

Fiat Lux – Using Light to Treat Disease

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Physicians have always relied upon using their eyes as a principle tool of diagnosis (along with all their other senses of course). We do, however, often forget just how limited are our visual capabilities: we are sensitive to a narrow range of light frequencies, and our colour discrimination is relatively poor compared to some other animals. We cannot see into the infra-red, nor the ultra-violet and even in our visual range, we are, for example, unable to distinguish the stimulation produced by one narrow range of colour (perhaps a single spectral line) stimulating, say, red and green cones equally, as against a rather broader range of light frequencies that again just happens to produce an equal amount of stimulation.

Many organic materials are rather more picky: they can respond very differently to different types of light stimulation, and can also emit light from the infra-red spectrum right through to the ultra-violet. Hence, modern methods of medical diagnosis are able to extend the range of the physician's senses using more accurate instrumentation that, for example, may be able to distinguish pre-cancerous tissue from that which is merely inflamed. Even better, we can sometimes persuade hungry cancerous tissue to preferentially absorb drugs that respond to stimulation by very specific light colours, causing it to release cancer-killing chemicals just exactly where they are needed.

The new methods are complex and sometimes produce an embarrassment of riches. There is often far too much information for humans to handle, and much of it needs to be sorted and filtered using large amounts of computing power before we can distinguish "the wheat from the chaff". As in so many areas, artificial intelligence techniques (such as neural networks) are being exploited to "learn" the characteristic "look" of diseased tissues. None of these methods are infallible, of course, so the physician or surgeon still needs to exercise his judgement - but now with access to a wider range of reliable data.

This well illustrated talk threw an interesting light on modern advances in medical diagnosis and treatments that are being applied to an ever wider range of sophisticated techniques in the continuous search for better and faster methods of disease diagnosis and treatment.