

Clue: A major city

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# Leading thinkers identify greatest challenges facing humanity

Alok Jha in Boston

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The experts single out sunshine as a "tantalizing source of environmentally friendly power, bathing the Earth with more energy each hour than the planet's population consumes in a year". (Photograph: Waltraud Grubitzsch/EPA/Corbis)

Reversing the effects of ageing, reprogramming genes to prevent diseases and producing clean energy are some of the biggest challenges for the next 50 years, according to a group of leading experts.

The pace of advances in technology means the rate of progress will be 30 times faster in the next half century than in the past 50 years, futurologists believe — and that opens up the prospect of innovation in many fields.

Better understanding of our genes could lead to more personalised medicines and longer, healthier lives; communication technology should get faster and cheaper; and we will hopefully find more environmentally sustainable ways of living.

The 18-strong team of scientists, entrepreneurs and thinkers was convened by the US National Academy of Engineering (NAE) to identify problems for technology in the 21st century that, if solved, would change the world. The group included biologist Craig Venter, inventor Dean Kamen, Google co-founder Larry Page and Harvard University professor of international development Calestous Juma.

They presented their report and list of challenges today at the American Association for the Advancement of Science (AAAS) annual meeting in Boston.

## Quality of life

The NAE group focused on four areas: sustainability, health, vulnerability, and joy of living. "As the population grows and its needs and desires expand, the problem of sustaining civilisation's continuing advancement, while still improving the quality of life, looms more immediate," they wrote in their report.

"Old and new threats to personal and public health demand more effective and more readily available treatments. Vulnerabilities to pandemic diseases, terrorist violence, and natural disasters require serious searches for new methods of protection and prevention."

The provision of clean energy was a priority. They identified sunshine as a "tantalizing source of environmentally friendly power, bathing the Earth with more energy each hour than the planet's population consumes in a year".

But capturing that power, converting it into something useful and then

### **Clean water**

Alongside clean energy came clean water, which was in "seriously short supply in many regions of the world. New technologies for desalinating sea water may be helpful, but small-scale technologies for local water purification may be even more effective for personal needs."

Personalised medicines were another challenge. The recent sequencing of the human genome and a better understanding of how the body works offered scientists a way to identify the things that determine the health of an individual.

"An important way of exploiting such information would be the development of methods that allow doctors to forecast the benefits and side effects of potential treatments or cures," they wrote.

Genetic technology allowed scientists to switch off selected strands of DNA and new techniques in gene therapy enabled them to modify the behaviour of genes. "Within one to two decades, we will be in a position to stop and reverse the progression of disease and ageing, resulting in dramatic gains in health and longevity," said Kurzweil.

### **Computer intelligence**

The NAE report also hailed the potential of advanced computer intelligence, which it said would enable automated diagnosis and prescriptions for treatment.

Kurzweil went further on artificial intelligence. "Once non-biological intelligence matches the range and subtlety of human intelligence, it will necessarily soar past it because of the continuing acceleration of information-based technologies, as well as the ability of machines to instantly share their knowledge."

He added: "Intelligent nanorobots will be deeply integrated in the environment, our bodies and our brains, providing vastly extended longevity, full-immersion virtual reality incorporating all of the senses ... and enhanced human intelligence."

The experts said none of the challenges would be met, however, without the economic and political will. "Despite environmental regulations, cheaper polluting technologies often remain preferred over more expensive, clean technologies," they wrote.

The group did not rank the challenges, though members of the public can vote on which they think is most important, at [engineeringchallenges.org](http://engineeringchallenges.org).

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