Index

510(k) (USA) 200, 201, 202, 205
accountability 93, 229
adaptation 97
Adaptation Committee 104
adaptive governance 58–9, 63, 71, 72–3, 82, 93, 100, 101, 142, 226, 258
Agency for Healthcare Research and Quality (AHRQ) (US) 208, 209
agriculture 25, 44
aircraft 30
Alexander Kielland 244, 248
ambiguous technology 9–10
American Petroleum Institute 120, 238
Animal Plant Health and Inspection Service (APHIS) (US) 183, 192
anticipatory regulation 75, 90, 176, 195, 196, 257
antitrust 232
artificial intelligence 136
Asilomar conference 179, 182, 183
as low as reasonably practicable (ALARP)
attacks, on technology 33
auditing 57
Australia 89, 156–75, 257
automobile 30, 32
autonomous vehicles 42
see also internal combustion engine
Bainbridge, William Sims 43
balancing risks and benefits 1, 99
Baldwin, Robert 75, 236
best management practices 56
Biobricks 36
biodiversity 23
biofuels 68
biohacking 94
Biological Weapons Convention 19
biomarker 198
bioremediation 50
BIOS program, London School of Economics 78, 79, 80, 82, 83
biosafety 68
biosecurity 68, 82
biotechnology 13, 19, 34, 44, 46, 48, 49, 51, 55, 58–9, 83, 136, 143, 160, 179, 258
see also genetic engineering, genetically modified
bioterrorism 68
Black, Julia 75
Blackmore, Susan 96
black swans 8
Blake, William 30
Bosso, Christopher 1
Bowman, Diana 164, 170
BP 235, 239
see also Deepwater Horizon
Bureau of Safety and Environmental Enforcement (BSEE) (US) 240, 241
Burgoyne Committee 242, 248
California Department of Toxic Substances Control 87
Canada 88–9
Cancun Adaptation Framework 104
carbon sequestration 67
Carlson Curves 21
Centers for Medicare and Medicaid Services (CMS) 199, 202, 203–4, 208–11, 213, 257
certification programs 6, 136, 141
Chemical Weapons Convention 19
civil society 9, 13
civil war (US) 27, 28
Innovative governance models for emerging technologies

Clark, Gregory 21–2
Clean Air Act (US) 112, 115, 116, 118, 122–6
clamp change 23, 102, 103–6, 112
Clinical Laboratory Improvement Act (CLIA) (US) 199, 202, 203
clinical utility 204, 205
Coast Guard (US) 238, 240
Code of Conduct for Responsible Nanotechnology 56
codes of conduct 6, 63, 71, 79, 136, 141, 195, 196
cognitive sciences 13, 19, 34, 41
see also neuroscience
collaborations, business-civil society 13
command and control regulation 13, 47, 51, 54, 82, 165, 236, 239, 247, 248, 252
commercialization 109
Commission for the Study of Bioethical Issues 76, 77, 78, 81, 147
Communications Act 220, 221
communications age 214
communications technology 214, 216
see also information and communications technology (ICT)
Community Right-to-Know Act 80
comparative analysis 255
complex systems 8
complexity 218
Congress (US) 122, 123, 124, 134
consensus standards 247
consistency 228
Continental Shelf Act (UK) 241
contractual agreements 225
control paradigm 95, 106
corvergence, technology 2, 43, 166, 218, 233
cooperative oversight 74, 82, 142
Coordinated Framework for Regulation of Biotechnology (US) 58, 143–4, 145, 179, 182–3, 187
coordination, regulatory 11–13, 58, 86, 137, 211, 213, 232, 255, 258
Cosmetics Regulation (EU) 88
coverage with evidence development (CED) 199, 207, 208–10, 213
Cullen Inquiry (UK) 242
cultural perspective 27
cyber
crime 214
security 214, 233
war 214
weapons 19
Dawkins, Richard 96
Deepwater Horizon 235, 237, 239, 240, 243, 248, 249, 250, 251, 252
demand pull 112
Dennett, Daniel 96
Department of Energy (UK) 242
Department of Interior (DOI) (US) 240
development of technology 109
diffusion 109
digital native 40
directed energy weapons 19
disruption 55
disruptive technologies 216
do it yourself (DIY) 68, 69
drones 19, 38
see also unmanned aerial vehicles
dual use 28
dynamic oversight 176, 196
dysfunction, regulatory system 138
Ecofisk Bravo 244, 248
Electronic Communications Privacy Act (ECPA) (US) 219
Endy, Drew 78–9
energy 44, 67, 108
see also nuclear energy 45
enhancement, human 7, 43, 138, 139, 255
Enlightenment 19, 31
environmental considerations 31
regulation 112
Environmental Defense-Dupont Nano Risk Framework 13, 56
Environmental Impact Statement (EIS) (US) 187, 188, 189, 191
Environmental Protection Agency (EPA) (US) 6, 52, 54, 57, 58, 71, 80, 84–6, 110, 118, 120–26, 179
Index

ethics
issues or concerns 7, 136, 138
lagging technology 40
see also pacing problem
European Union 12, 87–8, 171
ex ante governance 52
Executive Order 13563 (US) 10
experimentalism 63, 74, 75, 82, 102
Facebook 40, 102
see also social networking
fairness 138, 229
Federal Energy Regulatory Commission (FERC) (US) 233
Federal Food, Drug, and Cosmetic Act (FFDCA) (US) 182, 183, 184, 187
Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) (US) 85, 86, 179, 182, 183
Fiorino, Daniel 146
first-mover advantage 3
five horsemen 13, 34, 35, 41, 42
flexibility 59, 73, 142, 234
Food and Drug Administration (FDA) (US) 53, 57, 58, 74, 80, 99, 140, 179, 184, 186, 187, 199, 200–203, 204, 205, 210–11, 213, 257
Food and Safety Modernization Act (US) 74
foresight 101
Foresight Institute guidelines 13
Friends of the Earth 71, 168
Fuerth, Leon 75, 77
Funding for studies 53
genetic engineering 32, 36, 69
see also biotechnology, genetically modified
genetically modified
animals 54, 187
crops or plants 10, 26, 46, 54, 58–9, 176–97
foods 45, 47–8, 53, 255
organisms (GMOs) 48, 59, 80, 156, 157, 159, 162, 176–97
see also biotechnology, genetic engineering, transgenic
Geneva Conventions 19
geoengineering 136, 137, 197
GoodNanoGuide 145
Google 41
governance
13, 47, 51–2, 73, 74, 76, 80, 90, 92, 93, 97, 141, 176
art of 82
deficits 12, 76
gaps 55, 77
inclusive 10
integrative 70, 83
mechanism 19
systems 62
see also adaptive governance, new
governance
governance coordination committees
137, 147–52, 258
Great Divergence, The 22
Green Chemistry Initiative (California) 87
groundwater contamination 118
guidance documents 171, 175
gunpowder 32
Hague Conventions 19
hard law 236, 255, 257
Hazard Analysis and Preventive Control Plans 74
hazardous air pollutants 112
health care 44
Health Effects Institute 151
Health and Safety at Work, etc. Act (UK) 242, 251
Health and Safety Executive (HSE) Working Group 163
Health, Safety and Environment (HSE) Working Group 163
heuristics 119, 133
“hollowing out” 164
home brew tests 202
Hood, Christopher 236
human genome sequencing 36
humility 101
iGEM 79
immortality 42
Innovative governance models for emerging technologies

see also life extension incentives 3, 53, 54, 55, 56 incremental 74, 228 industrial chemistry 30 industrial revolution 23, 35 industry standards 71, 141, 252 industry stewardship 55–7 information and communication technology (ICT) 13, 19, 30, 34, 38–9, 40, 83, 215, 255 see also communications technology information cluster 32 information disclosure 6, 63, 79 information security 223–4 infrastructure, communications 215 infrastructure security 224 innovation 90, 99, 109, 112, 113, 157, 172, 203, 210, 211, 213, 217, 257, 258 art of 79 benefits of 13, 44 context 97 creative 15, 213 engine of 141 environment 44 financial 28 governance or oversight of 177, 195, 199, 207, 213 networks 29 platform 99 process 3, 111 speed of 13 strategies 102 system 99 technological 22, 44, 140, 177, 205 waves 29 innovation-development process 110, 112 Institute of Medicine 207 Institute on Governance 92 inter-agency conflicts 227 Intergovernmental Panel on Climate Change (IPCC) 103 internal combustion engine 31 see also automobile internal control system 245, 252 International Council on Nanotechnology (ICON) 144–5, 151 international development 105 international harmonization 5, 93, 150, 255 see also transnational international humanitarian law 38 International Risk Governance Council (IRGC) 2, 4, 5, 8, 9, 10, 11, 12, 70, 73, 76, 83 internet 27, 39, 40, 41, 68, 214 internet freedom 214 invention 109 in vitro diagnostics (IVDs) 200, 202 Islamic spring 40 iterative process 59 IVF 156, 157, 158, 159 see also test tube baby J. Craig Venter Institute 68, 76, 82 Jasonoff, Sheila 80 Jochelson, K. 155 Kelly, Kevin 96 key performance indicators (KPIs) 243 knowledge gaps 173 Kondratiev waves 29–30, 34, 42 Koniggratz, Battle of 28 Kuzma, Jennifer 78 labeling 168 laboratory developed tests (LDTs) 202, 203 Lee, Maria 66 legal standards 246, 247 letter of assurance 223 life cycle, technology 254 liability 10, 63, 71, 79, 90 life extension 7, 42–3 life expectancy 22 lifespan 21 see also immortality long-term consequences 255 Ludlow, Karen 160, 164, 169, 170 Mandel, Gregory 73 Marchant, Gary 195
Index

McCray, Lawrence 95, 1010
McNeal, J.R. 21
media 141
Medicare 204, 206, 210
Medicare administrative contractors (MACs) (204)
Merton, Robert 114
methyl tertiary-butyl ether (MTBE) 109, 113–27, 257
military technology 37–8, 42
Mineral Working (Offshore Installations) Act (UK) 241, 250
mobile phones 39, 40
see also telephone
molecular diagnostics 198–213
Monsanto 48, 188, 189
Monsanto v. Geertson Seed Farms 189–90
Monte Carlo risk analysis 132
Moore, Gordon E. 38
Moore’s Law 21, 38
moratorium 48, 162
muddle through 258
nanny state 5, 155, 156, 157, 164, 175
NanoSafety Consortium for Carbon 13
Nanoscale Materials Stewardship program (EPA) 6, 84
Nano Stewardship Council 146
nanotechnology 6, 19, 34, 35, 44, 46, 48, 49, 50, 51, 52, 53, 54, 55, 57, 58, 63–6, 69, 70–75, 83–90, 94, 97, 136, 137, 139, 147, 157, 158, 161–75, 193, 197
national coverage determination (NCD) 204, 208, 209, 210, 211
National Enabling Technologies Strategy (NETS) (Australia) 165, 166
National Environmental Policy Act (NEPA) (US) 182, 187, 188, 191, 193
National Institutes of Health (NIH) (US) 80, 179, 208
National Institutes of Health (NIH) rDNA guidelines 194
National Nanotechnology Initiative (US) 144
National Nanotechnology Research Strategy (Australia) 172
National Nanotechnology Strategy Taskforce (NNST) (Australia) 163
network security 215–30
network security agreements (NSAs) 215, 220–35, 257
neuroscience 21, 136, 137, 258
see also cognitive sciences
new governance 5, 9, 45, 61, 165
see also governance; soft law
NIOSH 13
non-government organizations (NGOs) 71, 141, 145, 169, 182, 187, 190, 194
non-linear effects 8, 21
Norway 244–7, 248–52
Norwegian Continental Shelf (NCS) 235, 236, 244, 246
Norwegian Petroleum Directorate (NPD) (Norway) 244, 245
nuclear energy 45
obsolete regulations 255
Occupational Safety and Health Administration (OSHA) (US) 57, 238
Office of Science and Technology Policy (US) 77
Office of Technology Assessment (OTA) (US) 129, 130, 133
offshore oil and gas exploration 235–53
Offshore Safety Act (UK) 242
oil and gas industry 236
open government 10
open innovation 79
open source 68
organic farmers 186, 190, 194
 Organisation for Economic Co-operation and Development (OECD) 10, 13, 245
ossification 138
outdated rules 216, 217
outer continental shelf (OCS) 237, 238, 240–41, 248
overlapping jurisdiction 232, 233
Innovative governance models for emerging technologies

Oye, Kenneth A. 95, 101

pacing problem 3, 9, 82, 92, 94, 137–8, 156, 174, 177, 199, 207, 212, 216, 217, 231, 255, 257

see also ethics lagging technology, regulation lagging technology, speed of technology

parallel review 199, 207, 210–12, 213

paralysis 99, 102

path dependence 199, 207

perfluoroalkyl sulfonates (PFAS) 84

performance-based approach 240

performance measurement 93

personalized medicine 1, 136, 198, 199, 205, 206, 207, 212

pesticides 85–6

petroleum 30, 235–53

Petroleum Safety Authority (PSA) (Norway) 245, 246, 247

Pew Center on Global Climate Change 145

Pew Initiative on Food and Biotechnology 145–6

pilot project 211, 212

Piper Alpha disaster 242, 248, 251, 252

plant incorporated protectants 183

Plant Pest Act (US) 182, 183, 187, 191, 192

Plant Protection Act (US) 59, 187

polarization of views 45, 61, 102

pre-assessment, of risk 4

precautionary principle 71, 101

predictability 33, 230

pre-market approval (PMA) (US) 200, 201, 202

pre-market notification 200

Presidential National Bioeconomy Blueprint 207

Prince Charles 26

Principles for Regulation and Oversight of Emerging Technologies (US) 10

Principles for the Oversight of Synthetic Biology 71

privacy 7, 138, 139, 214, 255

private standards organizations 238

proactive regulation 73, 255

product registry 168

Project on Emerging Nanotechnologies 63–4, 67, 72, 145

promotional policies 108

proper pacing 177, 195, 197

Proposition 37 (California) 194

Prussia 27–9

psychological effect 27

public backlash 61, 100

crunch 50

confidence or trust 61, 100

dialogue 63, 71

engagement 79, 81, 82, 91, 196

failures 194

health 155

interest 219, 221, 226, 229

knowledge 49

participation 52, 230

perception 61, 81

see also stakeholders

public-private partnerships 13, 136, 141

railroads 23–9, 30, 32, 33, 255, 257

rate of technology change 22

reasonable and necessary 204, 210

Reasonable and Prudent Alternatives (RPAs) 86

“reasonable man standard” 246

recombinant DNA 80, 179, 194

Recombinant DNA Advisory Committee (RAC) (US) 179

Recording Industry Association of America 32

reflexive 74

regenerative medicine 136

Registration, Evaluation, Authorisation and Restriction of Chemical Substances (REACH) (EU) 87–88

regulation, lagging technology 36

see also pacing problem

regulatory authority 7

regulatory efficiency 239

Regulatory Forum (Norway) 246

regulatory gaps 12, 54, 161

regulatory overlaps 12

regulatory reform

reimbursement 199, 202, 203–8, 210, 212, 257
### Index

<table>
<thead>
<tr>
<th>Term</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>coding</td>
<td>204, 205</td>
</tr>
<tr>
<td>coverage</td>
<td>204</td>
</tr>
<tr>
<td>payment</td>
<td>204, 205–6</td>
</tr>
<tr>
<td>reputational harm</td>
<td>79</td>
</tr>
<tr>
<td>reporting programs</td>
<td>54, 87</td>
</tr>
<tr>
<td>reproductive technologies</td>
<td>156</td>
</tr>
<tr>
<td>research</td>
<td></td>
</tr>
<tr>
<td>applied</td>
<td>109</td>
</tr>
<tr>
<td>basic</td>
<td>109</td>
</tr>
<tr>
<td>funding</td>
<td>111</td>
</tr>
<tr>
<td>needs</td>
<td>53</td>
</tr>
<tr>
<td>tax credit</td>
<td>111</td>
</tr>
<tr>
<td>Resource Conservation and Recovery Act (RCRA) (US)</td>
<td>55</td>
</tr>
<tr>
<td>Responsible NanoCode</td>
<td>13</td>
</tr>
<tr>
<td>results based management</td>
<td>93</td>
</tr>
<tr>
<td>Rhodes, R.A.W.</td>
<td>164–5</td>
</tr>
<tr>
<td>risk</td>
<td>44, 49</td>
</tr>
<tr>
<td>adversity</td>
<td>93</td>
</tr>
<tr>
<td>assessment</td>
<td>4, 162, 173</td>
</tr>
<tr>
<td>communication</td>
<td>4, 5</td>
</tr>
<tr>
<td>culture</td>
<td>4, 7</td>
</tr>
<tr>
<td>governance</td>
<td>5, 6, 7, 76</td>
</tr>
<tr>
<td>management</td>
<td>4, 5, 79</td>
</tr>
<tr>
<td>significant</td>
<td>65</td>
</tr>
<tr>
<td>unknown</td>
<td>44</td>
</tr>
<tr>
<td>roadmaps</td>
<td>39</td>
</tr>
<tr>
<td>Robens Committee on Health and Safety at Work (UK)</td>
<td>242, 250, 251</td>
</tr>
<tr>
<td>robotics</td>
<td>13, 19, 34, 37–8, 69, 136, 137, 151, 197, 258</td>
</tr>
<tr>
<td>Roco, Mihail</td>
<td>43</td>
</tr>
<tr>
<td>Rogers, Everett M.</td>
<td>109, 100</td>
</tr>
<tr>
<td>Rothstein, Henry</td>
<td>236</td>
</tr>
<tr>
<td>Roundup Ready alfalfa</td>
<td>188–91</td>
</tr>
<tr>
<td>Royal Society/Royal Academy of Engineering (RS-RAE)</td>
<td>160–61</td>
</tr>
<tr>
<td>rulemaking</td>
<td>216</td>
</tr>
<tr>
<td>Sabel, Charles</td>
<td>74</td>
</tr>
<tr>
<td>safe and effective</td>
<td>204</td>
</tr>
<tr>
<td>Safety and Environmental Systems (SEMS) rule (US)</td>
<td>240</td>
</tr>
<tr>
<td>safety case</td>
<td>242, 243, 248</td>
</tr>
<tr>
<td>safety critical elements</td>
<td>243</td>
</tr>
<tr>
<td>Safety Forum (Norway)</td>
<td>246</td>
</tr>
<tr>
<td>safety inspections</td>
<td>239</td>
</tr>
<tr>
<td>safety management system</td>
<td>236</td>
</tr>
<tr>
<td>scientific-industrial complex</td>
<td>8</td>
</tr>
<tr>
<td>Sea Gem</td>
<td>241, 248, 251</td>
</tr>
<tr>
<td>selective participation</td>
<td>123, 124</td>
</tr>
<tr>
<td>self-reporting</td>
<td>57</td>
</tr>
<tr>
<td>self-regulatory approaches</td>
<td>82, 140, 244, 248, 252</td>
</tr>
<tr>
<td>see also voluntary approaches</td>
<td></td>
</tr>
<tr>
<td>sensitivity analysis</td>
<td>132</td>
</tr>
<tr>
<td>Shapiro, Robert</td>
<td>48</td>
</tr>
<tr>
<td>significant new use rule (SNUR)</td>
<td>84</td>
</tr>
<tr>
<td>Simon, William</td>
<td>74</td>
</tr>
<tr>
<td>smart grid</td>
<td>233</td>
</tr>
<tr>
<td>social adaption</td>
<td>92, 106</td>
</tr>
<tr>
<td>social construction risks</td>
<td>9</td>
</tr>
<tr>
<td>social media</td>
<td>136</td>
</tr>
<tr>
<td>social networking</td>
<td>40</td>
</tr>
<tr>
<td>see also Facebook, Twitter</td>
<td></td>
</tr>
<tr>
<td>socio-economic issues</td>
<td>255</td>
</tr>
<tr>
<td>soft law</td>
<td>6, 13, 22, 38, 39, 43, 92, 95, 100, 136, 141, 142, 147, 196, 236, 257</td>
</tr>
<tr>
<td>speed of technology</td>
<td>63</td>
</tr>
<tr>
<td>see also pacing problem</td>
<td></td>
</tr>
<tr>
<td>stakeholders</td>
<td>195, 196</td>
</tr>
<tr>
<td>engagement</td>
<td>9–11, 86, 104, 176, 183</td>
</tr>
<tr>
<td>identification</td>
<td>4</td>
</tr>
<tr>
<td>involvement</td>
<td>60–61</td>
</tr>
<tr>
<td>perceptions</td>
<td>8</td>
</tr>
<tr>
<td>pressure</td>
<td>194</td>
</tr>
<tr>
<td>see also public</td>
<td></td>
</tr>
<tr>
<td>state regulation</td>
<td>87</td>
</tr>
<tr>
<td>strong objectivity</td>
<td>176, 196, 197</td>
</tr>
<tr>
<td>substantially equivalent</td>
<td>200</td>
</tr>
<tr>
<td>sui generis regulation</td>
<td>5, 157, 158, 160</td>
</tr>
<tr>
<td>Superfund program</td>
<td>110</td>
</tr>
<tr>
<td>surveillance technologies</td>
<td>136, 137</td>
</tr>
<tr>
<td>sustainability</td>
<td>31</td>
</tr>
<tr>
<td>Syngenta</td>
<td>191</td>
</tr>
<tr>
<td>synthetic biology</td>
<td>7, 13, 34, 36, 44, 46, 47, 50, 51, 57, 61, 63, 66–70, 71, 75, 76–83, 90–91, 97, 136, 137, 145, 151–2, 157, 197, 255, 258</td>
</tr>
<tr>
<td>Synthetic Biology Engineering Research Center</td>
<td>68</td>
</tr>
<tr>
<td>Tanji, Todd</td>
<td>78</td>
</tr>
<tr>
<td>Taylorism industrial efficiency</td>
<td>32</td>
</tr>
<tr>
<td>Team Telecom</td>
<td>220–24, 226–30, 233</td>
</tr>
</tbody>
</table>

Gary E. Marchant, Kenneth W. Abbott and Braden Allenby - 9781782545644
Downloaded from Elgar Online at 05/03/2019 10:16:59AM via free access
technium 96, 101, 102
technological change 109
technological determinism 31
technology clusters 29, 31
technology forcing regulation 112, 113
technology push 110
technology systems 33
Telecommunications Act of 1996 (US) 217, 218
telegraph 25
telephone 40
see also mobile phones
test tube baby 158
see also IVF
time, concept of 24
top-down approach 252
Toxic Substances Control Act (TSCA) (US) 55, 80, 84, 124, 179, 184
trade-offs 11, 131, 230
trade wars 255
transgenic animals 54, 187
see also genetically modified
transhumanism 94
transnational 75, 79
see also international harmonization
transparency 10, 222, 225
tripartite system 236, 245, 247, 248, 249, 252
Twitter 40
see also social networking
uncertainty 7, 8, 45, 47, 50, 51, 58, 69, 78, 118, 138, 174, 217, 254–5, 257
unintended consequences 109, 113, 114, 117, 118, 131, 134
unique properties 65
United Kingdom 241–4, 248–52
United Nations Framework Convention on Climate Change (UNCC) 103, 105
United States Department of Agriculture (USDA) 57, 58, 80, 86, 179, 183, 184, 186–93
unmanned aerial vehicles (UAVs) 37, 38, 152
see also drones
upstream engagement 106
upstream oversight assessment 176, 196
urbanization 31
value of information 132
values 9
Vilsack, Tom 191
virtual reality 40
voluntary approaches 49, 54, 71, 77, 122, 136, 141, 195, 224, 228, 229
see also self-regulatory approaches, soft law
Waller Committee (Australia) 158, 159
warfarin 209
white goods 32
White House Emerging Technologies Interagency Policy Coordination Committee (US) 10, 12, 77, 84, 146
Whiteman, David 135
wicked problems 31
window of opportunity 51
Winner, Langdon 96
Woodrow Wilson Synthetic Biology Project 67, 69, 78, 81
World Bank 105