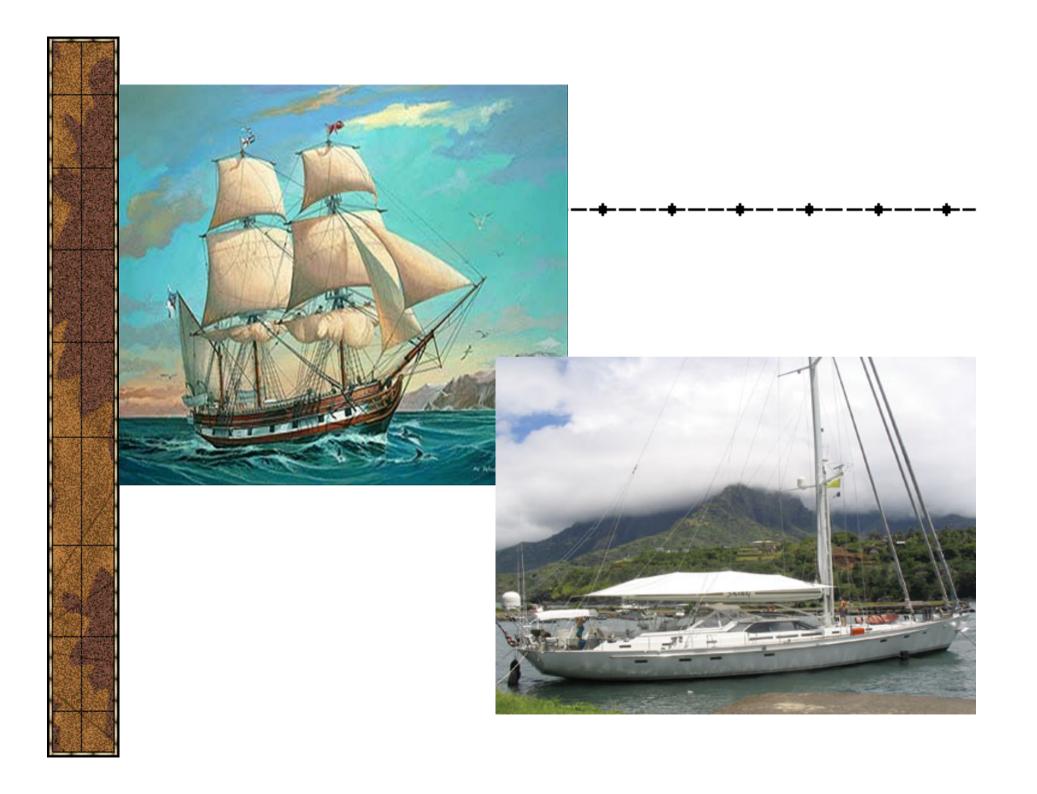
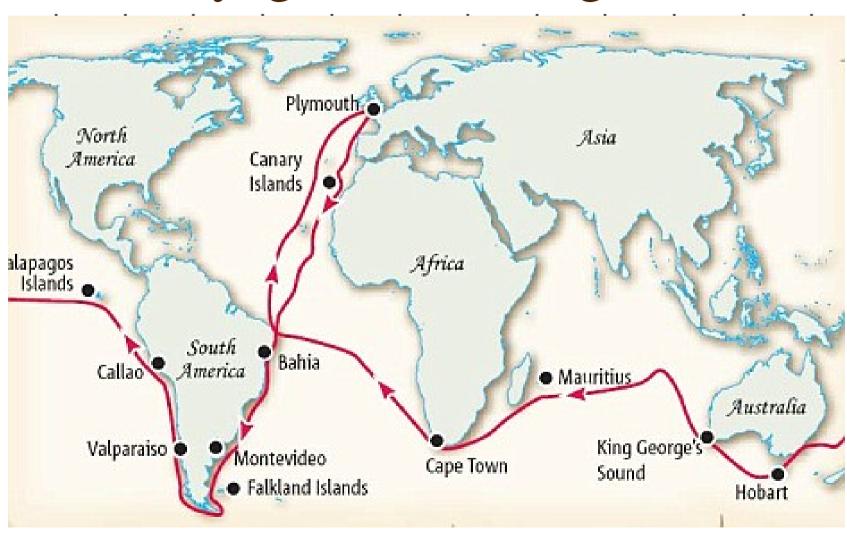
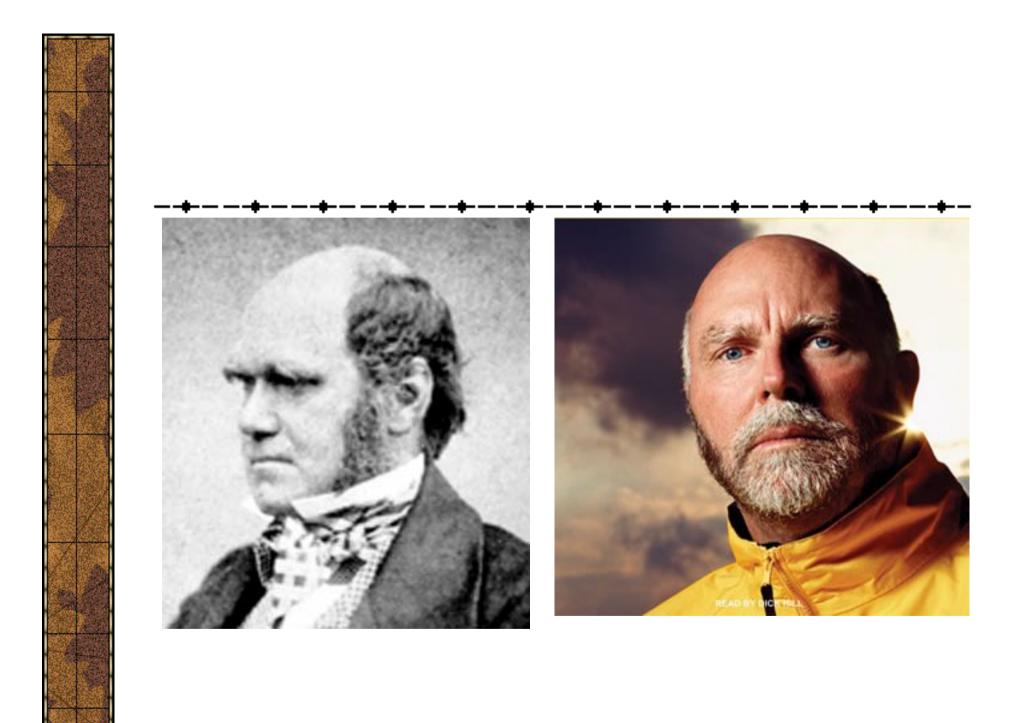
Helga Nowotny "From the voyage of the Beagle to Sorcerer II: What kind of transformation?"

Darwin in Science and Society, Zurich 4-5 September 2009



The Voyage of the Beagle





What transformation? Caveat: STS meets history of science * the scientific and technological transformation interests

- * the reconfiguration with commercial
- * from government to governance: the role of public discourse
- * the cultural transformation: what does it all mean?

What happened to molecular biology? (Hans-Jörg Rheinberger)

- * 40s to 60s: the path to the double helix (classical molecular biology)
- * °70s: the gene technological shift: *molecular* technologies transform *extracellular* test tube representation of innercellular structures and processes into *intracellular* realization of an extracellular project
- * °80s and 90s: the second wave of molecular technologies (e.g. DNA chip technology) > sequencing of whole genomes > postgenomics, proteomics, systems biology: focus on contribution of individual genes to whole cells, tissues and organisms

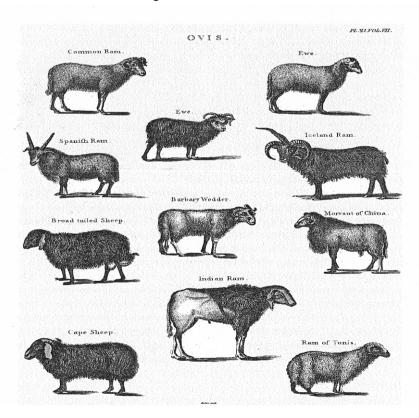
Related developments and trends

- * the entry of physics, bioinformatics, engineering ...
- * "students need a broad, more integrated education, so that they can work fluently across disciplines, Susan Hockfield, President of MIT, one third of 400 MIT engineers work in the life sciences
- * the inevitable mathematization of biology (before an observational and historical discipline)
- * the inevitable shift towards engineering and standardization (synthetic biology)
- * the epistemological shift: "to know life, is to (re)make life" (Paul Rabinow)

What transformation: reconfiguration with commercial interests

** longstanding tradition: from agriculture to

 $Dolly \ \ {\tt Source: Sarah \ Franklin, \ Dolly \ mixtures \ (2007)}$





What transformation: reconfiguration with commercial interests

* acceleration from 70s onwards: Cetus (1971) PCR technology; Genentech (1980); first patent granted by US Court of Customs and Patents on living organisms (Diamond v. Chakrabarty); automatized sequencing machine (Leroy Hood & L. Smith, 1986) TIGR (Institute for Genomic Research, Craig Venter, 1992), Celera (1998, Venter) and many others

What transformation: reconfiguration with commercial interests

** first patent granted by US Court of Customs and Patents on living organisms (Diamond v. Chakrabarty) "the fact that microorganisms are alive is without legal significance for purposes of patent law"

What transformation: the taming of scientific curiosity and role of public discourse

** Scientific curiosity as main driving force

** its taming through society

the discourse on innovation

the discourse on risk

the discourse on values

Source: Helga Nowotny, Insatiable Curiosity, MIT Press, 2008

What transformation: from government to governance

The stabilizing function of human technologies

- * the role of the law and regulation
- * from government to governance
- * bioethics: 'the effective currency of a global moral economy'

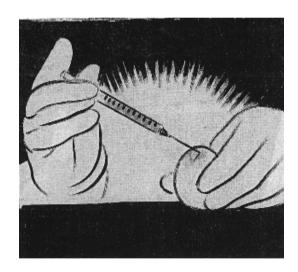
Source: Helga Nowotny & Giuseppe Testa, Die Gläsernen Gene, 2009 (engl. Translation, The Naked Genes in progress)

What transformation: the quest for meaning

- *Who am I? Social vs. biological identities
- * the species concept: morphological classifications vs. DNA-based ones?
- *Making up people: biosocial group formation
- * the flooding of public imagination with new objects, artefacts, images
- * a glimpse into the latent future

What transformation: the quest for meaning

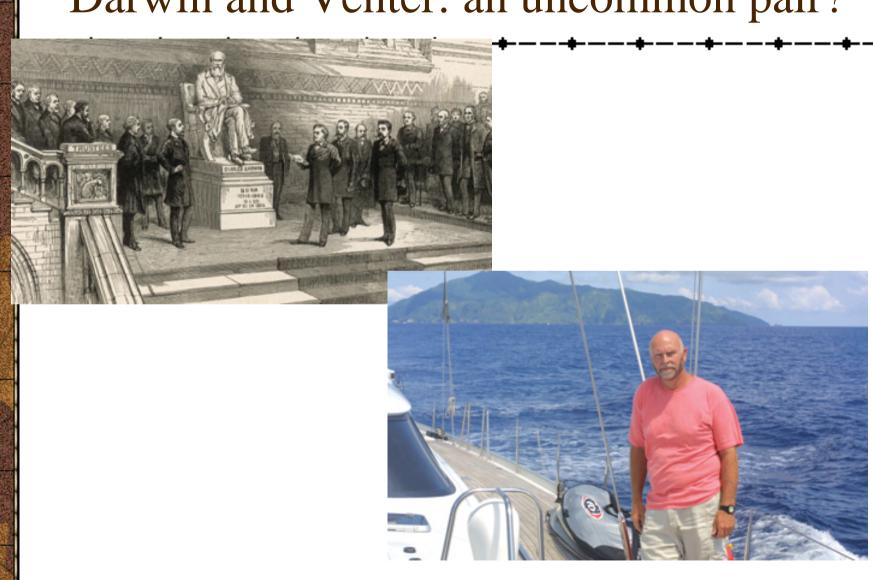
** genetic markers as risk factors: the previvor syndrome and other risk factors



El Roto, El Pais, September 3, 2009

"According to the epidemiological experts, not being within a risk group is a risk."

Darwin and Venter: an uncommon pair?



The invention of heroes and the making of media stars

- ** the invention of heroes and the heroes of invention (Christine MacLeod, Heroes of Invention)
- * scientists as media stars

**iconic status: from Victorian gentleman to self-made scientist-entrepreneur

The context of transformation

*The Age of Wonder (Richard Holmes): the wealth of plants and other stories

**Darwin's age of discovery: the collection of S.M.H. Beagle

*The molecular age: Sorcerer II 's quest for the DNA of the oceans

Funding

* from family wealth and patronage to venture capital

* the attraction of 'biocapital'

** public-private partnerships as solution?

A science-STS divide?

- * the persisting nostalgia for the Age of Wonders
- **Arden Bement, Director of NSF, 9-10 July 2009 on synthetic biology: "we have an opportunity to get this right from the outset"
- **STS: where is the critical awareness? are we all in STS "sour moralists"?

Have fun and play – and make money at the same time

- ** edutainment with genes: 23&me and other toys
- ** personal genome testing: blurred boundaries between medical, genealogical and recreational information
- * anticipatory governance: when and how to regulate

The moral challenge of entrepreneurial science

*The scientist-entrepreneur as amateur: who is a scientist?

** Steve Shapin: The Scientific Life

*Citizens' science as correlate? The tension between science and democracy

What follows? The ambivalent relationship between science and democracy

*In search for new institutions and collective spaces to accommodate, modify and appropriate new experiences

* living with ambivalence