

Introducing humans version 2.0
By James van der Pool
BBC Horizon

How long before robot counterparts are human and machine?

The half-human, half-robot cyborg has long been a vision nurtured by science fiction writers and futurologists. But how close are we to humans version 2.0, computer-enhanced people?

Ray Kurzweil, a renowned American inventor and futurist, supplements his daily diet with a cocktail of 250 pills. Now in his mid-fifties, Kurzweil is attempting to extend his life until 2029.

This is when he believes science will have made two huge breakthroughs; understanding how the human mind works and the creation of computers that are equal to its power.

If Mr Kurzweil is right the implications could be profound.

"In 25 years from now... we will have both the hardware and the software to recreate human intelligence in a machine," he says.

Once computers have the processing power of the human brain it will be possible to enhance our intelligence with silicon implants and even download the contents of our minds to machines, preserving them forever.

Mr Kurzweil is saying that in just a few decades humans could, in effect, become immortal.

Rehashed sci-fi

Although his vision may sound like rehashed sci-fi fantasy it is based on the closely observed trends in the fields of computer and neuroscience.

As far back as 1964, Gordon Moore, a founder of the computer chip firm Intel, predicted that computer power would double every year.

Matthew Nagle was fitted with a sensor to control objects

Moore turned out to be right and his simple idea offers up a staggering statistic, as Kurzweil points out: "Computers are about a billion times more powerful than they were a quarter century ago and they will become a billion times more powerful than they are today in a quarter century."

But whilst there may be an almost metronomic predictability about the progress of computers toward Kurzweil's dateline, neuroscience inhabits a far more complex and controversial arena.

In order to unlock the secrets of the human mind, neuroscientists often turn to other species, with some extraordinary results.

The brain was considered the last frontier, the impenetrable part of us

Professor Miguel Nicolelis

At the State University of New York, Professor John Chapin has come up with a unique interface between animal and machine - a remote control rat.

Prof Chapin transmits radio signals to electrodes placed in the area of the rat's brain that controls its whiskers.

When he sends a signal to the right whisker the rat turns right. If the rat does as asked, Chapin rewards it with another signal to its pleasure centre.

Rat's mind

Bizarre as it sounds, by commanding the rat's mind, Prof Chapin hopes to discover the exact function of the different parts of its brain.

Professor Miguel Nicolelis at Duke University in North Carolina, has taken this paradigm of brain machine interfaces even further.

For the past decade, he has been tapping in to the brains of monkeys by wiring them up to computers and eavesdropping on their thoughts.

Prof Nicolelis acknowledges how surprisingly fertile this approach has been.

"The brain was considered the last frontier, the impenetrable part of us, and we are just learning that we can actually go in there and read thoughts," he says.

Prof Nicolelis has refined his decoding of the mind to such a degree that his monkeys are able to control extraneous devices, such as robotic arms, through thought alone.

'Finally freed'

In doing so, Prof Nicolelis believes they present us with a glimpse of how technology may enhance or even transform us as "the brain is finally freed from the body and it can act upon the world directly".

This mind reading technology is now appearing in some humans.

Following a devastating car accident, 23-year-old Erik Ramsey was left paralysed from the neck down. He's unable to move, talk or eat without assistance, yet his brain remains intact.

Now Erik is at the centre of an experimental therapy to try and restore his ability to speak by connecting his brain to a computer.

When Erik thinks a sound the computer reads Erik's brain activity and turns it in to an actual sound.

To date, Erik and the computer are able to make just a few basic sounds, but the hope remains that within a matter of years he will be able to make useful, vocal communication once more.

Earlier this year US scientists implanted a sensor in a paralysed man's brain that has enabled him to control objects by using his thoughts alone.

Matthew Nagle, 25 at the time of the trial, was left paralysed from the neck down and confined to a wheelchair after a knife attack in 2001. He was the first patient to try out the brain sensor.

See how the system works

But rather than offer us hope, another leading computer scientist believes these inroads in to the mind threaten oblivion.

Professor Hugo de Garis is the architect of some of the world's most complex neural networks - computers that evolve their own intelligence.

Now he is deeply conflicted over the future he is helping to create.

Prof De Garis believes that in a matter of years machine intelligence will supersede our own by a factor of millions.

These so called artefacts - short for artificial intellects - will be so powerful that they will appear "almost God-like".

But Prof De Garis fears that they may not be quite so benign.

"How will they feel about us - an inferior species?" he asks before drawing a doom-filled analogy.

"...They may treat us like mosquitoes; as pests," and simply wipe us out, he says.

Horizon is broadcast on BBC Two on 24 October at 2100 BST. Or watch online after that at the Horizon website.