beginning of the eighties in the context of industrial four-colour copper gravure printing. In this context, their highly differentiated effectiveness in the diffusion capability of bio-chemical biological membrane systems, in dependence on characteristic weather processes, was also shown.

The signals of visible lightning, occurring over the period of the main lightning discharge comprising of virtually uninterrupted sequences of such EMP's, together showing impulse periods up to tenths of seconds with a continuous spectrum into the MHz range, are a strictly different phenomenon.

As such, however, they are suitable as a special weather or thunderstorm signal for the animal and possibly the plant world, i.e. for any organism fitted with the corresponding reception sensors.

Sferics or atmospherics of the various kinds could therefore deliver an almost complete picture of the weather of the day, including prognostic clues, for a biological strategy, considering that the sferics propagate from a weather front at the speed of light and are travelling for hundreds of kilometres, always clearly recognisable as encoded weather to those who have the reception sensors. This can be proven by the example of the reactions of the biochemical membrane system of dichromate gelatine. Also: throughout evolutionary time, both the constant impulse frequency spectrum of the CD sferics a.t.B. and the daily excursions, constant in their climatological average, have provided a wealth of precision information on the meteorological and geophysical environment to those equipped with the receptors for the signals and the experience; which is more than today's weather services can achieve with the most modern high-tech equipment." (End of the contribution by Walter Sönning).

Animals have a typical electrical charge pattern for each weather phase. Since all movement of charge is associated with forces, animals can analyse the approaching weather via the electrical quantities, even long before the arrival of a thunderstorm.

As a function of special electrical weather events, the bodies of the animals are therefore affected through a complicated interaction of different components: charged, reverse charged, discharged, dielectrically polarised. Polarisation is by a natural electrical DC field. It can be shown that animals are slowly electrically charged in good weather, whilst approaching thunderstorms cause a rapid discharge due to a high concentration of small ions in the atmosphere and charging changes rapidly between positive and negative as the thunderstorm approaches.

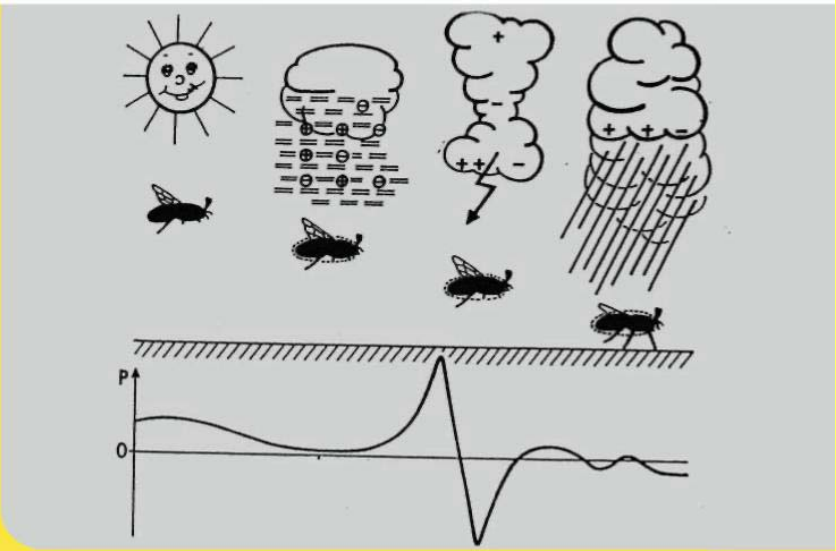


Fig. 2: Top sketch: *The electrical charging of the insects changes typically as the weather parameters change. The bottom curve shows the changes in the electrical field of a freely flying bee as a function of the weather condition.*
Warnke 1989, Copyright Ulrich Warnke

Insects such as bees receive these oscillations and recognise them as storm warnings. We were able to show that bees return in great numbers when these oscillations are simulated and transmitted, using a highly amplified signal generator signal. If the amplitudes of the artificial oscillations overlap with the natural signals, however, the return rate rapidly decreases. The bees fail to find their way home.

The sensitivity of the honeybee to weather is based mainly on electromagnetic information. When an approaching thunderstorm threatens the bees, flying bees return en masse when the natural 10 – 20 kHz component of the sferics activity increases within a radius of approx. 200 km (WARNKE 1973). The suction performance of the bees also correlates with the approach of the front and the associated sferics (SCHUA, 1952).

And ultimately, bees even use the receptor channel for electromagnetic waves for communication. Russian researchers found in 1975 already that bees generate electromagnetic signals with a modulation frequency between 180 and 250 Hz as they perform their communication dance. Hungry bees react to the frequencies by holding their antennae erect (ESKOV et al. 1976).

Such electromagnetic communication impulses of the antennae when touching another bee can be measured with an oscilloscope (WARNKE, 1989).

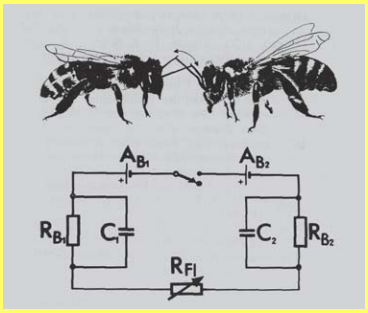


Fig. 3: *Bees communicate via electrical "switching" when their antennae touch. Warnke 1989, Copyright Ulrich Warnke*

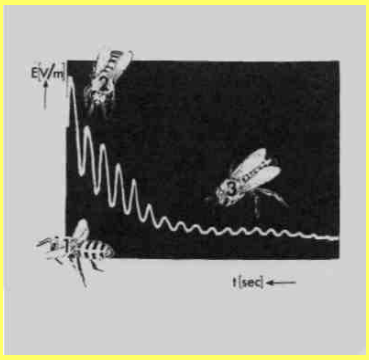


Fig. 4: *Oscillogram of the electrical field of a bee flying past (1). The field strength rises as it approaches a receiver (2) and drops again at a distance from the receiver (3).*
König, H. Unsichtbare Umwelt. Heinz Moos Publishers, Munich 1973. Copyright Ulrich Warnke

Some bird species, such as carrier pigeons, are sensitive to exactly the same electromagnetic oscillation amplitudes as the bees. Birds, particularly species of duck, also communicate by means of electrical fields (WARNKE, 1989). This interesting aspect will be dealt with in more detail below.

3.5 **Humans are also sensitive to weather through electro-magnetic pulses**

The interest in sferics and their effect was greater in the sixties than it is today. In those days, a number of valuable overviews were compiled of their effects on the organism (REITER, 1960; ASSMANN, 1963).

Mammals and man are also influenced by sferics.

Sferics impulses change the tissue pH independent of the amplitude of the field. This is true in the minimal field strengths occurring in nature and also in the laboratory with simulated impulses and increased field strengths. Especially in the frequency band between 2 and 20 kHz, in which the energy of the atmospheric-electrical waves is at a peak, the effect is the strongest. Pain associated with amputations and with brain injury also correlates with the presence of sferics both in the laboratory and in nature (REITER, 1960). The paper by Reiter also contains notes on the triggering of bronchial asthma, heart and circulatory disorders, insomnia, headaches, glaucoma, gall and urinary convulsions, heart attacks and strokes – among other by sferics.

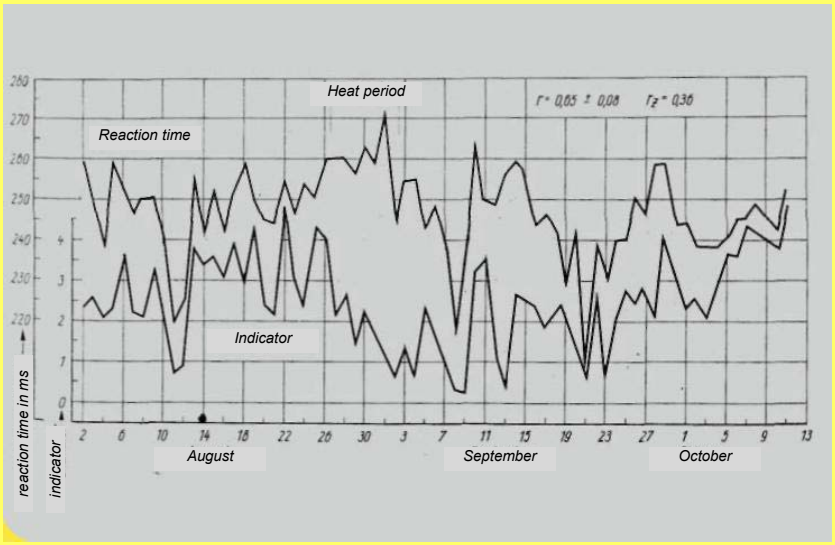


Fig. 5: *Significant linear correlation between electromagnetic very long wave activity and average reaction times of exhibition visitors.*
Reiter, R. 1960 Meteorobiologie und Elektrizität der Atmosphäre. Akademische Verlagsges. Geest & Portig, Leipzig

It has been known for a long time that certain weather conditions give rise to thromboses, heart attacks and embolisms; the correlation is statistically significant (ARNOLD, 1969; BREZOWSKY, 1965). A significant increase in platelet adhesion could be shown with certain electromagnetic oscillations such as those generated by exchange of electrical charge in the frontal regions of the atmosphere. These long-wave sferics easily penetrate into buildings. The mean impulse repetition frequency is in the region of 5-15 imp/sec, i.e. in the biologically active window. Thrombocyte adhesion was measured in subjects in a controlled laboratory study using a sferics stimulator (JACOBI et al. 1975). The result was a highly significant ($p < 0.0005$) increase in adhesive property at a carrier frequency of 10 kHz and an impulse repetition frequency of 10 Hz. The thrombocyte adhesiveness was reduced at repetition frequencies of 2.5 and 20 Hz and with no electrical signals. Pharmaka (75 mg Dipyridamol plus 300 mg Acetyl salicylic acid) prevents sferics-related thrombocyte adhesiveness. Mentally unstable subjects were more affected by the change in adhesiveness than stable ones.

The daily work performance is also correlated with diurnal sferics activity (RANTSCHT-FROEMSDORF, 1962).

After further investigation by Jacobi (1977), the physiologic detector location was found to be in the head. If the head is largely screened from sferics, the thrombocyte adhesiveness disappears under otherwise equal experimental conditions – a result that is not in agreement with the effects of screening found by other researchers.

The fundamental sferics frequency is 7.5 Hz, considering the speed of propagation of the electromagnetic oscillations generated by the lightning discharge and the resonant path given by the circumference of the earth between the earth's surface and the ionosphere. The bandwidth of the fields is several kHz.

The correlation between heart attacks and weak magnetic field variations has been described in 1979 in Nature*, one of the foremost scientific magazines.*

This result is not an isolated case. Other experiments even found a correlation between the average number of deaths and earth's magnetic activity.

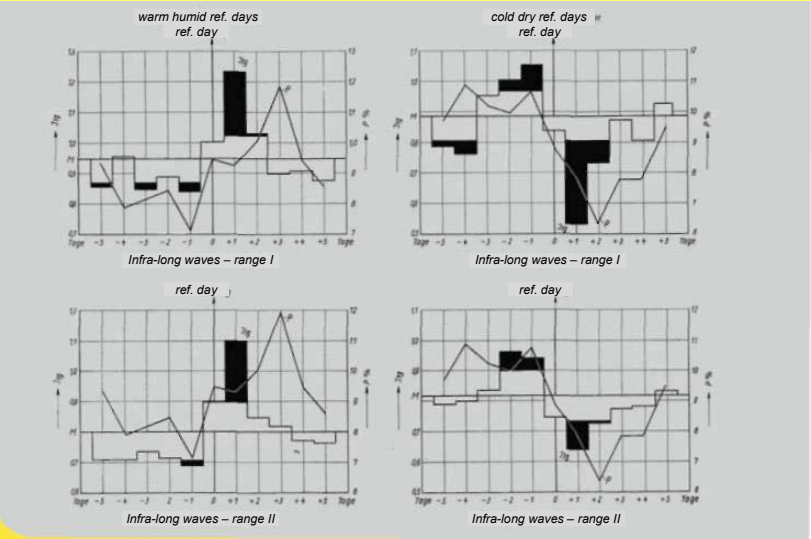


Fig. 6: *Significant synchronicity of very long waves and contracting poliomyelitis. The black bars show days of low (bars downward) or high (bars upward) sferics activity and the superimposed curves show the correlated levels of poliomyelitis contraction in the fifties.*
Reiter, R. 1960 Meteorobiologie und Elektrizität der Atmosphäre. Akademische Verlagsges. Geest & Portig, Leipzig

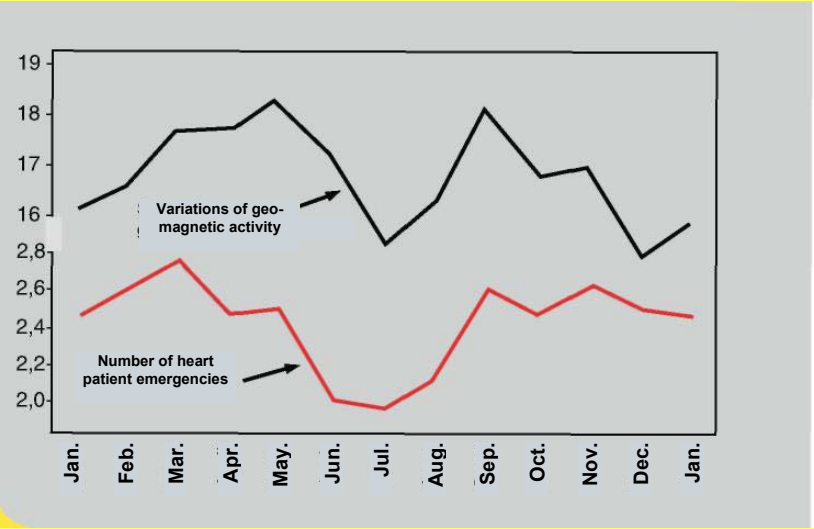


Fig. 7: *Daily emergency hospital admissions for heart attacks as monthly average (bottom curve) and geomagnetic activity (top curve)*
Malin SRC, Srivastava BJ. Correlation between heart attacks and magnetic activity. Nature 1979;277:646-648

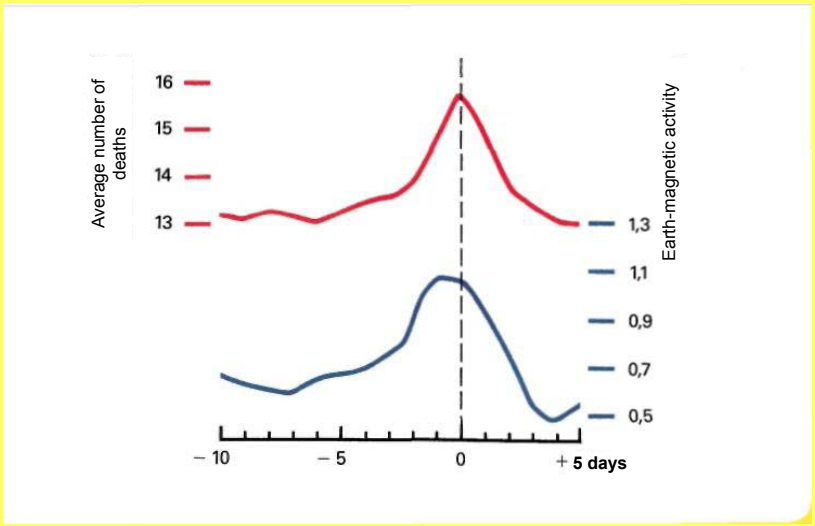


Fig. 8: *Magnetic storms (bottom) and fatalities from nervous and cardiovascular illnesses.*
Weiß 1991

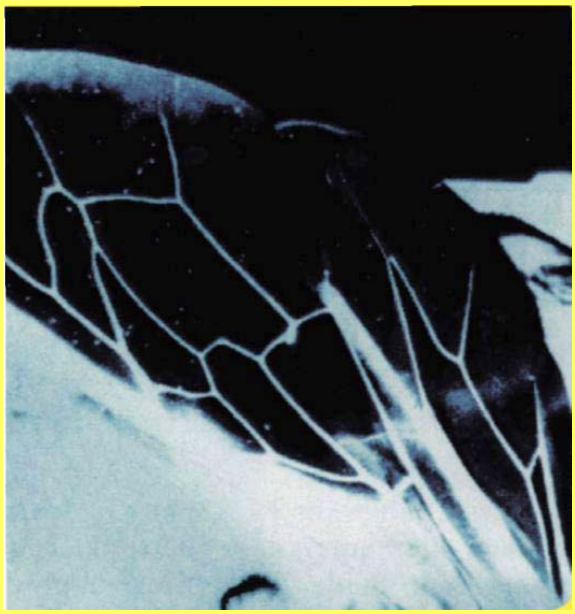


Fig. 9: *Wing of a bee under a scanning electron microscope. The electrical current pattern was recorded. All the white regions have high electron mobility, whilst the darker areas are highly electrostatically charged due to low electron mobility. Discharge is very difficult.*
Warnke 1989, Copyright Ulrich Warnke

3.6 **Bees transmit electrical fields**

Electrical fields with high amplitudes are always in evidence when the unipolar charge accumulations creating the fields cannot be repeatedly neutralised. Charges are easily neutralised when they are highly mobile.

All land-based insects with rigid body shells (cuticula) and also animals with scales, shields, feathers and hair have used these structures to form surfaces that have excellent electrical insulating properties. These body parts have semi-conducting properties and are piezo-electric and pyro-electric – distortion and temperature changes therefore both create electrical effects. The conductivities are therefore subject to the well-known laws of semiconductor theory: temperature changes, light effects, microwave effects, changes to atmospheric ion concentration – all these parameters change the conductivity pattern.

The areas of different conductivity can be shown in a visually impressive way – demonstrated here on a bee's wing - by using a scanning electron microscope with sample current imaging.

In terms of electrostatic charging, it is also important whether the animals are in flight or on the ground. Animals having sweat, scent and adhesion glands afford excellent galvanic contact. Animals walking on hoofs, toes or claws are largely isolated from earth, however.

There is a salient point about different insects. Flies, bees and others have a glandular adhesive pad (arolium) between two toes on their feet. This adhesive pad can be folded in or folded out when walking.

When the arolium is folded in, the animals walk on their claws, insulating them electrically from the environment allowing them to get statically highly charged up. If the arolium is folded out and touches the surface on which it is walking, however, the insect is instantly discharged, assuming the electrical potential of the surface. In bees, this happens just prior to taking off from a flower, in which case certain parts of the animal are discharged or obtain a different charge or sometimes even reverse polarity. Since flowers normally are at earth potential, the "arolium switch" effectively standardises the insect's potential to zero. When the bees arrive at the hive, they carry different charges that they picked up in flight and that cannot dissipate that fast (WARNKE, 1977).

When two surfaces make contact on the molecular level (10 to the power of minus 10 m), positive and negative charges are separated at the point of contact through charge transfer. Many such points are activated in a short space of time by friction. Frictional electricity is one of man's oldest observations and has lent its name to the entire electrical discipline (electron: Greek for amber). It is therefore surprising that we thus far hardly spared a thought for the significance of electricity in animals.

Especially in flight, animals could become statically highly charged through friction between air molecules and body tissue – up to electrical field strengths in excess of 1 000 V/cm.

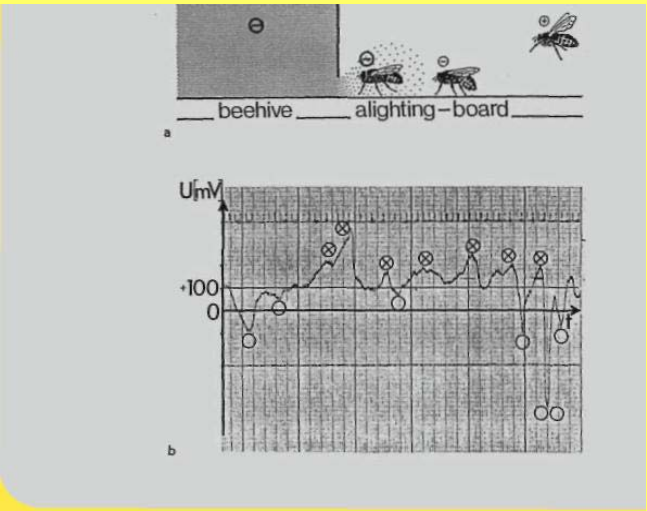


Fig. 10: *Every bee landing at the hive carries a specific charge (circle with cross) thereby changing its pattern of charge at the hive entrance, determined by the total electrical charge of the colony. Every departing bee carries with it electrical charge from the hive (circle).*
Warnke 1989, Copyright Ulrich Warnke

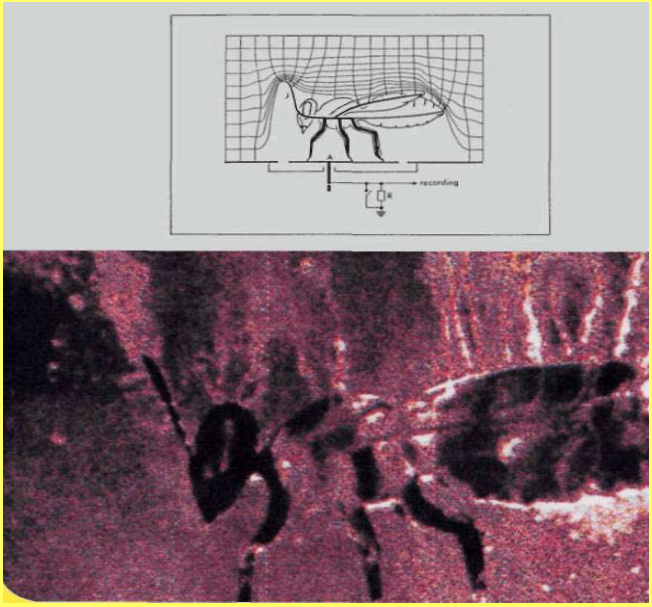


Fig. 11: *A bee in an electrical field; top: a construction, bottom: an experiment. It is shown how the field strength increases around certain surface structures.*
Warnke 1989, Copyright Ulrich Warnke



Fig. 12: *Bee in flight in an electric field. The fields around the antennae are particularly strong.*
Warnke 1986, Copyright Ulrich Warnke

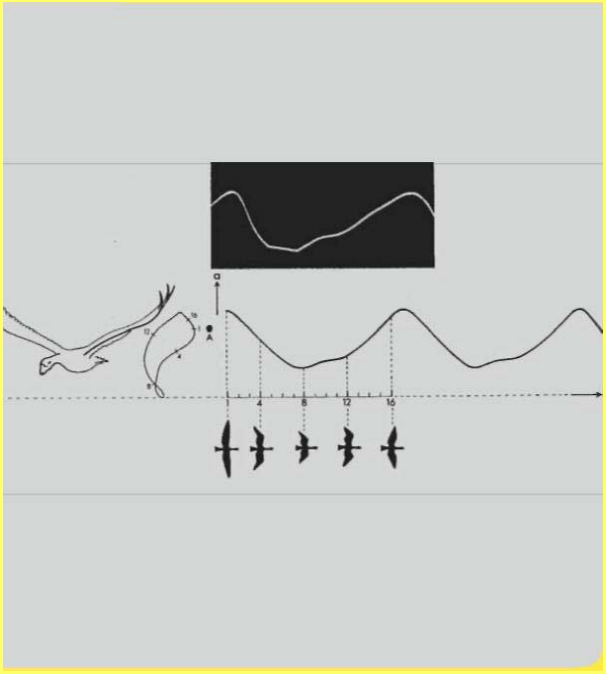


Fig. 13: *Wing movement and the electrical field – with reference to the wing – are in phase.*
Warnke 1989, Copyright Ulrich Warnke

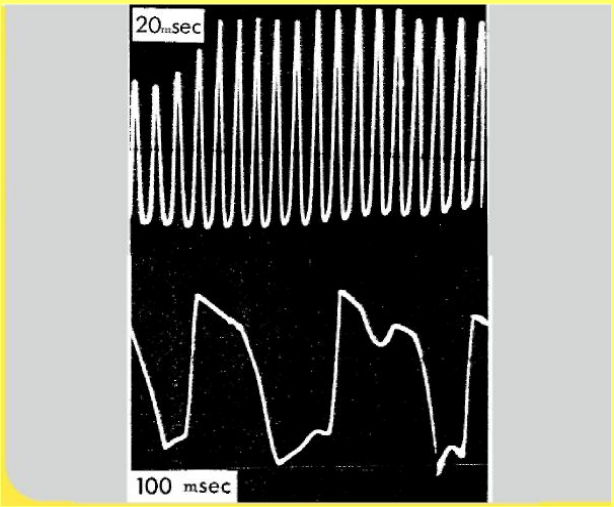


Fig. 14: *Oscillogram of the alternating electrical field around bees (top) and pigeons (bottom) in a wind tunnel.*
Warnke 1989, Copyright Ulrich Warnke

To increase these field strengths, animals have various aids such as protruding spikes on insect wings, but especially the field focussing effect of insects' antennae is measurable, developing appreciable Coulomb forces.

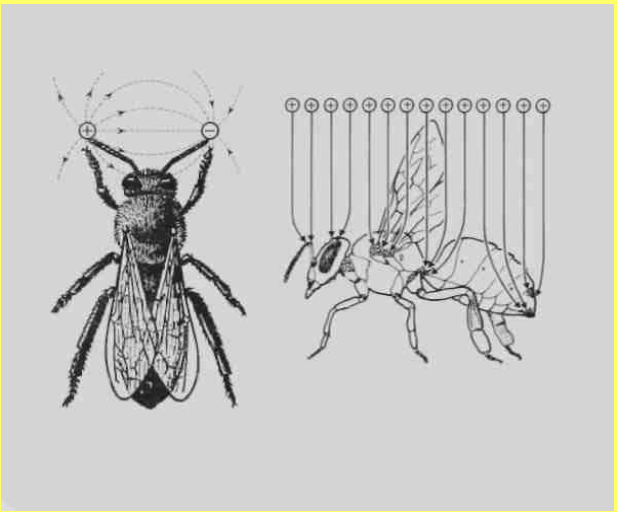


Fig. 14.1*: Representation of a measurable "dipole effect" on the antennae of the honeybee. Bees are able to change the polarity of their antennae at will (e.g. from positive to negative charge) – within a second. The dotted lines are an indication of the forces in the field.*
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3.7 **Effects of technically generated fields on bees**

We investigated the reaction of bees to artificially created electrical fields in the laboratory (WARNKE 1975, 1976, WARNKE et al. 1976) and found the following: 50 Hz AC fields with field strengths of 110 V/cm cause significant restlessness of the bees in their enclosure. The colony temperature increases greatly. The defence of the social territory is uncontrollably increased to the point where individuals in a colony stab one other to death. They no longer recognise one other.

After a few days in the field, the bees tear their brood from the cells; no new brood is reared. Honey and pollen are also depleted and then no longer collected. Bees that were newly established in their hives shortly before the start of the experiment always abandon the hive again and disappear when the electrical field is switched on. Bees that have lived in their hive for a long time, plug all the cracks and holes with propolis, including the entrance. This otherwise only happens in winter in a cold draught.

Since an acute lack of oxygen develops when the cracks and the entrance are plugged, the bees attempt to introduce air by intensive fanning. In this process, the wing muscles generate temperatures high enough to melt the wax. The animals attempt to fight the temperature increase by more fanning. In the end, the colony burns itself out. This implies the death of all members of the colony – which we could obviously prevent in future.

With very sensitive colonies, the reaction signal was measurable from field strengths of 1 V/cm and frequencies between 30 Hz and 40 kHz. When the field is switched on, the animals suddenly move their wings and buzz at frequencies of 100–150 Hz (WARNKE 1973, 1976, WARNKE et al. 1976).



Fig. 15: *Wing section of bees enlarged with scanning electron microscope. Observe the special structures serving to focus the electrical field.*
Warnke 1989, Copyright Ulrich Warnke

With signals in the frequency range of 10 to 20 kHz, the aggressiveness was increased and the homing ability much reduced even though the natural meteorological and electromagnetic environment was intact in the flight space (WARNKE, 1973).

Scientists from the University of Koblenz-Landau conducted several experiments, looking at different aspects and questions, to measure the homing behaviour of bees (Apis mellifera carnica) as well as the development of mass and area of the combs under the influence of electromagnetic radiation (KUHN et al. 2001, 2002, STEVER et al. 2003, 2005, HARST et al. 2006).

They recorded an increase in agility, an increased swarming drive and no winter clustering when under the influence of EM radiation of cordless telephones.

In other experiments with base station fields of the DECT cordless telephones (1 880-1 900 MHz, 250 mW EIRP, 100 Hz pulsed, 50 m range, permanent exposure), the weight and area development of the colonies was slower compared to the colonies that were not exposed to a field.

The homing ability of the bees was tested from five days after the DECT telephones were introduced. There were significant differences in the return times of the colonies that were in the field and those that were not. No more than six of the bees exposed to the field ever returned – sometimes none returned. With the bees not exposed to a field, there were returning bees at any point in time of the experiment.

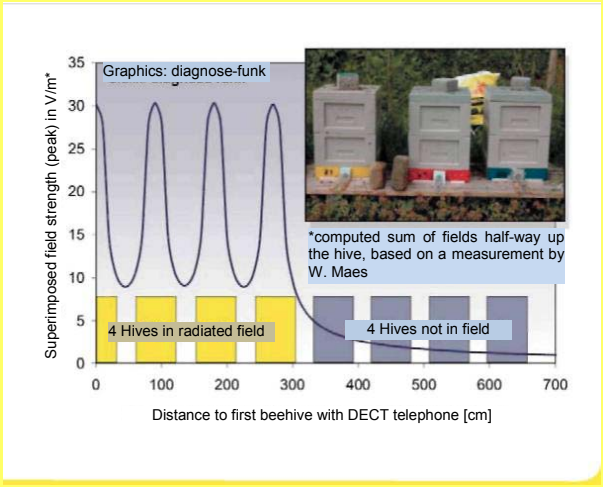


Fig. 16: *Estimated diagnosis radio field strength in the four beehives with and four without DECT telephone installations at the University Koblenz-Landau. The beehives were not electromagnetically screened, implying that the control colonies were also subjected to some field strength.*
Diagnosefunk, http://www.diagnose-funk.ch/impressum.php

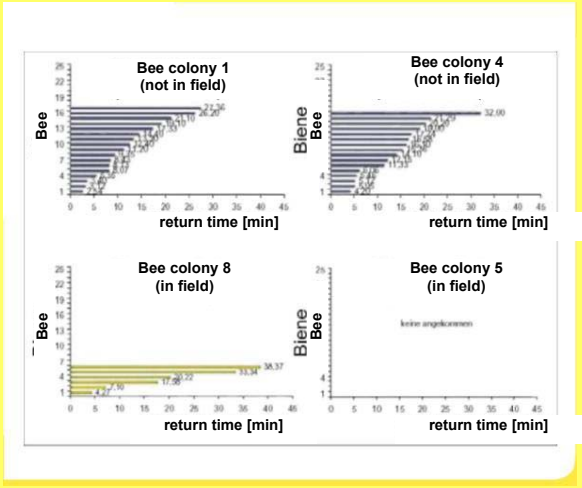


Fig. 17: *Top left and right: return times of bees not subjected to a field; bottom: return times and non-return when subjected to a field. Of the bees from hives not exposed to a field, 40% returned in total, of those subjected to a field only 7% returned.*

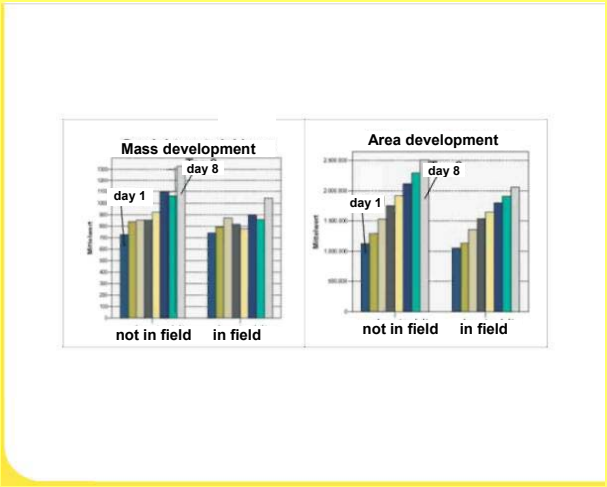


Fig. 18: *Mass and surface development of combs of bees in and outside of a field.*
Harst et al. 2006

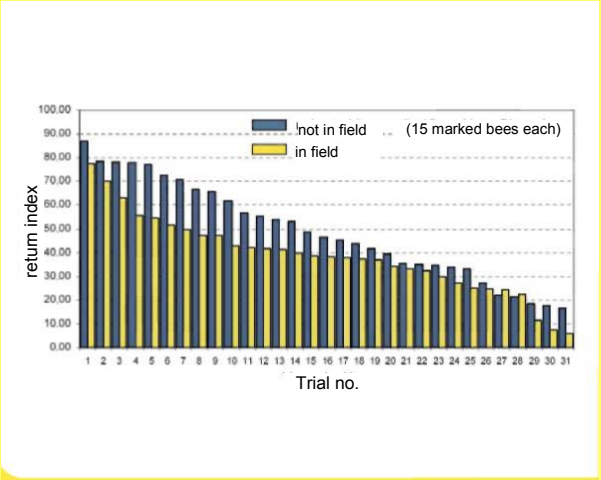


Fig. 19: *Significant difference in the homing behaviour of bees subjected to a field and others. A higher index indicates more returned bees and/or shorter return times.*
Harst et al. 2006

Two earlier NASA financed studies by one of their working groups found neither an increased fatality rate of bees in high frequency fields (2.45 GHz, CW) nor diminished orientation (WESTERDAHL et al. 1981a/b).

3.8 **The highly sensitive region for interference of bees**

If a new food source is discovered within 80-100 m, the bee performs a circular dance on the comb in the hive. If the food source is further away, communication is by means of a waggle dance. This waggle dance of the honeybee communicates information on the direction and distance of the new food source relative to the hive. In this dance, the returning worker bee initially traces a straight line and then dances sideways and down in a semi-circle. She then again starts along the straight and dances a semi-circle downwards again, but to the opposite side. The distance to the food source is given by the number of deflections of the abdomen on the straight (waggling). These waggles can also be measured in the form of electrical and magnetic alternating fields.

The distance to the food source is registered by reference to optical features of the landscape over which the bees are flying. The information on the direction to the food source is given by the angle between the straight line to the food source and the azimuth of the sun in each case. This angle is conveyed in the darkness of the hive via the direction of the dance with respect to the vertical (gravitational vector).

All this can be proven. The credit for discovering this evolved strategy of bee communication goes to the Austrian Karl von Frisch (FRISCH von, 1967). But we know in the meantime that the communication processes are associated with far more complicated mechanisms.

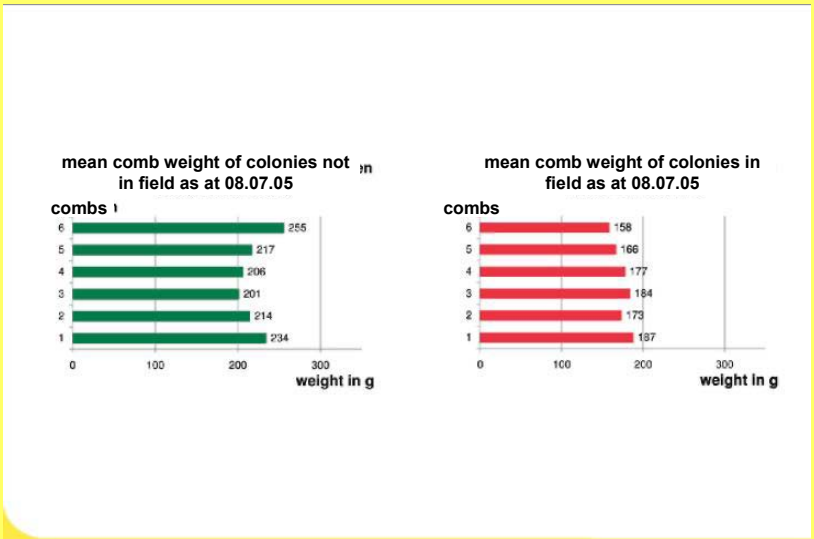


Fig. 20: *Starting with the same comb mass, the average values of the total mass of the colonies subjected to a field and those that were not, were 1326g and 1045g at the end of the test. The difference is therefore 281g (21.1%)*
Harst et al. 2006

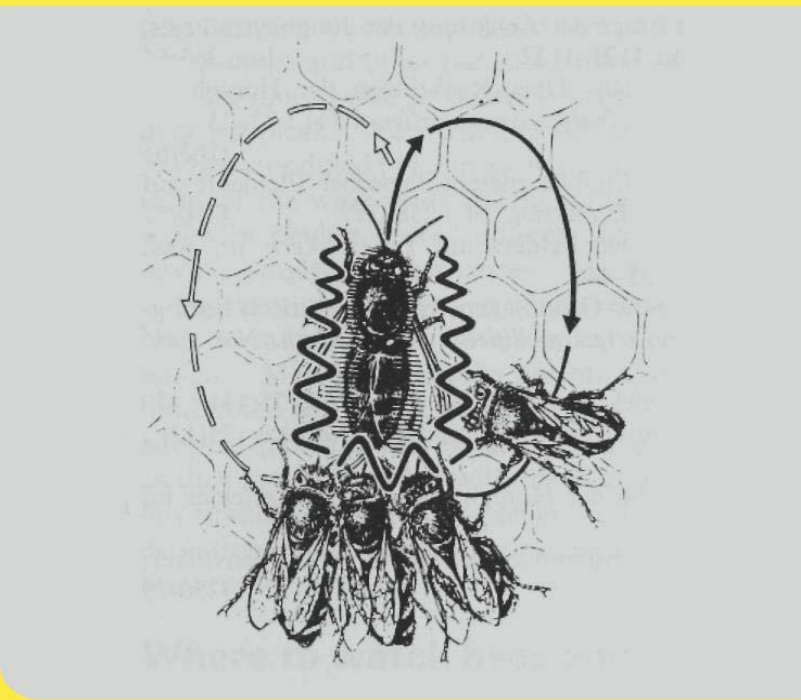


Fig. 21: *The waggle dance of the bees generates electrical oscillating fields.*
Warnke 1989, Copyright Ulrich Warnke

Apart from the position of the sun, the bees can also identify polarisation of the light. And in case of overcast skies, the positions of permanent landmarks are memorised (DYER, 1981).

Navigation to the food sources and back to the hive makes use of other physical quantities, however: these are exactly those quantities that have existed on the surface of the earth for millions of years –taking us back to our subject. How does the bee know the azimuth of the sun at any given moment?

She needs this information to recognise the time of day. And she needs to know about time because many flowers only open at a particular time of day and because navigation is coded via the position of the sun.

The answer to this question illustrates how finely nature has analysed the naturally occurring energies and forces, making these available to the organism. The higher the sun in the sky, the more the atmosphere heats up. The higher the atmospheric temperature, the faster the atmospheric molecules move. The faster the molecules, the more energetic the collisions between them. The larger the collision forces, the larger the air volume and the more intense the turbulences manifesting themselves also as eddies. These eddies ultimately also affect the ionosphere. The increased movement of ions in the ionosphere generates huge electrical currents. These directional electrical mass-flow currents in turn generate strong magnetic fields.

These magnetic fields reach the earth's surface and have a typical diurnal pattern – analogous to the described effect of solar radiation. They are characteristic diurnal magnetic field variations, superimposed on the largely uniform magnetic field of the earth. Exactly these variations can be measured by the bees. And they use these measurements to calculate the azimuth of the sun and the time of day.

In the experiments on navigation and orientation, this magnetic field component is recognised as a so-called "precision error" in the performance of the waggle dance. The expression "precision error" was created when a deviation of the dance direction from the principle described above was noticed, but the influence of the magnetic field was as yet unknown. Since a few decades we now know: the reason lies in the consideration of the magnetic field variation which modulates the direction angle of the waggle dance (KIRSCHVINK, 1981). The "remaining precision error" in the dance disappears if the entire magnetic field is compensated to 0-4%.

The maximum sensitivity of the bee to earth's magnetic variations is around 26 nT. It must be emphasised here already that the system is particularly sensitive in the naturally existing physical range. Significantly amplifying the magnetic field compared to the normal biological range, causes a stronger variation in direction communication. If the field is amplified to 10-times that of the earth's magnetic field, the colony swarms, away from its hive.

The question of how bees sense these magnetic field variations has been investigated in a number of studies (GOULD et al. 1978, 1980, GOULD 1986, FRIER et al. 1996, HSU et al. 1994, KALMIJN et al. 1978, KIRSCHVINK 1992, KIRSCHVINK et al. 1981, 1991, 1997, WALKER et al. 1985, 1989 a/b/c, COLLETT et al. 1994).

To summarise, it may be said that (HSU et al. 2007): The construction of combs and the homing capability of bees change if the bees are subjected to magnetic fields superimposed on the earth's magnetic field. Bees in free flight can sense extremely slight variations of the magnetic field intensity - in the range of 26 nT. They can be trained to magnetic anomalies, but only provided the changes remain stable for a longer period.

Many experiments proved that an accumulation of bio-magnetite particles (Fe_3O_4) serves as receptor of the magnetic field. These iron granules are arranged in a band in the abdomen of the bee. They have a diameter of only about 0.5 μm and are located in special cells, the trophocytes. Magnetite has the effect of amplifying the magnetic variations. If 30% of the intensity of the horizontal earth field component is modulated, the activity of the neurons in the ganglion of the abdomen changes (SCHIFF, 1991).

Apart from super-paramagnetic magnetite, FeOOH was also found in the abdomen. Magnetic material was also shown to be present in the antennae, head and claws of stingless bees.

The iron granulates are enclosed in small vesicles, touched by a cell framework. As in higher organisms, microscopic filaments (micro-tubules) serve as the cell framework. The vesicles also contain some phosphorus and calcium together with the iron. The density of the iron granules is 1.25g/cm^3, that of the Fe_30_4 magnetite is 5.24glcm^3.

Where does the magnetic material come from? Most of the iron originates from pollen (approx. 0.16 µg/mg) (BOYAIN-GOITIA et al. 2003). If an additional magnetic field is applied to the bee, the size and shape of the biomagnetic granula changes (HSU et al. 2007). These changes are detected by the micro-tubules and micro filaments, and the trophocytes thereafter secrete more Ca^{2+}. The fat cells of the bee also show this effect, but much less so than the trophocytes. It has been known for a long time that cells secrete Ca^{2+} under the influence of a weak magnetic field; macrophages, for instance (FLIPO et al. 1998), astrocytoma cells (PESSINA et al. 2001, ALDI-NUCCI 2000) and chrome-affine cells (MORGADO-VALLE et al. 1998).

It is also known that the Ca^{2+} secretion can be triggered by many different cell changes such as changes to the structure of membranes, changes to the electrical membrane and cell surface potential and changes to the structure and distribution of protein within the membrane. The magnetic field can stimulate two mechanisms for increasing the Ca^{2+} content in the cells: firstly by opening Ca^{2+} channels and by increased flow of external molecules into the cell; secondly by an increased release of Ca^{2+} from storage inside the cell (IKEHARAA et al. 2005, PETERSEN 1996). This explains the increased accumulation of Ca^{2+} in fat cells.

The magnetite mechanism amplifies the effects tremendously (SCHIFF, 1991). The property of the granules, to expand in an external magnetic filed, turns them into magnetic field sensors (TOWNE et al. 1985). The affected micro filaments make contact with the cell membrane (HSU et al. 1993, 1994), affecting signal transfer into the cell.

If the colchicine and latrunculin B toxic substances, known to shut down the micro-tubules and micro filaments, are administered, then an additionally applied magnetic field will not increase the Ca^{2+} in the cells.

A model of the magnetic field orientation is therefore as follows: If the bee flies parallel to the magnetic field lines, the magnetic granule vesicles will expand; if she flies vertically to the field lines, the granules contract. This change of shape is sensed by the cyto-framework and communicated to the membrane.

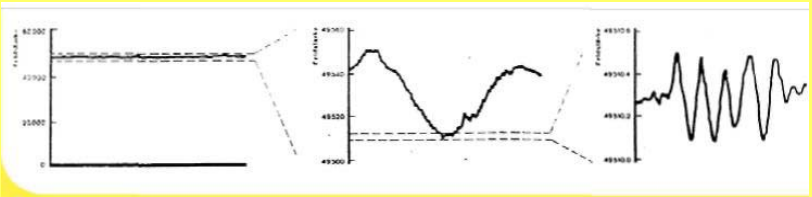


Fig. 22: *Variations in earth's magnetic field: Sensitivity of the measurements increased a 1000 times in each case. Diurnal rhythms and micro-pulsations are visible, utilised by bees and other organisms for orientation in space and time.*
Warnke 1978

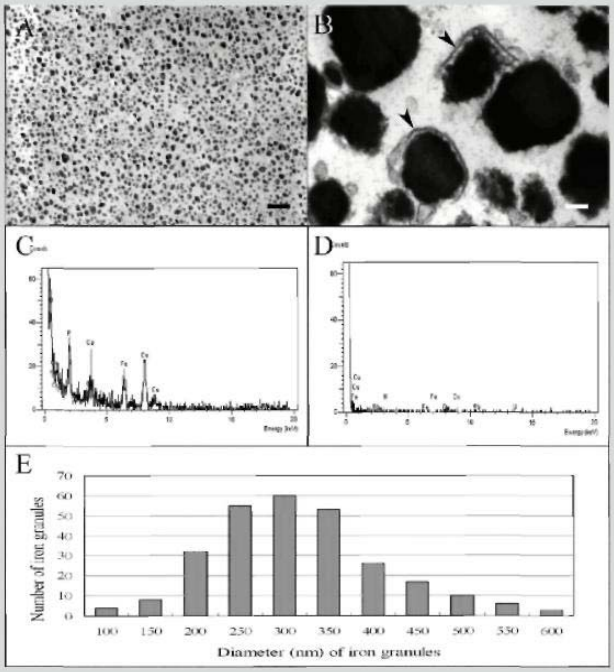


Fig. 23:
A) Iron granules in the trophocytes of the honeybee (bar: 1 µm)
B) Iron granules enclosed in lipid membranes (bar: 100 nm)
C) and D) Energy dispersing radiation analysis of the granules; they contain calcium, phosphorus and iron.
E) Histogram of the granule sizes.
Copyright by: HSU, C, KO, F., LI, C, LUE,1 Magnetoreception System in Honeybees (Apis mellifera) PLoS ONE 2007;2(4): e395

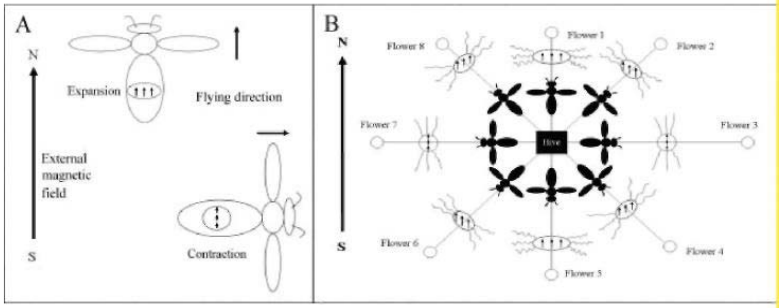


Fig. 24: *Schematic of the magnetic field orientation of a bee through use of the magnetic granules.*
Copyright by: HSU, C, K0, F., LI, C, LUE, J. Magnetoreception System in Honeybees (Apis melliferal PLoS ONE 2007;2(4): e395

That is where Ca^{2+} channels are correspondingly opened or closed. This signal transfer results in a magnetic field map for the duration of a flight, that can be used for orientation – particularly also for returning home, by reversing the time sequence of the magnetic field (RILEYet al. 2005, MENZEL et al. 2005). It is extraordinary that, in this process, variations of 26 nT can be sensed against the background of earth's 45 000 nT.

This model explains:

1. *The flight from the hive to the food source must be in a straight line. Bees navigate by means of a memory map (RILEY et al. 2005, MENZEL et al. 2005).*
2. *During the known circular orientation flights, the magnetic field is mapped over 360°. It is known that the orientation flight is indispensable for successful return to the hive (BECKER 1958, CAPALDI et al. 2000, WINSTON 1987). Nature arranged this similarly to the pigeons, who also circle several times before flying towards their goal.*

3.9 Constant change in the magnetic environment makes learning impossible for the bees

Bees learn the patterns of the landscape they fly over and also use the magnetic field to differentiate. This is always the case when other orientation aids such as sunlight are covered by clouds. The optical patterns are therefore also associated with a magnetic coordinate (FRIER et al. 1996).

Bees may be conditioned to magnetic deviations from the normal earth magnetic field (WALKER et al. 1989a); they can also be trained to recognise small changes in the earth's magnetic field (WALKER et al. 1989b). It is a prerequisite that the change in the magnetic field remains constant over the learning period. If the field varies continuously, learning becomes impossible.

But this is exactly the situation the bees find themselves in, with wireless communication fields. The magnetic component is continuously changing – during the day and at night.

3.9.1 HAARP changes the natural diurnal variation of the magnetic fields

The information on the HAARP project is thanks to Guy Cramer (USA); it was made available to me by Joris Everaert (Belgium).

HAARP (High-frequency Active Auroral Research Project) is the abbreviation for a military project of the US Air Force and Navy. 180 towers have been erected in an uninhabited area near the city of Gakona in Alaska, together constituting an antenna complex. The frequency is around 2.5-10 MHz and the power is extremely high at 3 million Watt ("high power, high frequency phased array radio transmitter"). This is the strongest technical transmitter on earth. Its effectiveness is increased by linking the antenna array with another antenna array in Alaska, via HIPAS (High Power Auroral Stimulation). The transmitters communicate with submarines deep in the ocean and scan the horizon as a type of deep earth radar.

But the frequencies are also absorbed by the ionosphere. They heat up certain layers, creating ion turbulences by day, that are modulated onto the earth magnetic field as unnatural magnetic fields. This masks the regular effects the sun has on the ionosphere. As such, the bees lose an orientation that served them for millions of years as a reliable indicator of the time of day – encoded in the regular variations of the magnetic field changes as the sun rises and the ionosphere temperature rises.

The effects of the HAARP transmitter activity should be further investigated especially in Canada, the USA and Europe. Since the disappearance of the bees was first documented in precisely these countries, a causal relationship can no longer be excluded. The following simultaneous events tend to confirm this: In 2006, the increase of the transmitting power from 960 000 Watt to four times that power (3 600 000 Watt), was approved for the first time. Exactly in this year, reports originated in all the "scanned" transmission regions of the disrupted homing ability of bees.

Another disruptive effect may play a role. Through the irregular heating of the ionosphere, the air at great heights begins to “glow”, with visible frequencies in the near infrared region (630 nm) and the associated magnetic field can be detected at the earth’s surface (PEDERSEN et al. 2003, RODRIGUEZ et al. 1998).

Since the bees use not only the UV component of sunlight for orientation, but also the longer infrared wavelengths (EDRICH et al. 1979, VAN DER GLAS 1977) the new light in the sky may also be a new disrupting stimulus to them.



Fig. 25: *HAARP location and construction.*

3.10 **Disrupted NO system damages learning ability, olfactory orientation and the immune system**

In following, we will further detail the significance of the (NO) system and the consequences of its disruption – in other experimental animals and particularly also in humans. The salient fact is that the NO system is affected by magnetic and electromagnetic oscillations and may in the worst case become totally disrupted - finally destroying molecular functions.

As in mammals, nitric oxide (NO) normally acts as a carrier of information in insects as well. The synthesis and excretion of NO is particularly high in the insect brain. In bees, NO plays a role in the ability to smell and in learning processes (MÜLLER, 1997).

As proven in humans, if the NO system of bees is disrupted through the effect of technical magnetic fields, they lose the ability to orientate themselves by smell and the vital learning programme also becomes defunct. But since NO also materially controls the immune system, disruptions to the NO household always affect the immune defences of the organism as well.

Dennis van Engelsdorp of the American Association of Professional Apiculturists (University of Pennsylvania), in his report on the investigation into the disappearance of bees, says: *“We have never seen so many different viruses together. We also found fungi, flagellates and other micro-organisms. This multiplicity of pathogens is confusing.”* It is also striking that the excretion organs of the bees are affected. Dennis van Engelsdorp suspects that a weakened immune system may be behind the mysterious phenomena (VAN ENGELSDORP 2007). But he rightly asks: *“Are these agents the causative stress factor or the consequences of a totally different stress?”*

Diana Cox-Foster, a member of the CCD working group, says: *"It is very alarming that the deaths are associated with symptoms that have never been described before".* It appeared that the immune system of the animals had collapsed and some bees suffered from five or six infections simultaneously. But dead bees are nowhere to be found (Spiegel 12/2007).

3.11 **Birds sense high frequency transmitters**

Birds also sense high frequency transmitters very clearly and belong to the group of animal species that reacts very sensitively to electromagnetic fields. They absorb the impinging energy particularly intensively via the feathers of their wings (CHOU et al. 1985, VAN DAM et al. 1970, BIGU-DEL-BLANCO et al. 1975 a/b).

How sensitively and promptly they react can be demonstrated by an example. Chicks exposed to a high power microwave field flee within seconds (TANNER, 1966). Investigations have, in particular, also shown how strongly microwave radiated fields affect the behaviour within a flock (WASSERMANN et al. 1984). It has repeatedly been observed that flocks of migratory birds split up when nearing a power station, to circumvent the station as if avoiding an invisible obstacle, only to re-unite again in flight afterwards. Technical disturbances in the frequency range of natural sferics, but with higher amplitudes, cause massive loss of orientation in migrating birds. The V-formation of cranes, for instance, is disrupted as they fly over transmitter stations. This phenomenon is particularly pronounced over water surfaces parallel to the flight path, which reflect electromagnetic waves.

Researchers have for a long time been pondering on how flocks of birds and also insect swarms and schools of fish stay together. It is surprising, for instance, that large flocks of starlings in an area of an estimated 500 m^2 or more, packed with birds, can perform complex flying manoeuvres within 5 milliseconds. But how can the animals, each at a different location in the flock, receive and react to signals in a short time? Transmission by sound would require more time and visual observation of a lead animal is blocked by other animals.

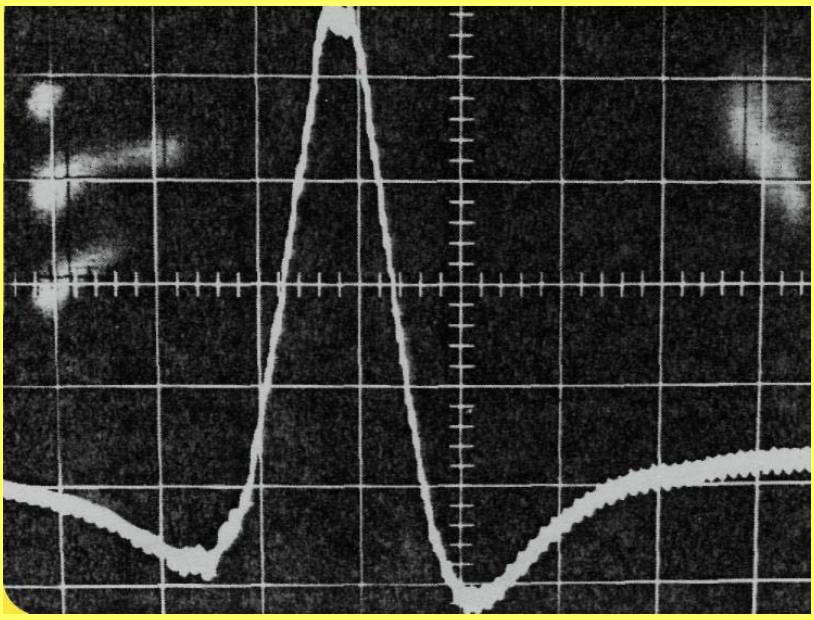


Fig. 26: *Electrical field of a passing flock of birds. The small superimposed oscillation is interpreted as interference by the beat of individual wings.*
Warnke 1989, Copyright Ulrich Warnke

A hypothesis that the flying manoeuvres were coordinated by electromagnetic signals therefore appeared reasonable. Such a signal, propagating at approximately the speed of light, could reach all individuals at the same time and independent of their position. This hypothesis appears more plausible when taking into consideration that the flying animals are highly electrostatically charged.

We were able to record by oscilloscope that the electrical field caused by the aggregation of animals resulted in a predominantly positive overall electrostatic field. The figure also shows the very small wing beat modulation compared to the total electrical field. This modulation can be explained as a “beat” resulting from all the individual wing beats.

This beat frequency is always smaller than the wing beat frequency of an individual. The maximum beat amplitude is always much larger than the individual wing beat amplitude, however. The measured values are dependent on meteorological conditions and the geometry around the measurement.

These data allow us to conclude that flocks of small birds flying at a height of about 40 metres are electrically charged to more than 6 000 Volt. We can only speculate about the type of coded signals given for direction changing manoeuvres. It appears that each individual bird has a set beat frequency and amplitude that is corrected immediately it weakens, by changing the direction of flight.

There are presently two theories explaining the typical wedge-shaped flight formation of larger birds:

One of these assumes unhindered contact and simultaneously minimum danger of collision. The other relates aerodynamic advantage to energy economy. The first theory is based on experience with formation flying of military aircraft; the second is based mainly on calculations.

Both theories leave a couple of questions unanswered, however. How sensitive is the system to cross-winds? When a critical wind speed is exceeded – should turbulences behind the wings not distort the formation or even break up the flock? Why do the members of the flock not permanently remain in the minimum energy zone? And why is there never a formation in reverse – open to the front? Can the recognisable geometric particularities of the total formation, considering species-specific bird size and typical distances, be explained by wing-induced updrafts?

In the following, our theory of biologically sensible formations, published 25 years ago, is repeated. It describes a functional system of nature that is largely immune to meteorological interference parameters. Electrical and magnetic external fields can, however, completely destroy the formation by superposition on the biological system's own fields.

The system we are discussing allocates a position to each animal, but also considers all the flying members of the formation. It could also be identified by the analysis of formations filmed in nature. Let us inspect some facts in more detail.

Bird species flying in formation generally maintain a typical order, even in the case of only two birds flying:

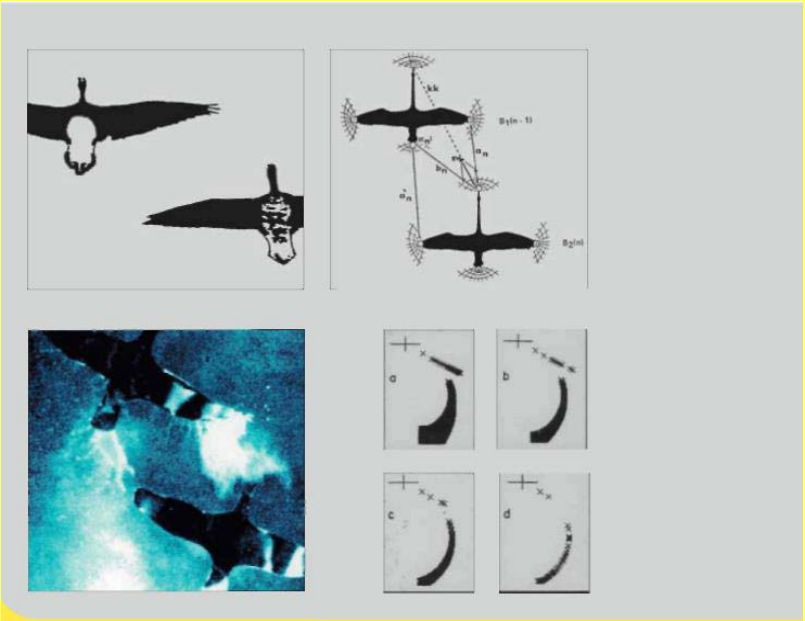


Fig. 27: *Birds use electrical fields for formation flying. Top left: Two geese in formation flight. Bottom left: Experimental model to visualise the electrical field forced between these birds. Top right: Vector diagram of the field distribution. Bottom right: Calculation of the position of the bird behind with reducing degrees of freedom a-d.*
Warnke 1989, Copyright Ulrich Warnke

The second bird flies laterally displaced behind the first. The electrical force relationships in space are in agreement with the electrical forces determined experimentally and depicted schematically in Fig 27. The highest field strengths are at the bill, the tail and the wing tips. Referring to the bird at the back, the bill-head region is charged in the alternating field of the wings of the first bird, creating an increased force field. Simultaneously, however, the wingbeat of the bird at the back induces charges in the tail region or the extremities facing backwards and resting against the body of the first bird. There is therefore a force field between these body parts as well. The respective induced charges are coupled - as shown in the model – by the electrical field. The balancing charges of opposite polarity, released from the former equilibrium, are free to move. They generate an effective new and measurable field. The bird under consideration, i.e. the second one, therefore not only received induced charges from the first bird but also indirectly - i.e. via the tail end of the first bird – originating from itself.

The field strength diminishes approximately as the square of the distance from the inducing charges. The magnitude of the active forces is therefore a function of the distances. Each bird is connected to every other bird via electrical fields of a certain amplitude and direction. These fields can be calculated for each species of bird – yielding the typical formation.

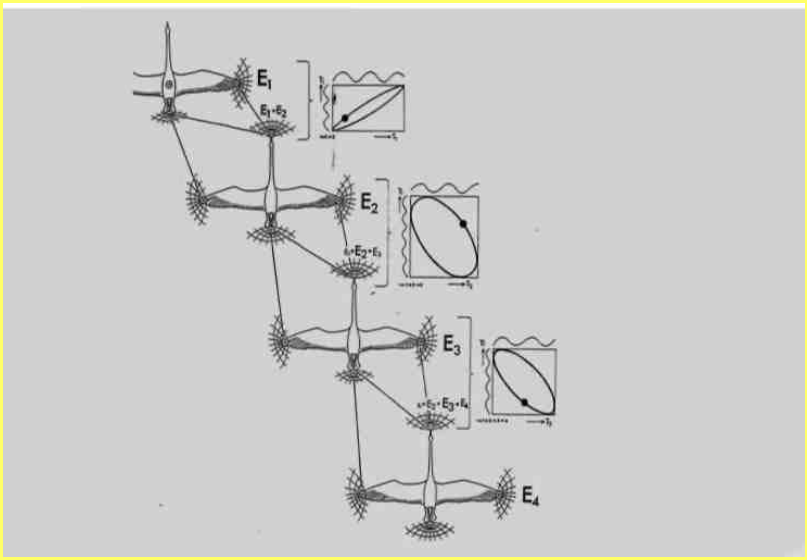


Fig. 28: *V-formations can be constructed by means of an equation that I developed on the basis of physical laws. Comparisons with photographs of natural bird formations show that the assumptions are correct: The formations are given by the Coulomb forces between birds that are electrically charged in flight.*
Warnke 1989, Copyright Ulrich Warnke

It is significant that long necked birds in particular, tend to fly in formation. Their long neck offers the advantage that the detectors in the head region – such as the highly sensitive mechanoreceptors, which also respond to the electrical field forces, can receive signals in flight largely free from the interference of their own body. Observations of their flight behaviour show that the head region compensates for all the movements of the body itself, thereby not having any own oscillations.

Electromagnetic fields therefore have a role to play in formation flying of birds as well. They serve as orientation and navigation aid and determine the position of a single animal in the flock. Depending especially on wing width, wing span and body length, our observations and calculations show that the biophysical relationships influence the species-typical V-formation flying of flocks. Computer calculations of the flight order allow us to predict natural formation flights. And photographic records, vice-versa, also agree well with computer simulations.

The observations demonstrate a unique information and orientation system of the animal kingdom. But they also explain why this is destroyed by the interference of technically generated electrical and magnetic fields.

Due to interference, it would not be possible to measure the magnetic field of the earth inside a flock of birds and its periodic variations caused by the individuals. The reason lies in the moving electrical wing charges, not only generating a weak magnetic field component (induction B approx. 0.01 pT), but also inducing voltages in neighbouring matter – like an AC generator. Only the bird flying at the tip of the formation will perceive a largely undisturbed earth magnetic field component for navigation, independent of changing superpositions - provided it is sufficiently far removed from its compatriots. The remaining animals must therefore do without own navigation mechanisms and couple themselves to the birds flying in front via an electromechanical reception channel.

The birds fly straight ahead, i.e. in the desired migration direction, if the direction of the total electrical force corresponds to the direction of the connection to the head of the bird flying in front. The connecting line between heads is visible by day and can be localised by night through calls.

The recognition of direction and magnitude of the electrical total force vector is by highly sensitive mechanoreceptors at the circumferential edge of the bill. Magnetite was also found here: Through ferromagnetic resonance, magnetite is an excellent absorber of microwaves in the 0.5-10.0 GHz band. Superimposed modulations can be transformed into acoustic vibrations via the magneto-acoustic effect (KIRSCHVINK, 1996).

Correspondence of the direction of the electrical force with the head-head line assigns to each bird a prescribed position in his flock; this position can be mathematically expressed and accurately calculated. All the results of the 22 formations investigated so far confirm the theory. It may be concluded from these data that the birds' electrical characteristics have an important biological function for transfer of information (WARNKE, 1978, 1984, 1986, 1989).

3.12 **Magnetite and free radicals as a magnetic compass**

Artificial oscillating magnetic fields deny migrating birds the possibility to orientate themselves. The investigation covered the effect of either an electromagnetic frequency band of 0.1 – 10 MHz, or a single frequency of 7 MHz, both superimposed vertically on earth's magnetic field. These investigations again showed that not only magnetite was required for orientation and navigation but that other mechanisms such as free radicals, played an important role as well.

Because the frequencies used in the experiments correspond to the transition energy from singlet to triplet in free radicals. The animals can obviously utilise this mechanism for orientation by targeted control (RITZ et al 2004).

The following overall picture emerges: The magnetite crystals found in the bill of the animals indicate the intensity of the magnetic field. But the animals receive complementary information on the direction of orientation via the free radical levels. Using these data, they are able to know at each stage of their flight what their instantaneous location is with reference to their biological magnetic field (WILTSCHKO etal. 2005) map.

If migrating birds are subjected to a stronger magnetic impulse, they will change their direction of flight. They can even be sent in the exact opposite direction with artificial fields superimposed on earth's magnetic field. Magnetic impulses convey information on the direction of migration; generated false impulses can also corrupt the migration direction (WILTSCHKO et al 2006).

Summary
Bees and other insects, also birds, utilise the magnetic field of the earth and electromagnetic high frequency energy such as light. Through free radicals and simultaneously reacting magnetite conglomerates they can orientate themselves and navigate. Technically generated electromagnetic oscillations in the MHz region and low frequency magnetic impulses consistently disrupt the natural orientation and navigation mechanisms they were given through evolution.

The following can be concluded from the results of studies by other working groups and from own investigations:

1. The chitin shell of bees' and birds' feathers are semi-conducting and have piezo- and pyro- electrical properties. These body parts transform pulse-modulated high frequency into mechanical acoustic oscillation frequency. One of its important functions is the dielectric sensitivity to electromagnetic fields in the microwave region.

2. The presence of magnetite particles in the nano-range was shown in the abdomen of bees and the head region of birds. Through ferromagnetic resonance, magnetite is an excellent receiver of microwave radiated fields in the 0.5 to 10.0 GHz frequency range. In this way, pulsed microwave energy is transformed into acoustical vibrations (magneto-acoustic effect).

3. It was shown that free flying bees are capable of detecting magnetostatic fluctuations and extremely low-frequency magnetic fields with very weak inductions (from 26 nT) against the background of the 30 000 – 50 000 nT magnetic field of the earth.

4. Magnetic field impulses oriented parallel to earth's magnetic field lines, with repetition frequencies in the region of 250/sec. are responsible for clear precision errors of up to +10% in the orientation dances of bees.

5. The levels of magnetic induction in today's technically distorted environment are generally between 1 nT and 170 000 nT in the low frequency region and between some nT and a few thousand nT in the high frequency region. These values therefore generally exceed the threshold sensitivity of bees for magnetic field changes.

6. In honeybees, the NO system in the antennae has a function in the sense of smell and in learning processes. Disruptions of NO production through magnetic fields and electromagnetic oscillations have thus far been proven only in mammals. Expectations are, however, that the mechanism of disruption is the same in insects. In this case, the sense of smell and learning processes in the orientation of bees would be severely impaired.

In any event, if all the scientifically proven facts are considered, it is clear why wireless communication technologies, with their overall density of superimposed electrical, magnetic and electromagnetic fields, should disrupt the orientation and navigation of many birds and insects – above all, that of the bees.

4. **Humans suffer functionality disorders**

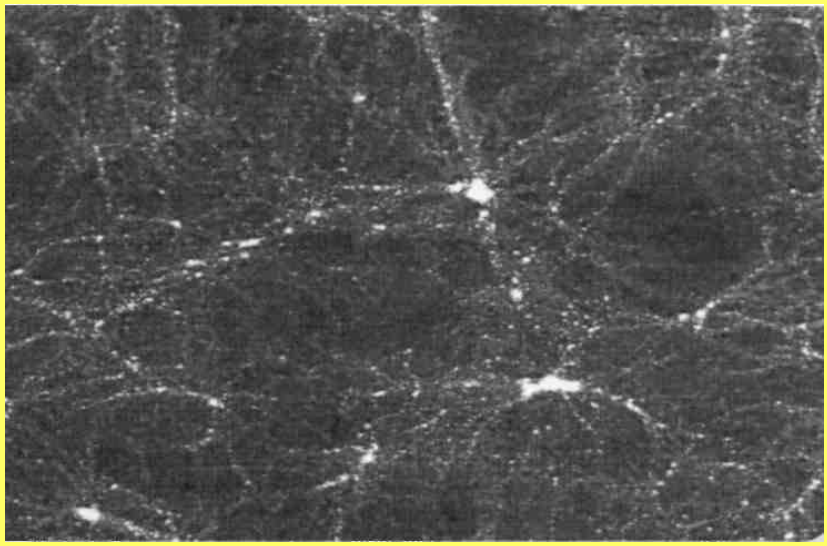


Fig. 29: *All flying organisms and also other animals, including humans, are caught up in an "impenetrable" network of electromagnetic oscillations and fields. The superpositions illustrated in this model result in points of particularly high power density or field strengths.*
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Humans do not have sensory organs via which electrical and magnetic energies can be detected. But these energies nevertheless envelop humans as a tightly woven net of electromagnetic oscillations and radiating fields.

We recognised the problem in the seventies already in connection with our bee experiments and called it, in our laboratory jargon, "electrosmog". The name has established itself, also via the media.

It has in the meantime been proven that humans too can transform the specific energies and forces into information, without having a specific sensory organ to do this. But the question up to now has always been: How do they do it? And to what extent can the fields damage our health?

Let us first ask what the direct effect is on humans of the high frequency energy that is spread almost uniformly across the globe for communication purposes, and then investigate whether the subjectively frequently repeated claim that this is damaging our health can possibly be true.

This requires the following steps:

1. **Finding trends:** *Do we have scientific literature causally correlating the epidemiologically recorded data on functional disorders and symptoms of disease in a human study group with the exposure to electromagnetic fields in the mobile radio and wireless communication range?*
2. **Finding a causal mechanism:** *Can a plausible mechanism be found that can explain functional disorders and disease systems as the result of exposure to these electromagnetic fields?*
3. **Proof of health disorder and subsequent damage:** *Can the function disorder as described be scientifically proven to be the result of subjectively described disease symptoms?*
4. **Excluding a nocebo effect** (unfounded expectations that negatively affect health): *Do we have sound scientific procedures, such as the double-blind method, showing that the symptoms of illness are not "imaginary" and are generally rapidly reversible after the physical stress fields have been "switched off"?*

The answer to these four questions will determine whether subjectively described symptoms of illness can be ascribed to a collective nocebo effect or whether those responsible are required to face consequences.

4.1 **On the question of finding trends**

Do we have scientific literature causally correlating the epidemiologically recorded data on functional disorders and symptoms of disease of an organism with the exposure to electromagnetic fields in the mobile radio and wireless communication range?

The answer is not treated in detail here, because it has been dealt with on several occasions elsewhere (WARNKE, 2005).

To summarise, it must be noted: There is a body of differentiated scientific literature that identified a causal correlation between epidemiologically recorded data on functional disorders and symptoms of illness of the human organism, and exposure to electromagnetic fields in the range of mobile radio and wireless communication. We therefore have an unassailable trend result.

4.2 On the effective mechanism

Can we identify a plausible effective mechanism that causally explains functional disorders and symptoms of illness as the result of exposure to electromagnetic fields?

The answer to this question does not only affect humans but analogously also birds and bees in many respects. It exposes an effective mechanism that has attracted our attention on several occasions before: The disruption of the nitrogen monoxide (NO) system. There are probably other effective mechanisms as well. But we shall only differentiate and elucidate the effective relationships of this mechanism at this point.

Nitrogen monoxide (NO) is a gas and free radical (contains unpaired electrons) that evolution has deployed as a regulator of vitality very early already – even in bacteria. This extremely important and indispensable gas is only beneficial to the organism, provided a) a certain concentration is not exceeded and b) there is no degeneration to so-called reactive nitrogens and reactive oxidative species (RNS and ROS) – i.e. no cascade-like release of newly formed free radicals and poisonous substances.

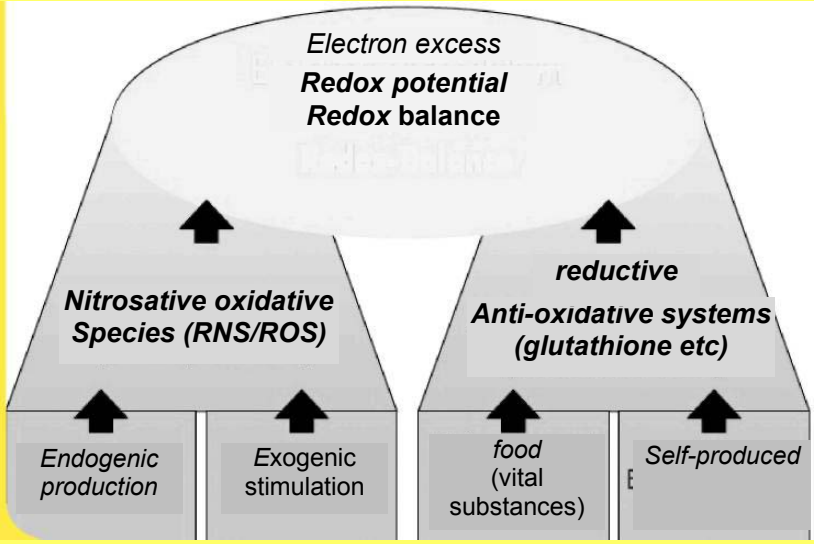


Fig. 30: *Substances with an excess of electrons are indispensible for metabolism if humans and many animals want to remain healthy. Electromagnetic oscillations destroy this electron excess and form nitrosative-oxidative species (RNS/ROS). The situation is fatal to a person if anti-oxidants are also absent in the diet.*
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4.2.1 Disruption of the redox balance

The NO system is closely related to the so-called redox system, which is extremely important to our molecular functions. What does this mean? Every organism needs a balanced ratio of electron excess and electron deficiency. This is also called redox balance. Oxygen compounds neutralise electron charges, causing "oxidant stress". Oxidant stress is particularly intensive if free radicals and reactive oxygen species (ROS) (e.g. superoxide anion, hydrogen-peroxide) and reactive nitrosative species (RNS) (e.g. peroxinitrite) largely prevent the antioxidative processes from re-establishing an adequate electron charge.

Shifting the redox balance towards oxidation may now result in cell damage. Oxidation may, for instance, damage unsaturated fatty acids, proteins and DNA, but particularly also the membrane – with serious consequences for heredity, energy creation and immune response.

Exposure to electrical, magnetic and electromagnetic fields disrupts the redox balance through oxidant/ nitrosative stress. This can no longer be denied in the face of many in vitro and in vivo experiments – also in humans.

Latest results on the creation of oxidant/nitrosative stress through mobile radio frequencies

Human blood cells exposed to mobile radio in standby mode show increased quantities of free radicals, resulting in lipid peroxidation (MOUSTAFA et al. 2001).

In rabbits and cells of other origin, the activity of the SOD enzyme, which neutralises free radicals, increases when exposed to mobile radio (IRMAK et al. 2002, STOPCZYK et al. 2002).

The damaging oxidative processes and NO are increased in rat brains exposed to mobile radio fields; they can be alleviated again by administering antioxidants (Ginko biloba) (ILHAN et al. 2004).

The damaging oxidative activity is increased in the skin tissue of rats exposed to mobile radio fields; this can be alleviated by administering the melatonin hormone (AYATA et al. 2004).

Acute exposure to unmodulated 930 MHz electromagnetic fields in vitro, increases the oxidant stress level in rat lymphocytes treated with iron ions (ZMYSLONY et al. 2004).

Kidney tissue of rats shows increased levels of free radicals when exposed to mobile radio fields. The damaging effects can be alleviated through various antioxidants (OZGUNER et al. 2005). The destructive effect can be neutralised by administering melatonin hormone (OKTEM et al. 2005).

Heart tissue exposed to mobile radio fields shows an increase in the activity of free radicals. This can be reduced through antioxidants (OZGUNER et al. 2005).

When exposed to mobile radio fields, eyes show an increased activity of free radicals; this can be alleviated through administering antioxidants and melatonin hormone (OZGUNER et al. 2006).

Melatonin can limit the lipid peroxidation caused by 900 MHz mobile radio fields in the hippocampus of rats, but not in the cortex (KOYLU et al. 2006).

When exposed to mobile radio fields of base stations (SAR 11.3 mW/kg), the oxidant stress level increases; the neutralising enzyme activity is simultaneously reduced (YUREKLI et al. 2006).

~~*Human immuno-relevant monocyte cells show increased levels of reactive oxidative species when exposed to mobile radio fields (ROS) (LANTOW et al. 2006).*~~

Compared to controls, the mobile radio signal (GSM-DTX 2W/kg) creates increased oxidative species levels in immuno-relevant human cells (LANTOW et al. 2006).

Electromagnetic high frequencies and magnetic low frequencies create stress symptoms in lymphocytes that are similar, but not identical to heat shock (BELYAEV et al. 2005).

The effect of a 890-915 MHz mobile radio field (with 217/sec. impulse rate, 2 W max. power, SAR 0.95 W/kg) was tested on guinea pigs. The setting was on 11hr 45min stand-by and 15 min talk mode. The malonaldialdehyde (MDA), Glutathion (GSH), Retinol (Vitamin A), Vitamin D3, Vitamin E und catalase enzyme activity (CAT) content in the brain tissue and in the blood was chosen as the effective indicator. The MDA level rose in the brain tissue; the GSH level and CAT activity were reduced. In the blood, the MDA levels increased, as did the Vitamin A, E and D3 levels, and the CAT activity rose. The GSH level simultaneously decreased here as well. The authors conclude from this that mobile radio produces oxidant stress in the brain tissue of test animals (MERAL et al. 2007).

These results are also confirmed for the kidney in a further study (TOHUMOGLU et al. 2007).

Stimulation of the nitrogen monoxide NO free radical by electrical, magnetic and electromagnetic fields, observed for a long time, is of importance in these effects. A chronological listing below:

Electromagnetic and magnetic radiated fields promote the production of nitrogen monoxide (NO) in organisms. A chronological literature compilation

*WARNKE **1979, 1980, 1984, 1993, 1994***
Weak pulsating magnetic fields create an immediate effect and stimulate NO production in humans.

*MIURA et al. **1993***
NO increases when a weak field of high frequency radio signals is switched on; measured directly in the brain.

*LAI AND SINGH **1996***
DNA destroyed through electromagnetic influence; later (2004) traced back to NO stimulation.

*BAWIN et al. **1996***
Magnetic fields (1 or 60 Hz, 5.6, 56, μT) had no effect when the NO synthase enzyme was pharmacologically inhibited. The effect could, on the other hand, be forced by binding NO to haemoglobin.

*ADEY **1997***
NO is a normal regulator of EEG rhythms and, in pathological cases, of epilepsy.

Weak magnetic fields (1 Hz, 100 μT), modulate the NO action.

*KAVALIERS et al. **1998***
A 60 Hz, 141 μT magnetic field affects the NO and NO synthase actions.

*SEAMAN et al. **1999** and SEAMAN et al. **2002***
Provided the body has sufficient supplies of nitrite, rapid increase of NO production when exposed to radio frequency pulses (SAR of 0.106 W/kg).

*ENGSTRÖM et al. **2000***
NO plays a role in the pathophysiology of oxidative stress, including Parkinson and Alzheimer disease through electromagnetic impulses.

*YOSHIKAWA et al. **2000***
A low frequency electromagnetic field increases the generation of NO.

*PAREDI u.a. **2001***
The production of NO also increases under exposure to the electromagnetic fields of mobile phones.

*DINIZ et al. **2002***
The increased proliferation of cells exposed to pulsating electromagnetic fields is caused by NO.

*KIM et al. **2002***
Pulsating electromagnetic fields amplify the neuronal NO synthase expression.

*LAI AND SINGH **2004***
Inhibitor of NO synthase (7-nitroindazol) blocks the effects of weak magnetic alternating fields (60 Hz, 10 μT).

*ILHAN et al. **2004***
Frequencies used by mobile radio (900 MHz) cause increased activity of NO levels, increase malondialdehyde, increase xanthin oxidase, decrease superoxide dismutase and glutathione peroxidise - thereby destroying the brain of rats. Antioxidants (Ginkgo biloba) counter this.

*YARIKTAS et al. **2005***
The NO level in the mucosa of the nose increases when exposed to mobile radio fields (900 MHz).

*AKDAG et al. **2007***
The long-term effect (2 hours per day for 10 months) of a low frequency pulsed magnetic field on rats reduces the NO production below the nominal values.

It has been known for many decades already that weak low frequency magnetic fields increase the levels of free radicals. It is therefore not necessary to quote further literature at this point.

4.2.2 Primary mechanism found: Enzymes transferring electrons are magneto-sensitive

Stimulation of free radicals – including NO – through physical fields and radiated fields is therefore scientifically and reliably proven. But viewed critically, this is no proof of damage unless the underlying primary mechanism is identified.
For this reason, we searched for a long time for a link to explain the damaging effect. And we have found it in one of the latest studies: The NADH oxidase enzyme exhibits a high – and quite reproducible – sensitivity for magnetic and electromagnetic fields of mobile phones (FRIEDMAN et al. 2007).

This sensitivity had been known for quite some time in connection with other oxidases such as cytochrome oxidase (BLANK et al. 1998, 2001 a/b). For a long time, it was believed that NADH oxidase was active only in certain cells such a phagocytes. But it was known for quite some time that it was sensitive to gravitation (NASA, 2006). In the meantime, homologues of NADH oxidase were discovered in various tissues and were collectively included in the NOX family (NOX1, N0X3, N0X4, N0X5, DUOX1 and DU0X2).

The NOX family is also responsible for a large range of pathological processes, especially neurodegeneration and heart diseases (BEDARD et al. 2007).

These oxidase enzymes are magnetically sensitive due to their capability of shepherding electrons through plasma membranes. When electrons move, an electrical current flows that in turn builds up its own magnetic field and also generates electromagnetic high frequency oscillations through acceleration and deceleration of electron movement. All these processes create sensitivity to external fields.

The electron transfer is finally responsible for the production of superoxide radicals and other reactive oxygen species (ROS). The consequences of this are far reaching in completely different areas, because radicals and ROS are very aggressive. In this way, the destruction of viruses and bacteria is promoted, the creation of proteins is forced through reinforced gene expression and finally cell proliferation is supported at the cost of cell differentiation.

Over-stimulation is a threat. It is analogous to a drug or medicine: Dosed correctly, the substance can be beneficial; but overdosing can be poisonous. This is exactly what happens with permanent exposure to magnetic and electromagnetic fields.

In detail, this process is as follows: It is a fact that the NADH oxidase enzyme also produces the superoxide anion (0_2-°) free radical. Superoxide anion is damaging to the NO budget, among other. NO may be deactivated and may subsequently degrade, negatively affecting various vital parameters (WARNHOLTZ et al. 1999).

What is new is the realisation that NADH oxidase also forces the generation of NO by stimulating the eNOS enzyme (SUZUKI et al. 2006, RACASAN et al. 2005). This stimulation of eNOS then becomes a further source of increased superoxide anion radical generation (SEINOSUKE et al. 2004). This is not the end of the list in this fatal loop of overstimulation, because the NADH oxidase system also stimulates the formation of toxic hydrogen peroxide (H_20_2), which also increases NO production by up to 100% (LI et al. 2002). These two additional NO stimulants explain the abovementioned increased NO production under the influence of magnetic fields and electromagnetic radiated fields – also through mobile radio communication.

But this is the start of a vicious circle. Because overstimulation of the eNOS enzyme, that in the final analysis is also an agent for increased NO production, also increases superoxide anion radicals on its own (SEINOSUKE et al. 2004). Nature, however, also has a cleverly devised countermeasure against excessive and dangerous NO production threatening overproduction of a radical: The more stimulated hydrogen peroxide, which also increases the NO production, is an agent for de-activating eNOS co-factors, which finally prevents the NO production by affecting the membrane receptor (JAMES et al. 2001). Such a reduction of NO has also been found before under long-term exposure to stronger magnetic fields (AKDAG et al. 2007). Even if the NO now appears to be regulated, the damaging effects of ROS remain intact.

The real pathological effects arise afterwards. We have to consider, in addition, that both the NO and ROS, which includes superoxide anion, are important modulators of the vascular tonus and are architects of the adhesive interaction of leucocytes, platelets and endothelium. The two molecules of NO and of superoxide anion, however, have opposite effects: NO is normally beneficial in a healthy life cycle; ROS, however, prepares the system for special regulation when disruptions occur.

The functions are thereby flexibly adjusted. This allocation of functions disappears, however, under the influence of an external magnetic and electromagnetic field: NO and ROS now react together. In this event, their specific effective potential is destroyed and toxic substances are created, such as peroxinitrite (0N00-) (MÜNZEL et al. 1999). This peroxinitrite in turn reacts with hydrogens, creating more hydrogen peroxide.

Because this mechanism is so important, we shall summarise it in one sentence: The serious pathological disruption is caused by exposure to magnetic and radiated fields resulting in the creation of additional reactive oxygen species (ROS) such as superoxide radicals and hydrogen peroxide, that combine with the increasingly produced NO to form extremely toxic peroxinitrite, that in turn reacts with hydrogens to form more hydrogen peroxide. The consequences of the pathological process are listed further down.

Many vital substances, required for functioning of the body, are rendered useless.

If the cascade of effects is disrupted, the normal and healthy effects of NO are restored (HORNIG et al. 2001).

The NADH oxidase is important in another sense as well. It is also found in the cell nucleus where it can – depending on the redox system – control the gene expression, but can also damage genes (MASUKA, 2006).

Let us therefore state in response to the question of a conclusive effective mechanism: The existing scientific literature abundantly documents disruptions of the redox balance in organisms through reactive oxidative and nitrogenous species (ROS/RNS), causally connected to the exposure to electromagnetic fields of mobile radio and wireless communication.

An unambiguous effective damaging mechanism has therefore been found.

4.3 On the question of deterioration of health and damage

Can the functional disruptions thus explained be considered the scientifically proven reasons for the subjectively described symptoms of disease?

The proven effective mechanism is important also because it shows that the subjective ailments of many people are based on biological facts that can be explained. If you are aware of the cascades of effects described hereunder, you will better understand why "electrosmog" is damaging.

4.3.1 Functional disruptions and symptoms of disease

Electromagnetically induced excessive ROS/RNS stimulation may be differentiated into three effective phases that are passed through sequentially:
1. Stimulation of free radicals,
2. Stimulation of highly toxic peroxinitrite,
3. Stimulation of highly toxic peroxide radical.

The following processes are serious: Cell components are destroyed; the antioxidants absorbed with the food and the substances with excess electrons produced by the organism itself are spent; the harmful cholesterine increases. People feel tired, tense, battle various infections.

Pain is felt in places. More detail on the individual steps is given below.

First complex: Stimulation of free radicals such as superoxide 0_2-° and NO leads to
- *activation of protooncogenes*
- *damage to the mitochondria genome*
- *damage to the cell nucleus genome*
- *damage to the membranes*
- *oxidation of the polyene fatty acids of the membranes; release of cardiolipins (auto antibody formation)*
- *oxidation of SH groups, causing enzyme blocking*
- *activation of proteases (cell damage)*
- *activation of transcription factors.*

Second complex: Stimulation of highly toxic peroxinitrite from superoxide anion 0_2° together with NO (0_2° -+ NO = ONOO°)
NO has three times the affinity for superoxide 0_2^-° that 0_2^-° has for the neutralising superoxide dismutase; the peroxinitrite
- *oxidises vitamin C*
- *oxidises uric acid*
- *oxidises cholesterine*
- *oxidises sulfhydryl groups (destroys thioles)*
- *oxidises polyene fatty acids of the membranes (initiates lipid peroxidation)*
- *causes DNA breaks*
- *activates kinases (phosphor lipase 2)*
- *activates polymerase (PAPP); this destroys NAD+, leading to a cellular energetic catastrophy.*

NO and peroxinitrite react to form nitrogendioxide (NO_2); this deactivates superoxide dismutase (MnSOD), i.e. inhibiting the neutralising enzymes of the mitochondria (mt-Mn-SOD). These reactions alone result in massive metabolism disruptions already.

Third complex: Stimulation of highly toxic peroxide radical ($H0_2$°-) from superoxide and peroxinitrite with the involvement of hydrogen
Peroxide H00° has a redox potential of +1000 mV, making it highly oxidising.. An addition to the listing in complex 2, peroxide also oxidises:
- *Polyene fatty acids*
- *Tocopherol (Vit E)*
- *Lycopene*
- *Co-enzyme Q 10*

The functional disruptions are manifest in disease symptoms, as described in more detail below.

4.3.2 The "Acquired Energy Dyssymbiosis Syndrome" (AEDS)

The clinical picture of the "Acquired Energy Dyssymbiosis Syndrome" describes a deficiency of cell energy – with simultaneous derailment of the cell environment. This leads to "mitochondropathy": energy creation is blocked; the power generators for cell energy are transformed into copious sources of free radicals.

The changes have serious consequences:

1. Inflammation processes spread and release further substances that are harmful when overdosed (tumour necrosis factor TNFα and time and again nitrogen monoxide). We must also not forget that inflammations are on the increase in our industrial society and that arteriosclerosis and heart attacks – the primary cause of death – are ultimately caused by inflammations. This point of view has already been accepted among the scientifically active medical fraternity today.

2. Aerobic glycolysis (glycolysis despite the presence of oxygen) is activated as "emergency power generator" – which is in turn associated with:
   - stimulation of proto-oncogenes (precursors to cancer genes)
   - increased release of superoxide radicals
   - lactate acidosis (excessive acidification)

3. The mitichondric genome finally mutates. But especially this pathological change can be hereditary via the female gender. It burdens the progeny for the generations to come.

Overview: Physiopathological consequences of nitrosative/oxidative stress

I. Disruption of mitochondrial activity

II. Disruption of sugar utilisation (pathological lactate acidosis)

III. Disruption of the neurotransmitter function

IV. Disruption of the cholesterine metabolism

V. Disruption of the steroid hormone synthesis (corticoids)

VI. Disruption of the haem system

VII. Generation of mutations, esp. the mitochondrial DNA (hereditary)

VIII. Disruption of apoptosis

Catalogue of symptoms and diseases (excerpt), derived from the known effective mechanisms of nitrosative/oxidative stress

- Sleep disorders
- High level of fatigue: no relaxation, recuperation times ineffective
- Psychosomatic performance lapses
- Major phases of restlessness and "panic disorder"
- Corpulence
- Chronic hypoglycemia
- Increased cholesterine and triglycerid values
- Lactate acidosis
- Fibromyalgy FMS (nitroso serotonin auto-antibody formation)
- Autoimmune diseases
- Arteriosclerosis
- M. Parkinson
- Chronic inflammation processes, especially in the nervous system, with multiple sclerosis and amyotropic lateral sclerosis
- Haem synthesis disruptions (porphyria)
- Lactose intolerance
- Pathological energy deficit PED (WARNKE, 1989)
- Chronic immune insufficiency (high infection susceptibility)
- Functional disruptions of the thyroid
- Myopathy
- Encephalopathy
- Polyneuropathy
- Enteropathy
- Cancer
- AIDS

To summarise, we can answer the question as to whether subjective reports of illness have an objective basis as follows: The redox balance is disturbed via the direct influence of weak magnetic and electromagnetic fields on the NADH oxidase. The result is oxidative/nitrosative stress. It leads to disruptions and prevention of vital functions. In the course of these processes, exactly those disease symptoms subjectively described by those affected and exposed to radiated fields, are in evidence.

Hereditary pathological changes passed on via the mother should, in particular, draw our attention to the effects that will only manifest themselves in generations to come.

4.4 On the exclusion of a nocebo effect.

Do we have scientifically designed methods, such as the "double blind" method, proving that the symptoms of disease cannot be attributed to fears but that they are generally reversible after "switching off" the physically stressing fields (unbeknown to the participants), after a short period of time?

All the scientific investigations that addressed this question reply to this question with "yes":

The various problems disappear if the influence of the radiation or the ROS/RNS formation is "switched off" (e.g. ABELIN 1999, ABELIN et al. 1995, HORNIG et al. 2001, PETROV1970, TNO study 2004).

Health is not, however, restored if the disruptions have already led to serious damage such as DNA destruction or tumours.

5. **Summary**

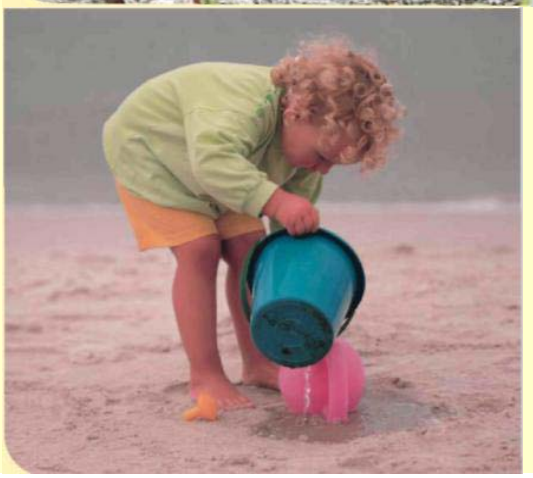


For many decades, research results showing that the natural electrical and magnetic fields and their variation are a vital precondition for the orientation and navigation of a whole range of animals, have been freely available.

What has also been known to science for many decades is that we as humans depend on this natural environment for many of our vital functions.



Today, however, this natural information and functional system of humans, animals and plants has been superimposed by an unprecedented dense and energetic mesh of artificial magnetic, electrical and electromagnetic fields, generated by numerous mobile radio and wireless communication technologies.



The consequences of this development have also been predicted by the critics for many decades and can now no longer be ignored. Bees and other insects disappear, birds avoid certain areas and are disoriented in other locations. Humans suffer from functional disorders and diseases. And those that are hereditary are passed on to the next generation as existing defects.

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Information: This concept is generally understood in everyday life and has gained a position of central importance, especially in modern bio-sciences. "Informed society" demands to be in a position to inform itself about everything if possible, at any time and any place in the world. Analogously, it is of cardinal importance to a living organism of any kind, not only to be in a position to communicate with its environment via information carriers, but the control of its internal vital functions must also be assured, which is again possible only through the exchange of "information".

Electromagnetic (EM) fields of all kinds and magnitudes (including light, UV and infrared radiation, microwaves, etc.) were chosen by evolution as particularly suitable carriers of information because they are able to flood the living space of organisms spontaneously and fully, affording every individual immediate access to its information content.

This is available in the ordered structure of the EM fields themselves, described in physics as waves, which propagate at the speed of light with alternating electrical and magnetic field components. Because, in accordance with Faraday's law of induction (1831), the changes in a magnetic field induce changes in an electrical field.

The force/field lines of magnetic and electrical fields are in the form of vectors between positive and negative poles and we can therefore describe them as electrical or magnetic flux and a flux density orthogonal to a unit surface area, e.g. 1 m^2.

The actual information in an EM field resides – similar to acoustics – in the number of oscillations per second (=frequency) and also in the amplitude of the oscillations. If an EM field of higher frequency is interrupted at a certain rate (facilitated only through modern digital technology), low frequency pulsed high frequency radiation is created, whereby the cyclic rate can also be used for information purposes.

The traditional technical method of transmitting "information" is called modulation. In this way, a continuous low frequency carrier wave, subject to less interference during propagation in space, is overlaid (modulated) with the higher frequencies of music and voice, allowing the information to be transmitted over large distances.

A few common physical units:

Ampere (A): current amplitude
Volt (V): electrical voltage
V / meter (E): electrical field strength
Watt:(W): power (=VA)
Joule (J): electrical energy (=W sec)
Tesla (T): magnetic induction (=V sec/m^2)

Number units

(k) Kilo... * 1000
(M) Mega ...* 1000 000
(G) Giga ... * 1000 000 000
(T) Tera ... * 1000 000 000 000

(m) Milli ... * 0.000
(µ) Micro ...* 0.000 000
(n) Nano ... * 0.000 000 000
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