16. Science and the Public Sphere

1. Science Popularization

What are the sources of scientific and technical authority?

STS claims:

- Scientific knowledge does not simply reflect nature.
- Scientific knowledge does not arrive from nature as the result of a perfectly rigid series of steps.
- Technologies do not simply unfold naturally and inevitably.

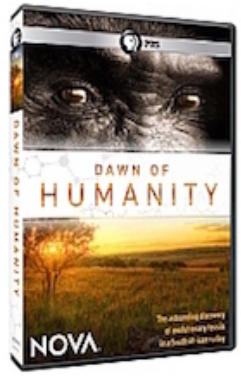
Thus:

- The authority associated with scientific knowledge cannot stem from nature alone.
- The authority of engineers cannot stem from a too-easy narrative of progress.

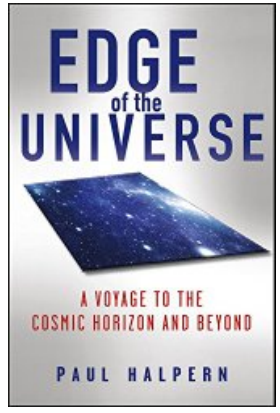
Science journalism as a source and legitimization of scientific and technical authority:

- "...very closely allied with scientists".
- "...to an extent that other journalists do not, science writers depend on their contacts for accurate facts and background information".
- Emphasis on findings and their importance, rather than the process whereby such findings are obtained.

"NOVA and National Geographic present *exclusive* access to an *astounding discovery* of ancient fossil human ancestors. Deep in a South African cave, a *special team of experts* has brought to light an *unprecedented wealth* of fossils belonging to a *crucial* gap in the record of our origins that spans the transition between the ape-like australopithecines (such as the famous Lucy) and the earliest members of the human family."
(http://www.shoppbs.org/product/index.jsp?productId=61808036#Details)



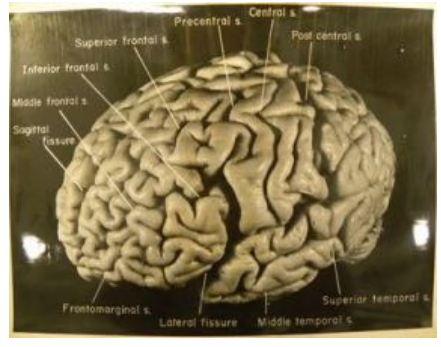
Popularized portraits of science and technology



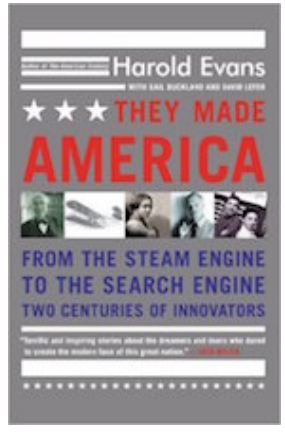
- Science as a quest/voyage/journey to uncover mysteries of nature.
  - *A team effort.*
  - *A competition (race) between groups of scientists to uncover the truth.*
  - *Physics as archane knowledge understood only by a small group of experts.*

- Scientist/engineer as eccentric genius.

Archaeology's Disputed Genius
Archaeology's establishment hasn't always looked kindly on Lee Berger. Then he found a cave full of bones, including *Homo naledi*.
(NOVA Next, http://www.pbs.org/wgbh/nova/next/evolution/homo-naledi-superhenge-and-humankind-nova-next-week-in-review)

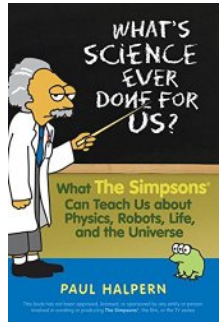


Why Einstein Was a Genius
Albert Einstein is widely regarded as a genius, but how did he get that way? Many researchers have assumed that it took a very special brain to come up with the theory of relativity and other stunning insights that form the foundation of modern physics. A study of 14 newly discovered photographs of Einstein's brain, which was preserved for study after his death, concludes that the brain was indeed highly unusual in many ways. But researchers still don't know exactly how the brain's extra folds and convolutions translated into Einstein's amazing abilities.
(Blater, M. 2012, AAAS News http://news.sciencemag.org/2012/11/why-einstein-was-genius.)



- *Guiding principles*: Technological determinism and technological essentialism.

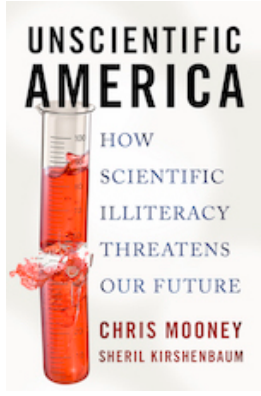
Dominant (Diffusionist) Model of science popularization:
"Science produces genuine knowledge, but that knowledge is too complicated to be widely understood. Therefore, there is a role for mediators who translate scientific knowledge into simplified accounts for general consumption." (Sismondo 2010, pg. 170.)



- *Assumes scientific knowledge is not tied to any context.*
- *Views popularization as a necessary evil: simplification as distortion.*
- *Enforces authority of scientists/engineers over non-scientists.*
- *Enforces authority of scientists within a given discipline over scientists in other disciplines.*

- *But*: No sharp distinction can be drawn between genuine scientific knowledge and science popularization.
  - *Both make use of simplifying distortions.*
- *And*: "Pure" science can depend on "popular" science; especially in interdisciplinary fields.

Deficit Model of science popularization:
"...scientific and technical literacy is a good in short supply outside the ranks of scientists and engineers." (Sismondo 2010, pg. 174.)



- *Claim*: A *moral* problem, given the centrality of science and technology.
- *But*: Is the solution simply better science education?

Claim: "If a proposed study of or solution to a public sphere problem is not put forward by trustworthy agencies or representatives, fails to take account of lay expertise, or makes inadequate sociological assumptions, then it may encounter opposition grounded in legitimate concerns." (Sismondo 2010, pg. 175.)

Example: 1986 Cumbrian sheep ban.

Wynne, B. (1996) 'May the Sheep Safely Graze? A Reflexive View of the Expert-Lay Knowledge Divide" in S. Lash et al. (eds.) *Risk, Environment & Modernity*, Sage, 44.

- 3-week ban on movement and slaughter of sheep in UK in aftermath of Chernobyl nuclear accident.
- Sheep farmers became distrustful of government scientists:
  - *Was detected radiation from Chernobyl or earlier 1957 fire at (local UK) Sellafield plant? (Later studies indicate 50% did not come from Chernobyl.)*

1. Farmers had history of distrust of government scientists: downplaying dangers, covering up problems, making errors.
2. Scientists ignored farmers' expertise about sheep habits.
3. Scientists made assumptions about culture and economics of sheep-herding that were contrary to sheep farmers' experience.

"Opposition to science was not the result of a misunderstanding, but was the result of inadequate trust and connections between scientific and lay cultures with very different knowledge traditions." (Sismondo 2010, 177.)

"The dominant model of expertise assumes that science trumps all other knowledge traditions, ignoring claims to knowledge that come out of non-science traditions." (Sismondo 2010, 177.)

- *Concern 1*: Are knowledge traditions really that radically distinct?
  - *Science as a refinement of common-sense.*
- *Concern 2*: Within its domain of applicability, isn't it rational to say "science trumps other knowledge traditions"?
  - *Should vacine opponents be allowed to engage in risky public health behavior?*
  - *Should climate change deniers and creationists have an equal say in science education?*

Reasons for not completely abandoning the deficit model:

- Can be applied to other types of (non-scientific) knowledge: public lack of knowledge about patronage, organization, and control in science.
- If expertise is "a genuine ability toknow about and deal with nature, we should want experts to be final arbiters on everything in their domains".

2. Expertise and Public Participation

- Is there a conflict between expertise and democracy?
  - *Experts have more influence on governmental decisions than non-experts.*

- Does deliberative democracy require increased public participation in science and technology?
  - *Should non-experts become more involved in technical decisions: nuclear waste disposal, regulation of GM foods, stem cell research, etc.?*

- Can it be shown that technical decisions are improved with citizen input?
  - *more critical scrutiny*
  - *establishment of trust among laypeople, experts, and decision-makers*

"Scientific knowledge is the result of the mobilization of resources to produce agreement among key researchers. Similarly, successful technologies are the result of the interplay among multiple actors and materials to produce artifacts that can be said to serve specific interests." (Sismondo 2010, 186.)

- "Citizen science"
  - *Participatory action research: allowing a community to take ownership of a clinical trial in order to motivate its members to volunteer.*
  - *Crowdsourcing science.*
  - *Open-source software*
  - *Histories of popular technologies: bicycles, musical instruments, etc.*
  - *Making resources for research more publically available.*

Kitzinger, J. (2008) 'Questioning Hype, Rescuing Hope? The Hwang Stem Cell Scandal and the Reassertion of Hopeful Horizons'

Trajectory of stem cell research in early 21st century:

Visionary promise phase (2000–2004) $\Rightarrow$ Breakthrough phase (2004–mid-2005) $\Rightarrow$ Setback and renegotiation phase (late 2005–present)

"...the implications of any scientific/medical developments are not predetermined by the technological 'facts' but rather that 'the future of science and technology is actively created in the present through contested claims and counterclaims over its potential' ". (K08, 418.)

Phase 1: Visionary promise

- 2000. Donaldson report in UK passes into law. Recommends expanding use of embryos for stem cell research and creation of cloned human embryos.
  - *Emphasis on visions of benefits of stem cell research directed at investors, policy makers, citizens (to accept risks), "embodied individuals" (women who supply embryos)*
- Recruitment of science journalists:

> "Embryo stem cell research looked like a very good story: good in the sense that it seemed as if it could save lives and halt hideous degeneration; good in that it could call upon images of celebrity victims like Christopher Reeve... [And] here was a story that had to be told before it happened, or it might never happen." (Tim Radford.)

- Media coverage in 2000:
  - *potential cures for Alzheimer's and Parkinson's*
  - *obligations to our children and future generations*
  - *univeral human good*
  - *not just realistically possible, but a moral imperative*

Phase 2: Breakthroughs

- 2004. Woo Suk Hwang and colleagues publish paper in *Science*.
  - Hwang, W. S. *et al.* (2004) 'Evidence of a Pluripotent Human Embryonic Stem Cell Line Derived from a Cloned Blastocyst', *Science 303*, 1669.
  - *Claim to have cloned 30 human embryos and harvested stem cell lines.*
- 2005. Second *Science* paper claims to have established 11 stem cell lines.
  - Hwang, W. S., *et al.* (2005) 'Patient-Specific Embryonic Stem Cells Derived from Human SCNT Blastocysts', *Science 308*, 1777.

Headlines: Same persuasive devices as in phase 1.

- "The future is here—how theory has grown into a virtual reality"
- "First human clone success 'will cure incurable' "
- "Could human cloning rid world of diseases? Embryos bring hope to millions"
- "The cloning revolution: advance heralds 'personalised medicine' "
- "Patients can look forward to having transplants of cells exactly matched with their need"

New claims:

- *Imagery of a 'landmark' and reification of a destination.* "A landmark acheivement"; "a great step forward"; "giant strides"; "milestone"; "[cures] on the horizon"; "the beginnings of a long journey".
- *Hyperbole and restropective qualifications.* "Now there is the real prospect of a treatment..."; [breakthroughs showed] what we thought was theoretically possible actually *is* possible".
- *Discourse of vindication and urgency.* Breakthroughs served to justify past opinion and optimisim.
- *Caution framed through certainty.* "...no one can say yet when the breakthroughs will happen".

Phase 3: Setback and renegotiation

- Cyranoski, D. (2004) 'Korea's Stem-Cell Stars Dogged by Suspicion of Ethical Breach', *Nature 429*.
  - *egg donors included junior members of the research team.*
  - *allegations that the data had been faked.*
- Cyranoski, D. (2006) 'Verdict: Hwang's Human Stem Cells Were All Fake', *Nature 439*.

"The results are in. The university committee looking into scientific misconduct in the laboratory of South Korean cloner Woo Suk Hwang announced on 10 January that his 2004 claim to have cloned a human embryo was fake. But his Afghan hound Snuppy is a real clone."

Snuppy!

- Metaphor of journey:

"It was as if Dr. Hwang had sent us a picture of him on top of Everest, but it happened not to be Everest. He lied to us about that and Everest is still there to climb." (Chris Shaw, member of team that created Dolly clone.)

"The fakery is here attributed to the *representation* of the fact..., not the 'fact' or 'goal' itself." (Kitzinger, pg. 426.)

Boundary management activities (attempts to shore up stem cell research):

- Severing working relations.
  - *Stem cell researchers sever relations with Hwang.*
  - *Good science versus bad science.*

- Drawing national distinctions.
  - *View of South Korea as nationalistic, as influenced by culture.*
  - *Implication: US and UK research uncontaminated by these values.*

- Highlighting diverse stem cell research methods.
  - *Make a distinction between stem cell research based on cloning (bad), versus stem cell research based on the use of spare IVF embryos (good).*
  - *View Hwang's research as former (even though in phase 1 no such distinction was made).*

- Process of incorporating these strategies took time.
- Eventually science journalists pick them up:
  - "dented not destroyed"
  - "Despite the humiliating setback in Korea over cloning, Steve Jones [UK stem cell researcher] believes there will be a breakthrough before the end of the decade"
  - "One scientist's feted work has been discredited, but human cloning was always a scientific sideshow... His tarnished reputation closes a shabby sub-plot. It is not the end of the story".

  "...different 'facts' become pertinent at different points in time to achieve particular aims." K08, pg. 428

- Science journalists reposition Hwang's work as insignificant:
  - therapeutic cloning now presented as marginal, whereas IVF embryo research repositioned as "mainstream".
  - theraputic cloning is "impractical" for the "foreseeable future".
  - risks of egg donation are highlighted (absent in previous accounts).
  - mismatch between number of eggs and number of patients with Parkinson's is highlighted.
  - question of cost is raised.

- Reoccuring rhetorical themes over all phases:
  - *appeals to imaginative identification*
  - *asymmetrical construction of notions such as 'potential'*

"Methodologically, this case study demonstrates the value of tracking promise-making over time—especially through periods of change (around legislation), celebration (around breakthroughs), and setback (around fraud)." K08, pg. 431.

"The concept of 'hype' is clearly an excessively simplistic way of characterizing the complex processes involved in the creation, management, and repair of hope." K08, pg. 431.