2016: The Year that Wasn't Normal

ETC Group's Year in Review

monitoring power
tracking technology
strengthening diversity

So you say you want a (fourth) revolution, well you know…

Source: Roy Export SAS with edits by ETC Group (and apologies)

Fashionably late and just in time for the Chinese New Year of the Rooster, ETC Group once again offers a wake-up call and look-back at the last thirteen months (spoiler: despite our best hopes, waiting the extra month didn't make the news any cheerier)

Brexit to Slapstick with a BANG: After a rollercoaster year that spanned everything from Brexit to 'Trumpxit' to Leonard Cohen's mortal exit, Naomi Klein best summed up the unusual place to which 2016 has brought us: one way or another, "the future is radical — we just have to decide what kind of radical we want." After one week, the new 'leader of the free world' is already staging an ominous re-enactment of Charlie Chaplin's "the Great Dictator." Likewise, ETC is reminded that this past year was the 80th anniversary of Chaplin's other great work, "Modern Times," in which workers were ruthlessly gobbled up and turned to drones by the industrial machine. That theme too is now firmly back in vogue as the World Economic Forum trumpets the arrival of the so-called 'fourth industrial revolution' (hashtag 4IR) in which robots, synthetic biology and artificial intelligence are predicted to leave swathes of human labour awash sans wages.

For over a decade, ETC Group has been harping on about the coming "technological convergence" (the old term for #4IR, another '4' that we called BANG — Bits, Atoms, Neurons and Genes) and the convergence is arriving on schedule. At the outset of 2016, the World Economic Forum predicted (unsurprisingly) that #4IR will likely worsen the gender gap and harm women's work more than men, and at year's end, UNCTAD reported that the effect of #4IR will (again, unsurprisingly) hit developing country economies worse where up to 2/3 of all jobs may be replaced by robots. When the Davos crowd gathered again this January 2017 to lick their wounds over the loss of beloved trade deals (TPP, TTIP — and good riddance to them) we imagine that they also, despite pieties about lost jobs, began coalescing their energies into waving the fig leaf of #4IR as plan B, and may increasingly offer it as a gene-edited olive branch to the new US Administration. After all, who needs free movement of peoples or goods across borders when the workforce can be robotized and the economy digitized? Asked by the *New York Times* if robots would replace or pre-empt the workers who voted him in, Mr Trump cheerily replied "They will, and we'll

make the robots too." (Except that actually it looks like China will.)

Newt Gingrich, one of Mr Trump's leading 'surrogates,' has assured the tech community that "this is going to be a very science- and technology-oriented administration," which in practice means that tech companies will continue to call the shots in Washington. Tellingly, even before Mr. Trump went to Washington, he summoned the top tier of twelve tech titans to the boardroom of Trump Tower as a show of apostolic unity between his administration and Silicon Valley. The tech titans reportedly asked his administration to prioritise innovation in "agriculture, infrastructure, manufacturing — everywhere." In other words, the fourth industrial revolution was explicitly tabled. (He got the hint — a few weeks later, Trump promised the *New York Times*, "robotics is becoming very big and we're going to do that.") Pat Mooney (as usual) saw this coming back in 2005 when he declared that in the future, "Technology trumps trade." Only maybe he mixed up the order of the words (as usual) and it turns out that what we really face next is "Trump trades in technology." Kudos to the San Francisco activists who, seeing who really pulls the strings, chose to protest the inauguration of America's new *Übermensch* by targeting Uber. (Not to mention the #DeleteUber movement!)

While at times 2016 felt a bit "too real," many themes ETC plucked from the years' wreckage had one thing in common – a move toward the artificial.

Artificial Intelligence (AI)

Artificial markets: Two years ago, Kevin Kelly of Wired argued that "the business plans of the next 10,000 start-ups are easy to forecast: Take X and add AI." And in 2016, the AI market soared, expected to rise to $70 billion by late 2020 and drive a $14–33 trillion impact within ten years. Indications are that seven familiar companies will dominate the AI space: Apple, Amazon, Alphabet (Google+), IBM, Facebook, Tesla and Microsoft, five of whom are the Olympian ringmasters of the sparkling new 'Partnership for AI' — and all of them were cloistered in the Trump tower tech summit.

Go, dodge, crash: 2016's AI landmarks range from Google's DeepMind taking a break from sorting cat photos to beat the world's 'Alpha Go' Champion Lee So Dol (and later covertly beating all of China's GO masters), to the runaway success of the 'DoNotPay' chatbot AI that successfully contested over 160,000 parking tickets in London and New York, avoiding $4 million in fines. Of course, the dark and stupid side of putting AI everywhere emerged too. On 7 May 2016, Joshua Brown became the first human known to be killed by AI after his Tesla went underneath a truck in autopilot mode. As the year ended, Uber admitted that its self driving cars already illegally cruising San Francisco streets were running red lights and haven't quite grasped the concept of bicycle lanes. With Uber's CEO now appointed to advise the Trump administration, might there be potential for an actual out-of-control 'American car-nage'?.

Impressionable minds: On the domestic front, Mark Zuckerberg proudly released a video showing his baby son Max left under the care of his own personal AI called Jarvis (voiced by

Morgan Freeman). Children's rights groups sued to take creepy AI-enabled dolls off the market because they were carrying out corporate surveillance of children (#hellobarbie took center stage, but new My Friend Cayla is also creeping in). Most embarrassingly, Microsoft released an online AI teen chatbot on Twitter, called Tay, who within 24 hours of 'life' morphed into a foul mouthed, sex-obsessed racist. Rumours that Donald Trump's twitter account is also a Microsoft chatbot have not been confirmed. (And Twitter, we note, was not at the Trump Tower tech love-in.)

Artificial Climates

The big melt: ETC would not be the first to point out that (unfortunately) climate change doesn't go away while everything also gets radical. In 2016, September finally broke the string of 16 straight 'hottest <insert month> ever.' July and August meanwhile competed for the hottest month of any month since weather recording instruments were invented (they tied). Researchers had to "double up" on their predictions for sea level rise after finding two new ways that Antarctica is melting and the Arctic was wearing its skimpiest ice covering ever. See, "The World at 1°C," a monthly publication launched in 2016, for a more sobering portrait of the locally-felt consequences of our planetary crisis.

The big fix: In the aftermath of the Paris Agreement, the climate community is trying to square the circle of how to stay below 1.5°C degrees of warming without changing anything in the economy. As we predicted, the 1.5°C target has become an on-ramp for geoengineering enthusiasm to enter the climate debate. So far, the siren voices are mostly pushing Bioenergy with Carbon Capture and Storage (BECCS), even though a 2016 report by the UN's Biodiversity Convention has warned starkly that BECCS "seems likely to have significant negative impacts on biodiversity through land use change." Solar geoengineering is also stepping into the spotlight with the change in US politics. As the Obama administration stepped out of the White House they published a report explicitly proposing geoengineering research. Meanwhile, prominent backers of geoengineering who may follow through on that proposal are now stepping into the new administration, including Newt Gingrich (not in Trump's cabinet, but still prominent in Republican Party), incoming EPA lawyer David Schnare and Exxon chairman Rex Tillerson, the newly-minted Secretary of State. Exxon was the earliest oil company to study and promote geoengineering options (particularly carbon dioxide removal technologies), and Mr Tillerson himself pronounced climate change to be no more than "an engineering problem." Will Trump himself like the idea of geoengineering? Of course he will — it's big, brash, over-simplistic and 'Made in America.'

Artificial Biology:

In 2016, we found ourselves spending more and more time tracking the overrunning frontiers of synthetic biology, genome editing, gene drives, molecular communication and beyond.

Gene Editing: As predicted, the CRISPR gene editing technique continued to be "a very big thing" through 2016. As science served up gene-edited dinners as PR stunts in both

Sweden and New York, it seemed a new nutritious CRISPR product in development was being announced monthly: chickens, mushrooms, corn. The heavyweight patent bust-up of the year over who actually gets to own CRISPR finally hit the courtroom in December, and the licensing battle also got underway. Harvard's Broad Institute/Editas licensed to Monsanto, while Berkley's Doudna Lab/Caribou Biosciences licensed to DuPont and Max Planck's Charpentier lab licensed to syn bio leader Evolva. It also became clear that a CRISPR-plus future is waiting in the wings — several similar gene editing techniques with catchy names such as NgAgo and 16sRNA became public this year, Monsanto licensed an additional CRISPR variant (CPF1) and in an interesting twist in the CRISPR patent battle, Cellectis claimed their foundational patents may undercut the whole gene editing field including CRISPR.

Gene Drives: More out of control than a AI Uber car is the rapidly emerging development of gene drives — gene-edited organisms deliberately designed to spread in the wild by sexual reproduction (sex drives?) to take over and crash wild populations and species. In 2016, mega-foundations run by Bill Gates and India's Tata conglomerate each poured around $70–$75 million apiece into the gene drive race. Investment-wise, the US Defense Advanced Research Project Agency (DARPA) is the dark horse, with an unknown amount invested in its 'safe genes' project, which ostensibly aims to find ways to recall rogue gene drives back out of the environment. In other contingency plans to re-close Pandora's Box, in June, alpha gene drive jockey Kevin Esvelt of MIT introduced his safety idea of 'local gene drives' with his 'daisy drive' proposal. In ETC's view, daisy drives may perversely accelerate gene drive releases by rendering the field more commercially interesting. Esvelt's pronouncements on gene drives swing erratically between eagerness and caution. We suspect he was behind the Broad Institute's intriguing decision to stipulate in Monsanto's CRISPR licensing agreement that they could not use CRISPR for gene drives or terminator technology. ETC Group is sceptical that withholding a few patent keys will stop corporate, military or other interests from taking joy rides on gene drives.

The movement against gene drives also grew in 2016. In June, the US National Academy of Sciences issued a surprisingly worried policy report on gene drives, sounding strong cautionary notes. Civil society followed this up in September with a call for a moratorium from 30 leading conservationists and environmentalists including Jane Goodall and David Suzuki, which found further support from 170 organisations in another moratorium call in December. The IUCN World Conservation Congress in Hawaii in September issued a resolution amounting to a de facto moratorium on IUCN support for gene drive research and development, and at the UN Biodiversity Convention (CBD) in Cancun in December, gene drives careened onto the agenda propelled by strong concern from African and Latin American countries. Despite a ground deployment of literally hundreds of biotech lobbyists in Cancun working with Canada, Australia, Brazil and others to successfully see off a moratorium, the CBD Conference of the Parties nonetheless issued language sounding caution on gene drives.

Digital biopiracy: DivSeek and destroy: Thankfully, the army of biotech lobbyists in the Cancun UN biodiversity negotiations failed to stop a significant decision that called for the UN body to begin addressing the now-real problems of digital biopiracy. (Where genetic information is digitally sequenced in one location to enable synthetic biology and gene editing companies to make living copies elsewhere.) This ability to digitally transfer genomic information and then turn it back into biological reality evades (and may potentially destroy) the careful arrangements set up internationally to rein in biopiracy. The Captain Hook of digital bioprivateers appears to be the poorly governed DivSeek project, headquartered in Canada, which aims to collect all the databases on crop biodiversity into one handy location for digital biopirates. In 2016, investigations by Third World Network uncovered that DivSeek, possibly through the University of British Columbia, was [div]seeking $400,000 US from Syngenta and DuPont, offering privileged access to sequences and patenting opportunities in exchange. Ouch.

Fake flavours and foods: In 2016, ETC created a searchable map of countries affected by syn bio's fake flavour, fragrances and other ingredients, co-authored a handy shoppers' guide and began to catalogue a worryingly long list of synbio ingredients now on or close to market (expect the full list in 2017). Companies creating Syn bio-derived animal replacement products such as fake milk by Perfect Day, fake eggs by Clara foods and fake meat by Impossible Foods tried to organize themselves into a new hi-tech investment bubble, experimenting with various PR rebrands such as 'cultured foods,' 'cellular agriculture' or 'clean foods.' Syn bio company Solazyme rebranded itself as Terravia, but might be better named Terra-bull after one of its algae ingredients was blamed for making Soylent meal replacement consumers sick. Meanwhile, a GMO labelling bill was finally passed in the USA decades after everywhere else; however, it has so many holes that very few GMOs will actually be labelled any time soon. In cheerier news, the Non-GMO Project, which certifies North American food products as not containing either GMOs or synthetic biology ingredients, is now applying its 'butterfly' label on over 43,000 verified products, representing over $20 Billion in annual sales, and the US Organic Standards Board decided on guidance that would see the USDA exclude gene-edited and synthetic biology products from their organic standards label.

Molecular communication: Creeping onto the radar beyond syn bio is the emerging field of 'molecular communication,' in which genetic material and biological systems are harnessed as information carriers in a biological 'internet of living things.' While "Mol Com" researchers practiced sending communication signals by pheromones or encoding data in DNA, an MIT experiment published in November 2016 began to show applications in agriculture and beyond by creating the world's first cybernetic spinach. Nanotubes were incorporated into spinach plants that allowed the plants to send emails to a smartphone whenever the plants encountered chemicals found in explosives. "This is a novel demonstration of how we have overcome the plant–human communication barrier," enthused the researchers. Rumours that Donald Trump's twitter account or Zuck's AI babysitter are really a spinach plant have not been confirmed.

2016's most frivolous biotech revolutionaries:

- Born to booze: Vinome is a new startup that claims to tailor wines to your genome
- Moss deaf?: The crew at Taxa Biosciences failed to deliver glowing plants but now think consumers will go for their patchouli-scented fragrant moss instead. You can't see it in the dark, but you can smell it.
- Care for a light bite? In September, we learned that biohacker and dog breeder David Ishee had used CRISPR to inseminate mastiff dogs with glow-in-the-dark genes.

Artificial agriculture

The futuristic food system: 2016 also saw #4IR making waves in big ag, and precision agriculture is the name of the game. Big Data frames the future of agriculture as one that harnesses "the mass of increasingly available information on the environmental, biological, and human factors that govern crop growth and yield" (source) to help [large-scale industrial] farmers grow crops more efficiently. In this vision, drone sensors can measure water, nutrients, and chemicals across the field with a centimetre of precision, and that information gets fed into a 'black box' that determines exactly what proprietary seeds to plant, when and how frequently to spray patented chemicals and when to plant and harvest tailored gene-edited seeds. As driverless tractors (farmbots) roam their fields, the data-driven farmer chills in their kitchen sipping lattes and tracking everything on their iPad… or more realistically, the corporate executive can track and control the farmer better from their desktop. In this world, everything production related could potentially be owned by one company (ETC's prediction: the 'jolly green giant' will be John Deere and Co). Of course, large-scale industrial farms are the only ones with enough capital to afford "the new normal" of precision ag.

What are some early applications of precision ag down home on the ranch? Check out Fujitsu's Connected Cow project, the new SmartBarley or Blue River's 'lettuce bot' to get a flavour. Further up the food chain, groceries may soon be delivered right to your door by drone: in 2016 Amazon made its first "Prime Air" delivery, sending popcorn and movies to a UK farmer (who, if AI farms achieve their vision, will have not much left to do but watch himself on the History Channel.)

Merger madness: ETC has been predicting this new digital agricultural model for some years, but in 2016 we saw that vision coming to life in the mess of mega-mergers that were announced among agricultural input sectors, both on center stage and behind the scenes. There were some high-profile mergers announced up and down the agri-food chain in 2016. If the mergers between Dow–Dupont, Bayer–Monsanto, and ChemChina–Syngenta (the so-called ChemGens) and not stopped, the input sector will switch from the current 'joy of six' to something of a ménage à trois. In ETC's view, these mergers are just the beginning, and foreshadow a second round of mergers, with Big Data-enabled farm machinery companies, aka DataMachs, pulling the strings. More on this in our end-of-year ag mergers update — it's juicy stuff!

The issue of mergers and concentration and their impacts on food security and nutrition was taken up at the UN's Committee on World Food Security — not in an emergency debate as many civil society demanded (but a shout out to the Sudanese Chair Amira Gornass for supporting this effort!), but instead as a smaller informal conversation between governments… this is a space to watch in 2017.

Knowledge is power, and ETC is working with partners to raise awareness about the threats concentration poses to peasant farmers and agroecology around the world. Look out for the International Panel of Experts on Food Systems' (IPES-Food) upcoming report on concentration in the agri-food industry. We'll keep looking for opportunities to quash these mergers in their tracks through 2017.

"In the peasant's dream of a fair future, work is still necessary. Work is the condition for equality. (...) The peasant idea of equality recognizes a world of scarcity, and its promise is for mutual fraternal aid in struggling against this scarcity and a just sharing of what the work produces."

- John Berger, English writer, who in the 70s put the peasantry in the center of the world economic debate and the future of humankind. Died on January 2, 2017.

Artificial Governance?:

If robots and AIs are taking over the fields and the factories, should we be concerned that they might occupy the legislatures, cabinets and negotiation halls? As 2016 ended with allegations of cyberwar against the US election, a curious digital-driven politics is rising. The Pirate Party received 14.5% of the vote in Iceland on a platform of enacting digital direct democracy. More radical were those standing for Australia's new bitcoin-inspired "Flux party," who want to hand over the business of governance to so-called "delegative democracy' where you vote for a blockchain connected to a distributed smartphone voting app. It may only be a matter of time before somebody proposes handing the whole government enterprise over to Zuckerberg's AI nanny, or maybe DeepMind can govern between Alpha Go games.

Britcoin/artificial economies?: Speaking of blockchains, the cloud over Britain's pending EU exit may have a sterling lining. As the value of the pound sterling tumbled, Prime Minister May has played up the country's potential as an independent technology leader — particularly in Fintech (financial technology). This comes as the Bank of England begins seriously flirting with the feasibility of a Central Bank-issued Digital Currency (CBDC). They are not alone. According to the World Economic Forum, over 24 countries are currently investing in DLT (digital ledger technology, aka blockchains) with $1.4 billion in investments over the past three years. Around 100 central banks are engaged in DLT discussions worldwide and more than 90 corporations have joined blockchain consortia. 80% of banks are predicted to initiate DLT projects by 2017.

Global Tech governance: 2016 also saw the first-ever meeting of the UN's new confusingly named STI Forum (in this case, STI stands for Science, Technology and Innovation, not Sexually Transmitted Infections) as well as the initial work by the Secretary-General's special ten-member group for the Technology

Facilitation Mechanism (which includes ETC Group's own Neth Daño). In Latin America, more than thirty civil society organisations, peasant and social movements and responsible science groups banded together to launch the world's first regional technology assessment network, TECLA, to collaborate on critical early evaluation of technologies and drive civil society participation in emerging global technology debates and governance. Meanwhile, in July, Janos Pasztor, the senior advisor to the UN Secretary-General (UNSG) on climate change, established a new global project on governance of geoengineering — another space to watch in 2017.

Chilling of civil society: The criminalization of social movements and civil society organizations increased markedly during the past year, particularly in Brazil, after it invented a new wave of the "judicial" coup d'etat. Indigenous peoples, peasants fighting for land, and environmental activists are the most pursued rights defenders. In 2016, a Global Witness report showed that the killing of land and environmental defenders (people struggling to defend their land, forest and rivers) continue to increase, with 186 killings in 16 countries in 2015 — the highest annual death toll on record, and growing. The Philippines, Honduras, and Mexico are among the most dangerous countries for land and environmental defenders. Tragically, Goldman Environmental Prize awardee and indigenous woman leader Berta Caceres was killed in Honduras in March 2016, a crime that is still under impunity.

The Ecuadorian government tried to silence the voice of the famous 30 year old environmental organization Accion Ecológica because they publicly defended the rights of Amazonian Shuar Peoples expelled by the military for Explorcobres, a Chinese mining giant. The attempt was only cancelled after worldwide protests.

Campaigns to criminalize seed-saving continued in 2016, as farmers across Africa and Latin America fought secretive bilateral trade deals and national legislation that drove UPOV 91 to its logical conclusion: over four decades, the 12,000-year-old right to save and exchange seed has slid from a right to a privilege to a crime punished by publicly financed police rather than challenged by privately funded lawyers.

Comings and goings: Until the AIs take over, the UN meanwhile is still shuffling governance gongs between human beings. For the first time in the history of the UN selection, social media was tapped to involve broad civil society and citizens in the process of selecting the new Secretary-General. Nobody alleged that cyberwar skewed these elections, but curiously 2016 seemed to be a bumper year for European candidates across the UN system. Not only did we see a job change in the post of UN Secretary General (goodbye Ban Ki Moon, hello António Guterres), but also Executive Director of UNEP (goodbye Achim Steiner, hello Erik Solheim) and Executive Secretary of the Biodiversity Convention (goodbye Braulio Ferreira de Souza, hello Cristiana Paşca Palmer). And although UNFCCC leadership technically shifted from one Latin American to another (goodbye Christiana Figueres, hello Patricia Espinosa) Espinosa is a diplomat who's spent most of her career in Europe. The post of Executive Secretary to the FAO Commission of Genetic Resources remains to be filled. We would like to take a moment to especially thank Braulio

at the CBD for his outstanding scientific integrity and personal passion. Despite his best efforts, biodiversity isn't doing so well, but his legacy — and gift to his successor — is a smart, skilled Secretariat that shares his commitment.

Artificial knowledge: What we don't know:

"Science is broken"?: In early 2016, William O. Wilson and Pascal-Emmanual Gobry wrote scathing pieces about the flaws of our current scientific method, revealing that a lot of what we think we know, we actually don't. Researchers looked at 67 high-profile/ 'blockbuster' drug discovery studies and found that three-quarters weren't replicable. Another study of cancer research found that only 11 percent of preclinical cancer research could be reproduced. Why? Human error — lots of excel & basic math mistakes (in another study, improper use of Microsoft Excel was blamed for errors in a fifth of gene studies that use Excel to process data — and 'outright fraud' that skews findings toward favourable outcomes. They also cited an ineffective scientific peer review process and that we are producing new knowledge faster than we can verify that it's true. In the age of "alternative facts," we need all need to hold ourselves to more rigorous scientific standards and healthy scepticism. Maybe it's time to make compulsory the refreshingly blunt university course which was proposed at University of Washington in 2016. Its title: 'Calling bullshit in the age of big data' (or is that a precision data app for tracking ruminant output?).

Beyond learning that we don't know what we thought we knew, in 2016 governments also took steps backwards — actively choosing not to know things. At the UN Biodiversity Convention in Cancun, Parties decided to throttle the expert group on risk assessment set up under the Cartagena Protocol and to jettison risk assessment guidance documents prepared for GMOs and synthetic biology by the world's leading biosafety experts. Meanwhile, scientists in the US and Canada scrambled to archive the US EPA's climate data before the Trump presidency declares all of it 'fake news' and in just the first few days of the Trump presidency, we have learned that the US Government's Agricultural Research Service is now banned from publicly publishing its international reports monitoring trade, food and agriculture. So even when we know something, don't tell anyone!

ETC's pick for the best book of 2016:

Gordon, Robert J. *The rise and fall of American growth: The US standard of living since the civil war.* Princeton University Press, 2016.

Robert Gordon's book is not just about the USA nor is it just about the economy. It is a cool and fact-filled indictment of capitalist innovation over the last half-century. Surprisingly (and impressively), the book has garnered grudging respect from economists we thought would diss it. Gordon argues that the glory days of technological innovation roared into life following the American Civil War but spluttered and faded a century later, around 1970. En route, the book looks at developments in food and agriculture, health, communications and transportation and piles up persuasive data and accompanying anecdotes to show that the century's enormous progress in public sanitation, vaccines and antibiotics combined with greater access to fresher food served up

health and life expectancy outcomes that the last near-half-century of physics and chemistry, biotechnology, and genome mapping haven't come close to equaling. The advent of the radio and the telephone, Gordon maintains, changed lives and livelihoods far beyond Netflix, smart phones or even the Internet itself. For all of the technological hype of the last 50 years, and for better or worse, the passenger car and plane have impacted the world more than satellites and spaceflight. Gordon doesn't necessarily applaud the social outcomes of these technological changes: in fact, he is critical of much of what is happening to industrial foods and commercial pharmaceuticals — but while he demonstrates the profound impact of changes most of us have taken for granted, he contrasts the 1870–1970 technological change with the 1970–today hype of patchwork apps and models that create the illusion of scientific breakthroughs now. In the last couple of years, other authors have pointed to the decline in startup companies, the shriveling of venture capital, and the withering of some "next big thing" technologies, but Gordon provides the historical context that should make Silicon Valley shiver. While, yes, it does focus on the US, Gordon's book is filled with facts and anecdotes and written in a style that makes it hard to put down.

The worst book we read in 2016:

Moazed, Alex, and Nicholas L. Johnson. *Modern Monopolies: What It Takes to Dominate the 21st Century Economy*. St. Martin's Press, 2016.

Modern Monopolies is an infuriating book. Coming after a year (2015) that allowed a record-breaking near-$4 trillion US in mergers and acquisitions worldwide, the authors enthusiastically assure us that monopoly is the "old normal" in new duds. The old Monopolies of the Gilded Age, of robber barons and Rockefellers — the ones that the trust-busters and the anti-competition laws tried to break up a century ago — haven't really changed, they just have a faster turnover. This, apparently, is a good thing. Strong competition laws and anti-cartel rules may give the marketplace *diversity now*, but Modern Monopolies give us *diversity through time*. The price and power of new technologies, the authors insist, require global assets and global access. AI, nanotech and Genomics are just too big. They need to be Monopolies to be effective. But, where the leaders in the Fortune 500 used to stay on top for 50 or 60 years, the GEs, GMs and AT&Ts are surrendering to Apples and Amazons, who may already be yielding the right-of-way to Uber and unicorns as yet unborn. Don't worry, be happy. A quarter century ago, the research VP of a major seed company told us that the convergence of seed and pesticide companies might eliminate crop and genetic diversity *now*, but the new gene Giants would give farmers even greater genetic diversity *through time*. The pipeline he assured us was full even if the field looked a little forlorn. That's not how things turned out. The mega-mergers we are fighting today — which could mean that three companies control 60% of global commercial seed sales and 71% of pesticide sales — have led to huge research costs and few research results. Monopoly destroys the incentive to innovate and, if the mergers go through, will leave the industrial food chain R&D with nothing more than Three Shades of Grey or even maybe one agritech *über alles*.

But, not to worry, we can still have pie in the sky when we die — some monopolies never change.

Makers and Movers … Thank Yous and Goodbyes

After more than three decades leading and guiding the CS Fund, Roxanne Turnage stepped down as Executive Director and handed over the reins to Bailey Malone in a thoughtful, planned transfer of power that TC Group hopes to soon emulate. No stranger to the CS Fund, Bailey has traditions to uphold but the world to change. In 2016, we were saddened by the passing of Cathleen Kneen, much-missed matriarch of the Canadian Food Sovereignty movement and editor of the magnificent magazine *The Ram's Horn*. In the course of her lifetime's work in food and social justice activism, she was chair of Food Secure Canada, and a leading light in developing a 'People's Food Policy' for Canada which spurred even the Trudeau government to commit to a National Food Policy. A big congratulations to our allies at Friends Of the Earth International for electing Karin Nansen of REDES in Uruguay as their new fearless leader and to TWN (especially sleuth-in-chief Edward Hammond) for its investigative research uncovering DivSeek's double dealings.

Thank you, friends and allies, for your support through 2016's rollercoaster. Like many in civil society, we too face challenges and bumps -- if you appreciate ETC's work, please do consider supporting our continued existence with a donation. Here's to helping each other through another, ever more radical, year.

And here's one more John Berger quote for good measure:

> *"Hope is not a form of guarantee; it's a form of energy, and very frequently that energy is strongest in circumstances that are very dark."*

ETC's Random Predictions for 2017:

- ETC Group will launch an ingredient database of syn bio and GMO 2.0 ingredients in March, and an updated version of our popular stat-filled *Who Will Feed Us?* publication!

- After sorting cat photos, winning Alpha Go, designing biotech organisms and outfoxing ticket inspectors, the frontier of AI will move onto even thornier tasks: Zuckerberg's AI nanny Jarvis will be called in by the UK government to negotiate Brexit, while Google's DeepMind will be commandeered by the US government to sort out Donald Trump's business conflicts.

- Pat Mooney will step down as executive director of ETC Group at the end of 2017, and will be succeeded by co-directors (it will take two to tidy up) — DeepMind and Jarvis? or Beavis and Butthead?? Ha! Not yet. It's Neth Daño and Jim Thomas!

- The investment bubble to promote genetically engineered artificial animal replacements will make more name changes: from Cultured Foods followed by Clean Foods to Shiny, Slimy, Warm & Fuzzy Foods.

- To recover from the Soylent scandal, syn bio algae-maker Terravia/Solazyme will again rename itself (3rd time lucky?) Terraslyme.

- The Trump administration will turn out not to be climate deniers but instead climate engineers… or more likely, some internally-contradictory mix of the two.

- We'll start hearing more about Molecular Communication, precision agriculture outsourcing to telepresence robots and AI everything everywhere.

- The European Union's much-delayed legal advice on whether gene-edited products are GMOs (of course they are) will continue to be delayed and hidden from public view at the request of the biotech industry and the US government.

- Following a ground-truthed study, Bill Gates will fund a new gene drive strategy to protect Cyclops, dragons and unicorns

- ETC Group will move its international headquarters to the Philippines (actually, we established the office already this month) but the complete transition won't be over until sometime after we get rid of Pat.