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Future Shocks

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14th Edition

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FUTURE SHOCKS

As the world becomes more complex and interconnected, incremental change is giving way to the instability of feedback loops, threshold effects and cascading disruptions. Sudden and dramatic breakdowns—future shocks—become more likely. In this section, we present 10 such potential future shocks. Some are more speculative than others; some build on risks that have already begun to crystallize. These are not predictions. They are food for thought and action—what are the possible future shocks that could fundamentally disrupt or destabilize your world, and what can you do to prevent them?

Illustrations: **Patrik Svensson**

WEATHER **WARS**

USE OF WEATHER MANIPULATION TOOLS STOKES GEOPOLITICAL TENSIONS

Weather manipulation tools—such as cloud seeding to induce or suppress rain—are not new, but deploying them at scale is becoming easier and more affordable. As the impacts of climate-related changes in weather patterns intensify, the incentives to turn to technological fixes will increase in affected areas. Think of governments trying to manage simultaneous declines in rainfall and increases in water demand.

Aside from the potential environmental consequences, at a time of increasing geopolitical tensions even well-intentioned weather manipulation might be viewed as hostile. Perceptions would be paramount: a neighbouring state might see large-scale cloud-seeding as theft of rain or the reason for a drought. Cloud-seeding planes might be viewed as dual-use tools for espionage. Hostile uses are prohibited, but cannot be ruled out—for example, weather manipulation tools could be used to disrupt a neighbour's agriculture or military planning. And if states decided unilaterally to use more radical geo-engineering technologies it could trigger dramatic climatic disruptions.

As technologies evolve and deployment increases, increased transparency—about who is using what, and why—would help limit destabilizing ambiguity. So too would active discussion and collaboration on environmental vulnerabilities, both bilaterally between bordering states and on wider regional and global multilateral platforms.

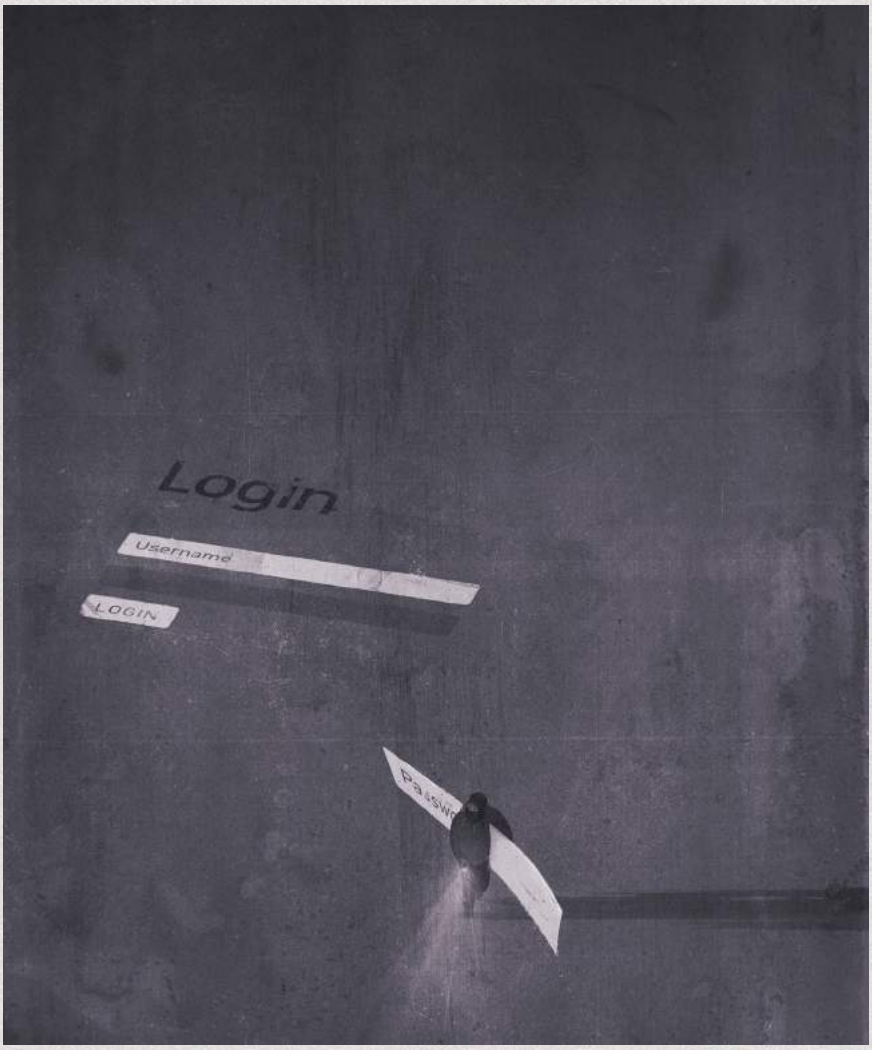
OPEN **SECRETS**

QUANTUM COMPUTING RENDERS CURRENT CRYPTOGRAPHY OBSOLETE

When the huge resources being devoted to quantum research lead to large-scale quantum computing, many of the tools that form the basis of current digital cryptography will be rendered obsolete. Public key algorithms, in particular, will be effortlessly crackable. Quantum also promises new modes of encryption, but by the time new protections have been put in place many secrets may already have been lost to prying criminals, states and competitors.

A collapse of cryptography would take with it much of the scaffolding of digital life. These technologies are at the root of online authentication, trust and even personal identity. They keep secrets—from sensitive personal information to confidential corporate and state data—safe. And they keep fundamental services running, from email communication to banking and commerce. If all this breaks down, the disruption and the cost could be massive.

As the prospect of quantum code-breaking looms closer, a transition to new alternatives—such as lattice-based and hash-based cryptography—will gather pace. Some may even revert to low-tech solutions, taking sensitive information offline and relying on in-person exchanges. But historical data will be vulnerable too. If I steal your conventionally encrypted data now, I can bide my time until quantum advances help me to access it, regardless of any stronger precautions you subsequently put in place.



CITY **LIMITS**

WIDENING GULF BETWEEN URBAN AND RURAL AREAS REACHES A TIPPING POINT

The world's political geography is being transformed by surging migration from rural to urban areas, straining the web of connections between the two. Divergences are widening on numerous dimensions, such as values, age, education, power and prosperity. What if a tipping point is reached at which the urban-rural divide becomes so sharp that the unity of states begins to erode?

Domestically, divergent values between urban and rural areas are already fuelling polarization and electoral volatility in many countries. Greater bitterness and rivalry could lead to localized nativism and even violent clashes. Separatist movements might break through in wealthy city-regions that resent diverting revenues to poorer rural areas with which they feel diminishing affinity. Leading cities might look to bypass national structures and play an international role directly. Economically, accelerating urban migration could lead to rural depopulation and the decline of local economies, with potential food security implications in some countries.

Better long-term planning—for both expanding cities and rural areas at risk of decline—might help to mitigate these dangers. Stronger transport and communications links could help to soften the urban-rural divide. Resources will be needed, which might require more fiscal creativity, such as finding ways to decentralize revenue-raising powers or more widely redistribute the productivity gains that urbanization generates.

AGAINST **THE GRAIN**

FOOD SUPPLY DISRUPTION EMERGES AS A TOOL AS GEO-ECONOMIC TENSIONS INTENSIFY

With climate change placing growing strain on the global food system, and with international tensions already heightened, the risk of geopolitically motivated food-supply disruptions increases. Worsening trade wars might spill over into high-stakes threats to disrupt food or agricultural supplies. Conflict affecting supply-chain chokepoints could lead to disruption of domestic and cross-border flows of food. At the extreme, state or non-state actors could target the crops of an adversary state, for example with a clandestine biological attack.

In these circumstances, retaliatory dynamics could swiftly take hold. Domestically, rationing might be needed. Hoarding and theft could undermine the social order. Widespread famine risk in recent years suggests that greater hunger and more deaths—in least-developed countries, at any rate—might not trigger a major international reaction. If similar suffering were inflicted on more powerful countries, the responses would be swift and severe.

More resilient trade and humanitarian networks would help to limit the impact of food supply disruption. But if trade wars were a contributing factor, then countries might seek greater self-sufficiency in food production and agriculture. In some advanced economies, this might require rebuilding skills that have been allowed to fade in recent decades. Agricultural diversification and the development of more-resilient crop variants could bolster national security by reducing countries' vulnerability.

DIGITAL **PANOPTICON**

ADVANCED AND PERVASIVE BIOMETRIC SURVEILLANCE ALLOWS NEW FORMS OF SOCIAL CONTROL

Biometrics are already making exponential advances—technologies that were recently in the realm of science fiction now shape the reality of billions of people's lives. Facial recognition, gait analysis, digital assistants, affective computing, microchipping, digital lip reading, fingerprint sensors—as these and other technologies proliferate, we move into a world in which everything about us is captured, stored and subjected to artificial intelligence (AI) algorithms.

This makes possible increasingly individualized public and private services, but also new forms of conformity and micro-targeted persuasion. If humans are increasingly replaced by machines in crucial decision loops, the result may lead not only to greater efficiency but also to greater societal rigidity. Global politics will be affected: authoritarianism is easier in a world of total visibility and traceability, while democracy may turn out to be more difficult—many societies are already struggling to balance threats to privacy, trust and autonomy against promises of increased security, efficiency and novelty. Geopolitically, the future may hinge in part on how societies with different values treat new reservoirs of data.

Strong systems of accountability for governments and companies using these technologies could help to mitigate the risks to individuals from biometric surveillance. This will be possible in some domestic contexts, but developing wider global norms with any traction will be a struggle.

TAPPED **OUT**

MAJOR CITIES STRUGGLE TO COPE IN THE FACE OF THE EVER-PRESENT RISK OF WATER RUNNING OUT

A range of compounding factors risk pushing more megacities towards a "water day zero" that sees the taps run dry. These include population growth, migration, industrialization, climate change, drought, groundwater depletion, weak infrastructure and poor urban planning. Short-termist and polarized politics at both municipal and national levels in many countries further heighten these dangers.

The societal shock of running out of water could lead in sharply differing directions depending on the context. It could exacerbate divisions. Conflict might erupt over access to whatever water was still available, or wealthier residents might start to import private supplies. But a water shock could also galvanize communities in the face of a shared existential challenge. Either way, damage would be done. Hygiene would suffer, increasing strains on healthcare systems. And governments blamed for the failure might be tempted to scapegoat weaker communities, such as those in informal dwellings with unofficial connections to the water system.

Getting governance and planning right during times of plentiful water would reduce the risk of day zero arising, including public information campaigns and basic maintenance of existing infrastructure, as well as regulations limiting the amount of water that households, businesses and government can use. New water sources could be identified, subject to careful risk assessment. And smart technologies could be deployed to reduce water use and improve water reclamation.

CONTESTED **SPACE**

LOW EARTH ORBIT BECOMES A VENUE FOR GEOPOLITICAL CONFLICT

With satellites now central to the smooth functioning of civil and military technologies, the amount of commercial and government activity in space has been increasing. This is a legally ambiguous realm, creating the potential for confusion, accident and even wilful disruption. Space debris is proliferating too—half a million pieces are now moving at the speed of a bullet in low orbit.

Even accidental debris collisions could cause significant disruption to internet connectivity and all that relies on it. But at a time of intensifying geopolitical competition, space could also become an arena for active conflict. Even defensive moves to protect critical space assets might trigger a destabilizing arms race. Precision weapons and military early-warning systems rely on high-orbit satellites—militarizing space might be seen as necessary to deter a crippling attack on them. In the future, as space becomes more affordably accessible, new threats of space-based terrorism could emerge.

New rules or updated protocols would provide greater clarity—particularly on the rapid expansion of commercial activity, but also on military activity. Even simple measures could help—such as ensuring transparency on debris-removal activities to prevent the misinterpretation of intentions. At a time of fraying global cooperation, space might be an area where multilateral advances could be signed up to by all.

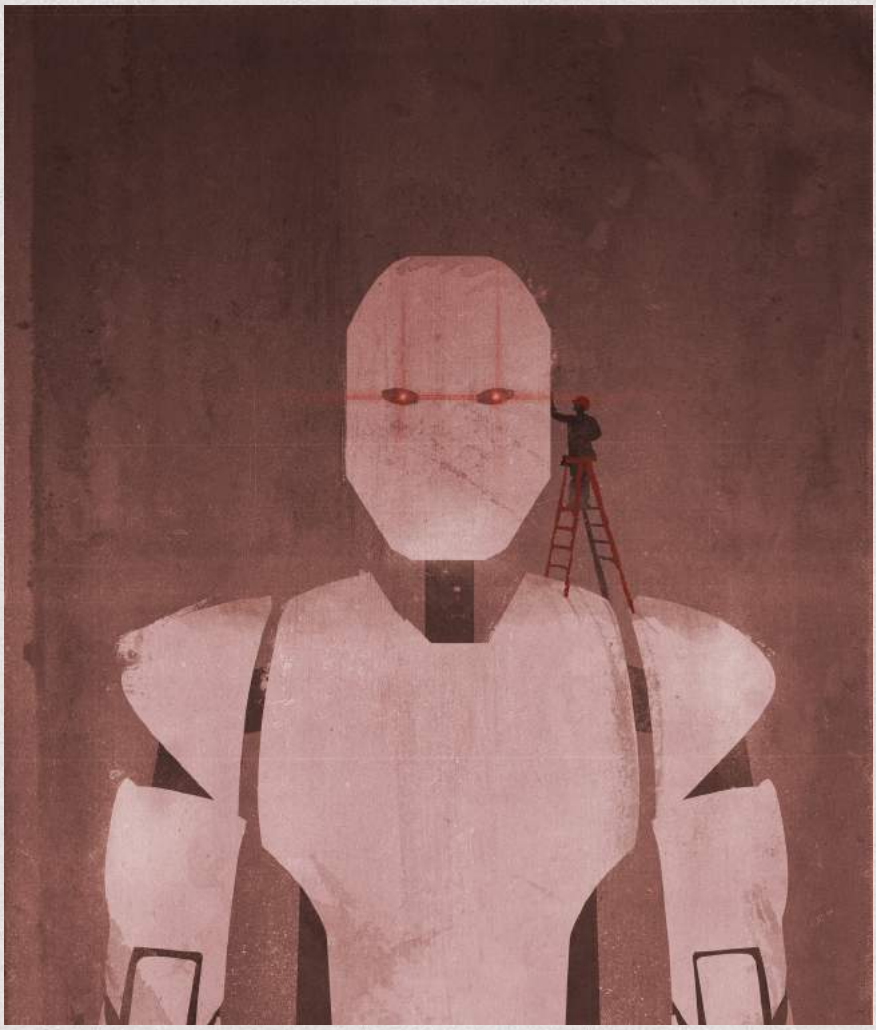
EMOTIONAL **DISRUPTION**

AI THAT CAN RECOGNIZE AND RESPOND TO EMOTIONS CREATES NEW POSSIBILITIES FOR HARM

As the intertwining of technology with human life deepens, "affective computing"—the use of algorithms that can read human emotions or predict our emotional responses—is likely to become increasingly prevalent. In time, the advent of artificial intelligence (AI) "woebots" and similar tools could transform the delivery of emotional and psychological care—analogous to heart monitors and step counters. But the adverse consequences, either accidental or intentional, of emotionally "intelligent" code could be profound.

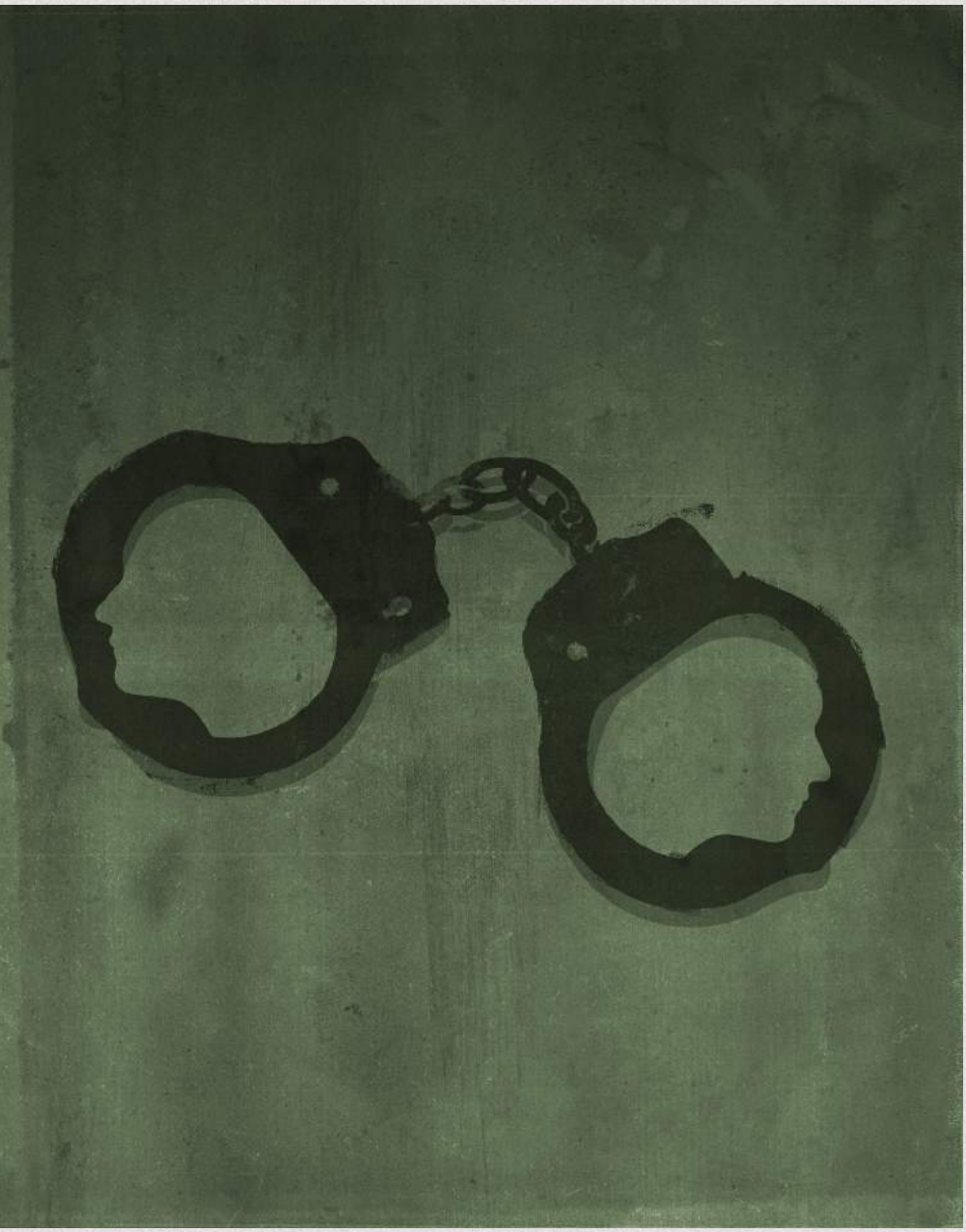
Consider the various disruptions the digital revolution has already triggered—what would be the affective-computing equivalent of echo chambers or fake news? Of electoral interference or the micro-targeting of advertisements? New possibilities for radicalization would also open up, with machine learning used to identify emotionally receptive individuals and the specific triggers that might push them toward violence. Oppressive governments could deploy affective computing to exert control or whip up angry divisions.

To help mitigate these risks, research into potential direct and indirect impacts of these technologies could be encouraged. Mandatory standards could be introduced, placing ethical limits on research and development. Developers could be required to provide individuals with "opt-out" rights. And greater education about potential risks—both for people working in this field and for the general population—would also help.



NO **RIGHTS** LEFT

IN A WORLD OF DIVERGING VALUES, HUMAN RIGHTS ARE OPENLY BREACHED WITHOUT CONSEQUENCE



Amid a new phase of strong-state politics and deepening domestic polarization, it becomes easier for governments to sacrifice individual protections to collective stability. This already happens widely: lip service is paid to human rights that are breached at home or abroad when it suits states' interests. What if even lip service goes by the wayside, and human rights are dismissed as anachronisms that weaken the state at a time of growing threats?

In authoritarian countries with weak human rights records, the impact of such a tipping point might be one of degree—more rights breached. In some democratic countries, qualitative change would be more likely—a jolt towards an illiberalism in which power-holders determine whose rights get protected, and in which individuals on the losing side of elections risk censorship, detention or violence as "enemies of the people".

Battles are already under way among major powers at the UN over the future of the human rights system. In a multipolar world of divergent fundamental values, building far-reaching consensus in this area may be close to impossible. "Universal" rights are likely to be interpreted locally, and those interpretations then fought over globally. Even superficial changes might be of modest help, such as new language that is less politicized than "human rights".

MONETARY **POPULISM**

What if the protectionist wave expanded to engulf the central banks at the heart of the global financial system? Against a backdrop of geo-economic escalation, calls could rise to "take back control" of independent monetary policy and to use it as a weapon in tit-for-tat confrontations between the world's economies. Prudent and coordinated central bank policies might be attacked by populist politicians as a globalist affront to national democracy.

A direct political challenge to the independence of major central banks would unsettle financial markets. Investors might question the solidity of the global financial system's institutional foundations. As unease deepened, markets might start to tremble, currencies to swing. Uncertainty would spread to the real economy. Polarization would hamper domestic political response, with mounting problems blamed on enemies within and without. Internationally, there might be no actors with the legitimacy to force a coordinated de-escalation. The risk of a populist attack on the world's financial architecture could be mitigated by deepened efforts to maximize the popular legitimacy of central bank independence.

This could be done by bringing the public in—perhaps through formal consultative assemblies—to decisions on independence, accountability and stability. The greater the public understanding of and support for monetary policy mandates and tools, the less vulnerable they will be in times of crisis.

ESCALATING PROTECTIONIST IMPULSES CALL INTO QUESTION INDEPENDENCE OF CENTRAL BANKS

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