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Anticipating artificial intelligence

Concerns over AI are not simply fear-mongering. Progress in the field will affect society profoundly, and it is important to make sure that the changes benefit everyone.

In January, the Information Technology and Innovation Foundation in Washington DC gave its annual Luddite Award to "a loose coalition of scientists and luminaries who stirred fear and hysteria in 2015 by raising alarms that artificial intelligence (AI) could spell doom for humanity".

The winners — if that is the correct word — included pioneering inventor Elon Musk and physicist Stephen Hawking.

In January last year, both signed an open letter that argued for research and regulatory and ethical frameworks to ensure that AI benefits humanity and to guarantee that "our AI systems must do what we want them to do". Hardly "fear and hysteria".

As AI converges with progress in robotics, cloud computing and precision manufacturing, tipping points will arise at which significant technological changes are likely to occur very quickly. Crucially, advances in robot vision and hearing, combined with AI, are allowing robots to better perceive their environments. This could lead to an explosion of intelligent robot applications — including those in which robots will work closely with humans.

Even academic debate on AI has tended to be polarized between sceptics and fanciful futurists. Yet there is an emerging middle-ground consensus that AI research is poised to have profound impacts on society. For those who remain sceptical that progress is imminent, bear in mind that Google, Toyota, Facebook, Microsoft and other companies are together pouring billions of dollars into AI and robotics research, which they see as the next frontier for profits (see page 422). Efforts to accelerate research must be accompanied by safeguards against the potential pitfalls of these powerful technologies.

Stuart Russell, a computer scientist at the University of California, Berkeley, who is well known for his deeply sceptical views on over-expectations of technological progress, is convinced that it is time to assess and mitigate potential risks. "Several technologies are reaching the level where they could be developed in potentially harmful directions," says Russell, who was a driving force behind the open letter signed by Musk and Hawking.

So, what are the risks? Machines and robots that outperform humans across the board could self-improve beyond our control — and their interests might not align with ours. This extreme scenario, which cannot be discounted, is what captures most popular attention. But it is misleading to dismiss all concerns as worried about this.

There are more immediate risks, even with narrow aspects of AI that can already perform some tasks better than humans can. Few foresaw that the Internet and other technologies would open the way for mass, and often indiscriminate, surveillance by intelligence and law-enforcement agencies, threatening principles of privacy and the right to dissent. AI could make such surveillance more widespread and more powerful.

Then there are cybersecurity threats to smart cities, infrastructure and industries that become overdependent on AI — and the all too clear threat that drones and other autonomous offensive weapons systems will allow machines to make lethal decisions alone.

The first wave of AI is already beginning to pervade our lives inconspicuously, from speech recognition and search engines to image classification. Self-driving cars and applications in health care are within sight, and subsequent waves could transform vast sectors of the economy, science and society. These could offer substantial benefits — but to whom?

Historically, automation in agriculture and industry has caused mass extinctions of jobs and led to profound societal changes — including rapid urbanization. But job losses have typically been more than compensated for by jobs created in the service and high-tech industries.

"As AI converges with progress in robotics, significant technological changes are likely to occur very quickly."

Many experts worry that AI and robots are now set to replace repetitive but skilled jobs that had been thought to be beyond machines, and it's not obvious where new jobs would come from. The spectre of permanent mass unemployment, and increased inequality that hits hardest along lines of class, race and gender, is perhaps all too real.

A society dependent on AI could yield broad benefits if increased wealth resulting from gains in productivity is shared. But currently, most such benefits are concentrated in companies and the capital of their shareholders — including the infamous 1%.

It is crucial that progress in technology is matched by solid, well-funded research to anticipate the scenarios it could bring about, and to study possible political and economic reforms that will allow those usurped by machinery to contribute to society. If that is a Luddite perspective, then so be it. ■

On a downer

The United Nations has chosen to keep the war on drugs going — but it can't win.

Readers of the *Los Angeles Times* last week received some unexpected news about a major shift in the attitude of the United Nations towards the decriminalization of cannabis. According to the paper, the UN Office on Drugs and Crime (UNODC) was set to announce a more tolerant approach at a major meeting in New York City. But although the meeting was real, the policy shift was not. The announcement was a hoax, and pointedly timed for 20 April ('4/20'), a day on which cannabis users celebrate and promote their choice. The scam even included a well-constructed fake press release

that quoted the (real) UNODC executive director Yury Fedotov as saying: "The science increasingly supports decriminalization and harm reduction over proscriptive, fear-based approaches."

For those who advocate drug-law reform — a group that includes a sizeable number of scientists — the truth was a lot less encouraging. The comments that Fedotov made at last week's UN General Assembly Special Session on Drugs (UNGASS) were certainly less quotable. In a tweet he noted: "#UNGASS outcome doc reaffirms joint responses to world drug problem based on agreed frameworks, #sharedresponsibility, intl cooperation".

Despite hopes ahead of the meeting that nations would step back from the 'war on drugs' rhetoric that has defined international policy — and science — for decades, instead the UN blandly reformatted the existing status quo. Essentially, the message is still: 'drugs are bad'.

This will disappoint the many readers of *Nature* who want to see a more evidence-based approach. And that disappointment is especially acute because hopes had been raised by a growing number of drug-policy experiments, such as legalization and decriminalization of cannabis in Uruguay and many US states.

If the overall message coming down from the highest levels remains the same, then so does the stance taken by those who fund research. Witness the struggles in the United States over cannabis studies: whereas some states permit citizens to openly smoke marijuana, researchers must wade through federal red tape to study it.

The harms that come from the current strategy of prevention through prohibition have been clearly demonstrated. Ahead of the meeting, researchers writing in *The Lancet* warned that the last UNGASS in 1998 made no distinction between drug use and drug misuse, leading to a focus on enforcement and a lack of focus on harm reduction (J. Csete *et al. Lancet* **387,** 1427–1480; 2016).

This is not to say that drugs do not have risks or do not bring damage. They can, and do, destroy lives and damage societies. Legalization brings its own problems — as places that have rushed to embrace commercial marijuana are finding out. The question is: what can be done to reduce harm and damage without creating more problems? And how can researchers find those answers? In other words, what would a reformed — and scientifically grounded — drug policy look like?

In January, the International Centre for Science in Drug Policy sent an open letter to the UN, signed by high-profile scientists from across the world, to ask the UNGASS to reconsider the metrics of drug use.

"Essentially, the message is still: 'drugs are bad'."

For too long, it said, countries have focused on a small number of metrics to judge the problem, including price, purity and levels of use in the general population. More-subtle indicators, such as treatment for drug-use disorders, drug-related murder and the proportion of prisoners jailed for non-violent drug crimes, might be better metrics to measure, they suggested.

It will not surprise many people that there is a disconnect between drug policy and drug research. But discussions of drug policy, such as at UNGASS 2016, also seem to be increasingly out of step with the situation on the streets. The true picture of illegal drug use is, for obvious reasons, frequently opaque. But illegal drug use is clearly not in retreat. The billions spent, and the lives lost, in fighting the war on drugs have not brought the promised victories, and they are not likely to if the current course is maintained.

At the 1998 UNGASS, delegates pledged to deliver "significant and measurable" reductions in demand for drugs by 2008. That meeting even used the slogan: "A drug-free world, we can do it". The deadline has slipped, but the intention seems to remain the same. Who are they kidding? ■

Biden time

The US vice-president's cancer project is winning hearts and minds.

For many of the 18,000 people who were in New Orleans last week for the annual meeting of the American Association for Cancer Research, the highlight came when US vice-president Joseph Biden took the stage. Biden heads the US National Cancer Moonshot Initiative, which aims to double the pace of cancer research. He has consulted with hundreds of cancer researchers during his 'listening tour' to lay groundwork for the programme.

Biden seems to have been paying attention. He ran through a list of familiar obstacles posed by what he called "cancer politics" — the difficulties in conducting interdisciplinary research and sharing data, and the lack of incentives to reproduce published results, among others (see page 424). But it was when he made a joke about how long it takes to get a federal grant — "It's like asking Derek Jeter to take several years off to sell bonds to build Yankee Stadium," he said, referring to a famous baseball player — that it really hit home. The audience laughed and clapped; a few even gasped in surprise. The realization struck: the vice-president was clued up.

Biden made it clear that he was not the only one who was listening. At a recent nuclear-security summit with heads of state gathered round, US President Barack Obama began by noting that many of them had asked about Biden's cancer initiative. Several countries, Biden said, then joined with the United States in a memorandum of understanding about how they could work together to fight cancer.

Are they right to be so enthusiastic? Certainly the flaws in Biden's plan — not least the name — should not distract from its potential. His National Cancer Moonshot Initiative could yet receive US$1 billion in funding: not enough to 'cure' cancer, obviously, but perhaps enough to make significant changes in how cancer research is done if scientists help to target the money properly. And yes, the implications could yet spread beyond US borders — particularly if international researchers weigh in with their thoughts about how best to accelerate the pace.

The US National Cancer Institute has made it clear that it wants to hear recommendations from the community, and has a website dedicated to stimulating participation (see go.nature.com/cc5crk). This participation need not be restricted to US researchers: international scientists and clinicians should submit recommendations, too.

And, if the US project is as well received elsewhere as Biden claims, then scientists in those nations should look for ways to band together and marry their unique resources. Some countries have meticulous databases of health outcomes; others may have unique computing power or long-running longitudinal studies. And researchers in all countries face similar challenges of data sharing, reproducibility and interdisciplinary research.

These topics are also not cancer-specific: researchers in other fields have much to offer — and to gain. Biden said that after Obama's State of the Union address, in which he appointed Biden head of the moonshot initiative, one of the first people to contact him was the US energy secretary Ernest Moniz. The Department of Energy has supercomputing power that could aid cancer researchers, the secretary said. Researchers from other fields can bring fresh perspectives to and reap the rewards of a coherent cancer-research strategy.

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In a US Congress that is paralysed by partisan bickering, the fight against cancer should find common support from lawmakers. Researchers can come together and show them the way. ■