



## Foreshocks 2015

### 9 “Gray Cygnets”

One can't see “black swan” events coming. But other kinds of disruptions do provide some warning—early, weak signals that we at Foresight Alliance are calling “gray cygnets”: less-noted events that could erupt into disruptive trends with far-reaching impacts, some foreseen, some unexpected. Last year was replete with these baby swans, both promising and ominous, and we've culled a list of nine that we believe are worth keeping an eye on.

Is your organization prepared for what these gray cygnets portend? What others would you nominate?

- 1. Blockchains of trust.** Although 2015 was a challenging year for Bitcoin, blockchain technologies continued to advance, most notably in the form of [Ethereum](#), a protocol for developing programmable “smart contracts.” Smart contracts—digital agreements drafted as computer code—can replace trusted third parties with the blockchain itself, substituting immutable rulesets of algorithmic logic for mutable human laws and agreements. Ethereum and smart contracts have the potential to disintermediate a wide range of economic middlemen, such as financial services companies. Potentially, Ethereum could grow into an [open global platform](#), enabling friction-free transaction processing for everyone from individuals to multinationals.
- 2. Algorithmic profiling.** As companies expand their reliance on big data analytics, they are increasingly using these tools to profile consumers. A 2015 analysis by the investigative journalism organization ProPublica found that [Princeton Review charged Asians more](#) for test prep, regardless of the income level of their neighborhood; meanwhile, [Facebook patented an algorithm](#) that enables banks to make lending decisions based not only on a person's creditworthiness, but on the credit scores of their friends as well. These events portend that as big data analysis expands, it will push further into people's daily lives, affecting a wide range of activities and situations. Grocery prices, seat selections, job offers, and search results are just the leading edge of a future where how you are treated is based on who an algorithm thinks you are.



- 1. Blockchains of trust**
- 2. Algorithmic profiling**
- 3. Quantum computers**
- 4. Adidas' “speedfactory”**
- 5. The post-antibiotic age**
- 6. CRISPR in China**
- 7. Universal basic income**
- 8. DIY genetic engineering**
- 9. Creeping copyright**

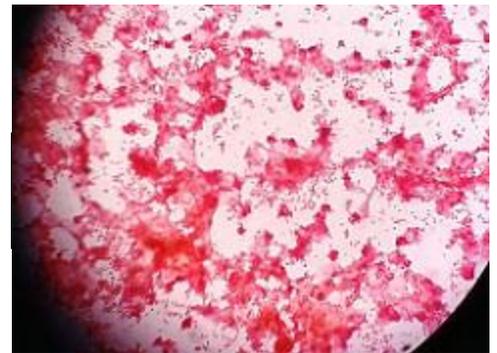


**3. Quantum computers.** Quantum computing has the potential to dramatically reduce the time required for certain computational tasks. While prototypes have been developed by companies like D-Wave Systems, it has proven a challenge to demonstrate that these computers are truly using quantum phenomena to compute solutions to algorithms. In December 2015, [researchers at Google announced](#) that they were able to achieve a 100 million-fold performance increase for a carefully designed optimization problem. Further work is needed to increase the scalability and range of applications for quantum computing, but companies like [Google, IBM, and Microsoft](#) are making progress. This could enable quantum computers to continue the acceleration of computing performance as Moore's Law begins to break down on conventional computing platforms.



**4. Adidas' "speedfactory."** In Ansbach, Germany, [Adidas is setting up a "speedfactory"](#) for "automated, decentralised, and flexible" shoe manufacturing. "Intelligent robotic technology" will enable these factories to be located in key markets, allowing Adidas to produce "individualized products that get into customers' hands more quickly" than is possible when shoes are manufactured overseas. Adidas will be able to respond quickly to viral demand for specific items, e.g., a shoe design worn by an athlete who won a championship last week. Speedfactories will also reduce emissions from shipping. The speedfactory strategy [augurs substantial changes for manufacturing](#), from old thinking in which labor costs drove manufacturing to remote locations, to new strategies in which proximity and rapid response drive nearby, automated, flexible, even pop-up factories. Speedfactories will likely offer fewer net jobs, require higher skill levels, and be distributed across many locations according to the geography of consumer demand.

**5. The post-antibiotic age.** Could the end of effective antibiotics be approaching, at least for some types of bacterial infections? Researchers reported in 2015 that a bacterial [gene that confers resistance to polymyxin antibiotics](#) has been found in a growing number of meat samples from China, as well as in a small number of infected hospital patients. Currently polymyxins are the last defense against many antibiotic-resistant gram-negative bacteria. Worse, the gene is found on plasmids—small DNA segments that can transfer genes between bacteria, spreading antibiotic resistance. In the short run these findings are prompting new calls for reduction or elimination of the use of some antibiotics in animals. Calls to restrict meat imports from China could follow. In the long term these findings could portend situations in which there are no effective antibiotics to treat some kinds of infections, spurring renewed emphasis on the development of new antibiotics or other treatment strategies.



**6. CRISPR in China.** In 2015 Chinese scientists announced the use of the revolutionary CRISPR gene-modification technology to create goats that are more muscular with longer hair. [Chinese research institutions](#)—possibly numbering in the hundreds—are working on sheep, pigs, monkeys, and dogs using CRISPR. One group of Chinese scientists even published a report on efforts to [modify nonviable human embryos](#), attempting to eliminate a gene linked to a blood disorder, but the experiment reportedly failed. These advances signal how widespread and important CRISPR technology—and the capabilities it unleashes—



is likely to be. They also presage upcoming cross-cultural debates about how far genetic modification should go—debates that will almost certainly extend into the realm of human modification.

**7. Universal basic income.** In 2015 [Finland announced](#) it will experiment with providing a basic income to up to 10,000 Finns, giving each as much as €10,000 per month for two years starting in 2017. Although not the first basic-income pilot, Finland's is the largest and should help answer key questions about this controversial notion. Around the world, analysts across the political spectrum [favor universal basic income](#) as a way to



eliminate poverty, reduce government, boost innovation, and give workers leverage with employers. Some even see it as inevitable, given the growing threats of automation and part-time work. (See Foresight Alliance's report [The Futures of Work](#).) But others say it will [damage the social fabric](#) by reducing incentives to participate in society and cutting ties between coworkers. Even so, universal basic income is an idea that could take root in the decades ahead.

**8. DIY genetic engineering.** The ability to perform genetic engineering outside a professional lab took big steps forward in 2015, including the release of several [consumer-level starter kits](#), crowdfunding campaigns for others, and the grand opening of the first community-biotech lab built inside a public library (the Bio Lab in San Diego, California). The kits (for example, from Amino and Synbiota) let people design custom DNA sequences at home, creating things like fluorescent bacteria or, soon, homebrewed beer. The promise of DIY biotech seems clear:

demystifying genetic modification and enabling crowdsourced bio-innovation. The risks also seem starkly obvious: unlike DIY activities like infotech-hacking, some of the end products of biohacking are alive. The nightmare of self-replicating organisms run amok has been explored in scenarios ranging from bioterrorism to population-decimating pandemics. [Regulation to prevent such outcomes is uneven](#), and some experts feel a hazardous event is inevitable if oversight isn't strengthened. But scientists argue for freedom to allow DIY biotech to grow. As its popularity continues to mount, the question of how to proscribe its risks without stunting its benefits could become urgent.



**9. Creeping copyright.** Do you own your car? Think hard before answering. As the Internet of Things grows and software—specifically, pieces of proprietary code—is embedded in more kinds of hardware, the question of who owns the entire product is becoming less clear-cut. In 2015, [the Electronic Frontier Foundation filed two requests](#) on behalf of vehicle owners who wanted to repair their cars, but couldn't because it would have meant violating the Digital Millennium Copyright Act (DMCA). [GM has said](#) that customers are conflating ownership of the vehicle with ownership of the code that runs the vehicle. And while the most prominent 2015 case was about cars, the issue isn't limited to vehicles. Coffee-pod brewing systems from Keurig and Nespresso, as well as Amazon's Fire TV, use digital rights management (DRM) to prevent third-party "content"—from ground coffee to digital entertainment—being used in their hardware. Copyright and DRM have been expanding stealthily across the consumer landscape, but the move into cars may finally ground this issue in a way that people really care about. We suspect the fight against copyright creep begins here.