

From the library

Remembrance of things past

"As in the more obviously psychological experiments, colour theory was being transformed from the study of light into the study of vision. It was the new departure Goethe needed—he admitted to Sommerring that he had now virtually lost sight of his starting point in chromatics—though he thought he could at last now show that the phenomenon of colour was completely independent of refraction. A new term entered his optical vocabulary much more than people realized, colour phenomena were physiological—but with it came also an understanding of the terms "objective" and "subjective" which was much closer to that of contemporary philosophy than Goethe's own previous usage. (Nicolas Boyle. *Goethe, the poet and the age*. Vol 2. Oxford: Clarendon Press, 2000:214.)

Pharmacogenetics

In the journal of the American Medical Association (*JAMA*), it was reported that in 1994 alone 100 000 patients in the United States died because of medications given to them. Many reasons exist for these adverse effects. However, one area of concern that is emerging is the new field of pharmacogenetics. This field studies the genetic variability of responses to standard pharmacological agents. One of the first success stories came in the early 1990s when investigators demonstrated that children being treated for leukaemia with the drug 6-mercaptopurine may die as the result of taking standardised doses of this medication. These children were found to have less than the normal concentrations of enzymes in the liver necessary to metabolise 6-mercaptopurine. It now appears likely that there are many examples of genetic variability in the metabolism of standard pharmacological agents, and identifying patients who are at risk for adverse reactions is the subject of pharmacogenetics. Occasionally, this scientific field ventures into the controversies of political territory since it is clear that in some cases the variability of response to pharmacological agents runs along ethnic lines. For example, people of African heritage are much more likely than white people to have adverse reactions to the antimalarial drug primaquine. In contrast, people from northern European descendants are much more likely than Japanese to suffer the side effects of isoniazid. Nevertheless, this emerging field may perhaps reduce the far too large number of people who suffer adverse effects of medications each year. (*The Sciences* July/August 2000:8-9)

Cold virus used to treat head and neck cancers

Workers at the MD Anderson Cancer Study Center in Houston, Texas, have recently reported the successful treatment of head and neck tumours with standard chemotherapy combined with an adenovirus. These scientists gave 30 patients with head and neck tumours cisplatin and 5-fluorouracil—standard anticancer drugs for these kinds of tumours. In addition, however, they administered a virus that was aimed to attack and destroy cancer cells but not healthy cells. The virus, an adenovirus, OMYX-015, normally is a cold virus; however, the MD Anderson team

altered the virus so it could not replicate in healthy cells. However, it could in fact destroy cells that had faulty copies of the gene P53. This is a gene that normally destroys abnormal cells before they can become cancerous. Malfunctions of this gene are said to occur in between 45% and 70% of all head and neck tumours. The virus was injected locally into the tumours. Nine of 11 injected tumours shrank while only three of the uninjected ones did. Regrettably, most of the patients subsequently died from their tumours that were too inaccessible for injection of the virus. However, of the 30 patients studied, three remained disease free. In the future, the MD Anderson team plans to select 400 patients with tumours that can all be injected with the adenovirus. (*Nature Medicine* 2000;6:879.)

Nanomedicine

In 1999, one of the most futuristic books published was entitled *Nanomedicine*. This is the work of Robert Freitas, a research scientist in Texas. Nanomedicine is a development in the field of nanotechnology. It is the science of diagnosing, treating, and preventing disease with novel molecular techniques—from smart drugs that target specific organs or cells to miniature robots that can ferry materials into and out of cells and even enter cell nuclei to repair damaged genes. The focus of nanomedicine is on molecular treatments. One innovation based on this notion is the so called smart drug. An example of this is a novel drug, developed by the Japanese pharmacologist Suzuki, that releases antibiotics only in the presence of infection. Much of the theory of nanomedicine remains just that—theory. But Freitas is already working on volume two of *Nanomedicine*. (*The Sciences* July/August 2000:26-31)

Pain and neurons

Not too long ago the standard teaching was that newborns do not require anaesthesia or pain medication for operative procedures since their nervous system was considered to be immature and incapable of mediating pain. Not only does this appear to be woefully in error but now the question has been raised about whether operating on newborns might make them more sensitive to pain later in life. Ruda and colleagues simulated surgery on newborn rats by injecting inflammatory agents into a hind paw. These rats, when adults, withdrew the test paw from heat much faster than rats that had been injected with saline as newborns. These rats also could be shown to have more nerves in the region of the injection. (*Science* 2000;289:628.)

The obesity epidemic

The epidemic of obesity in the past two decades is well documented. Many causes have been cited, including the increase of fat in the diet and decrease in exercise. But what if obesity is a real epidemic caused by a viral infection? This controversial theory has been put forward by investigators who have studied obesity in experimental animals and have discovered that antibodies to the virus SMAN-1 are elevated in obese animals. SMAN-1 belongs to a group of viruses called adenoviruses. It now seems clear that one of these

viruses Ad-36 can make chickens, mice, and monkeys fat. But can a virus be responsible for human obesity? The same investigators have recently demonstrated that in identical twins antibodies to Ad-36 can be found in one twin who is obese and not in another twin who has a normal body weight. It should be pointed out that while antibody studies have been revealing, the virus Ad-36 has not been isolated in obese animals. (*International Journal of Obesity* 2000;24:989.)

Gene therapy and retinal dystrophies

Investigators in England and Germany have now reported that the introduction of a missing gene into the eyes of mice with an inherited eye disorder similar to retinitis pigmentosa can be successfully accomplished and may reverse the retinal dystrophy. By inserting the missing gene the researchers corrected the underlying genetic defect and restored function in the photoreceptors. A specifically modified virus was used to transport the missing gene into a significant proportion of photoreceptors. (*Nature Genetics* 2000;25:306-10.)

Global warming and health problems

Few scientists now seem to doubt the reality that the earth's atmosphere is warming, although controversy still surrounds the factors that are responsible for it. The implications for changes in patterns of health problems throughout the world because of this change in the earth's temperature are now being studied. It would appear that global warming and the disrupted climate patterns that result will have a significant effect on the patterns of health problems throughout the world. In particular, diseases relayed by mosquitoes such as malaria, dengue fever, yellow fever, and encephalitis are likely to increase in frequency. Mosquitoes are very sensitive to meteorological conditions since winter freezing kills the eggs, larva, and adults outright. Moreover, *Anopheles* mosquitoes which transmit malaria, cause sustained outbreaks of this disease only when temperatures routinely exceed 60°F. Likewise, the *Aedes aegypti* mosquitoes responsible for yellow fever and dengue fever convey this virus only when temperatures rarely fall below 50°F. Malaria and dengue fever are two of the mosquito borne diseases most likely to spread dramatically as global temperatures increase. In addition, global warming will probably elevate the incidence of water borne diseases including cholera. This may occur as the result of increased frequency and extent of droughts and floods. Scientists suggest a number of strategies to deal with this change in diseases as the earth's atmosphere warms. One would include improved surveillance systems that would promptly spot the emergence of infectious diseases. An example of this is the effort in the northeastern portion of the United States when, during this past spring, the West Nile virus was shown to have survived the winter. Yet, almost certainly, the most important component of any strategy to address the health consequences of global warming is an effort to reverse the warming itself. (*Scientific American* 2000;August:50-57.)



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