

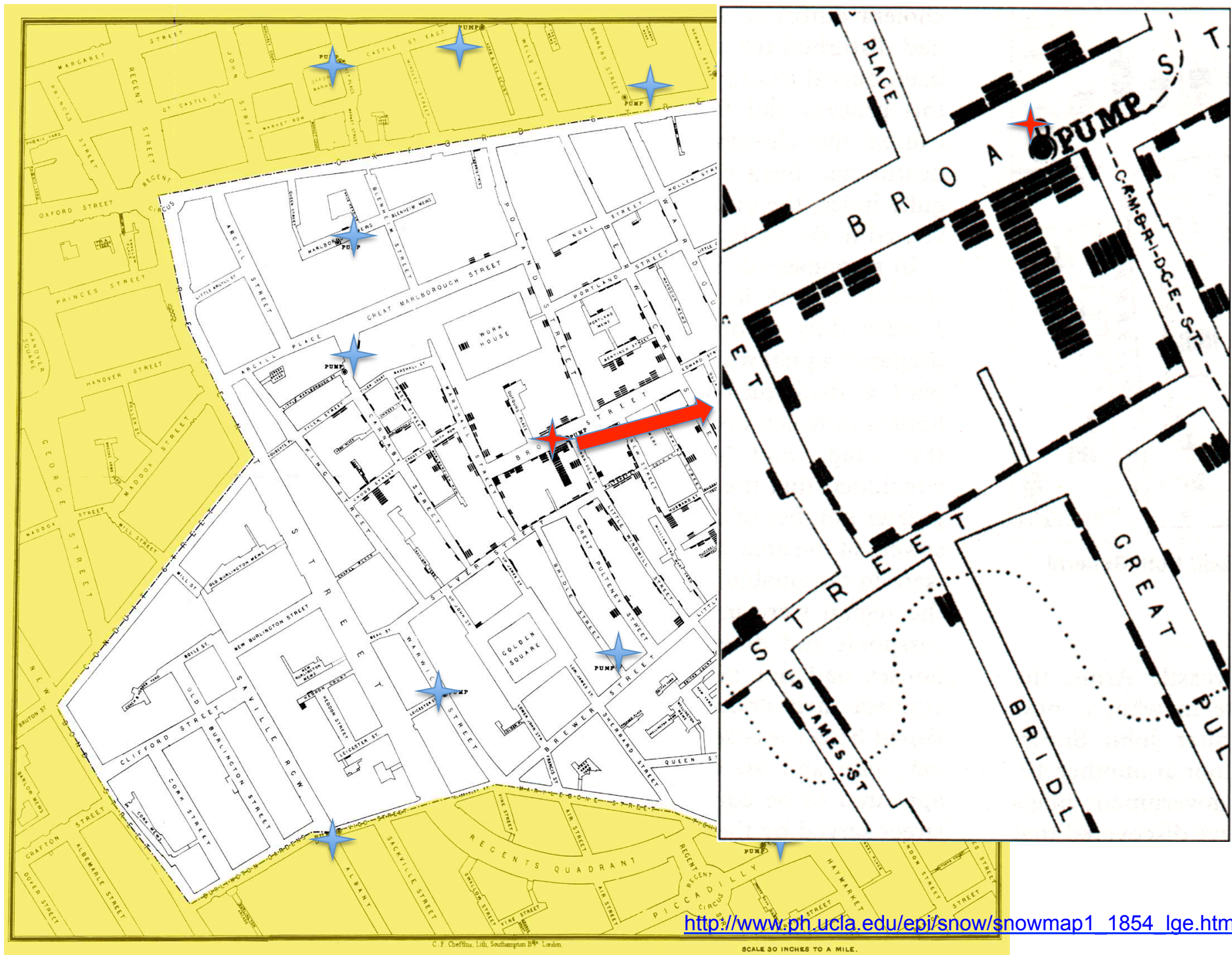




© J. Paul Getty Trust



*[Laetoli Diorama], Hall of Human Biology, American Museum of Natural History,
(Courtesy Special Collections, AMNH Library)*



http://www.ph.ucla.edu/epi/snow/snowmap1_1854_lge.htm



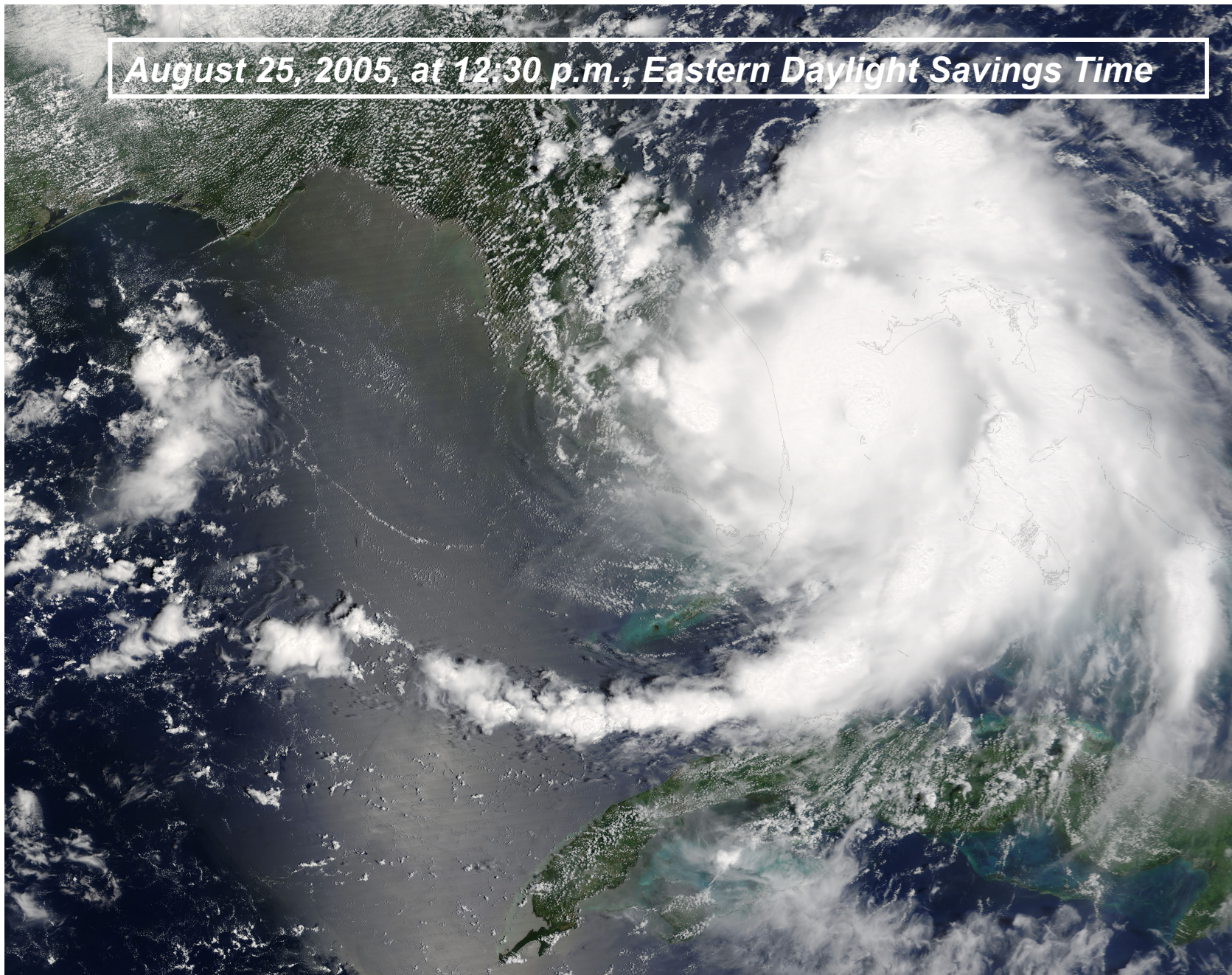
http://johnsnow.matrix.msu.edu/images/online_companion/chapter_images/fig12-6.jpg



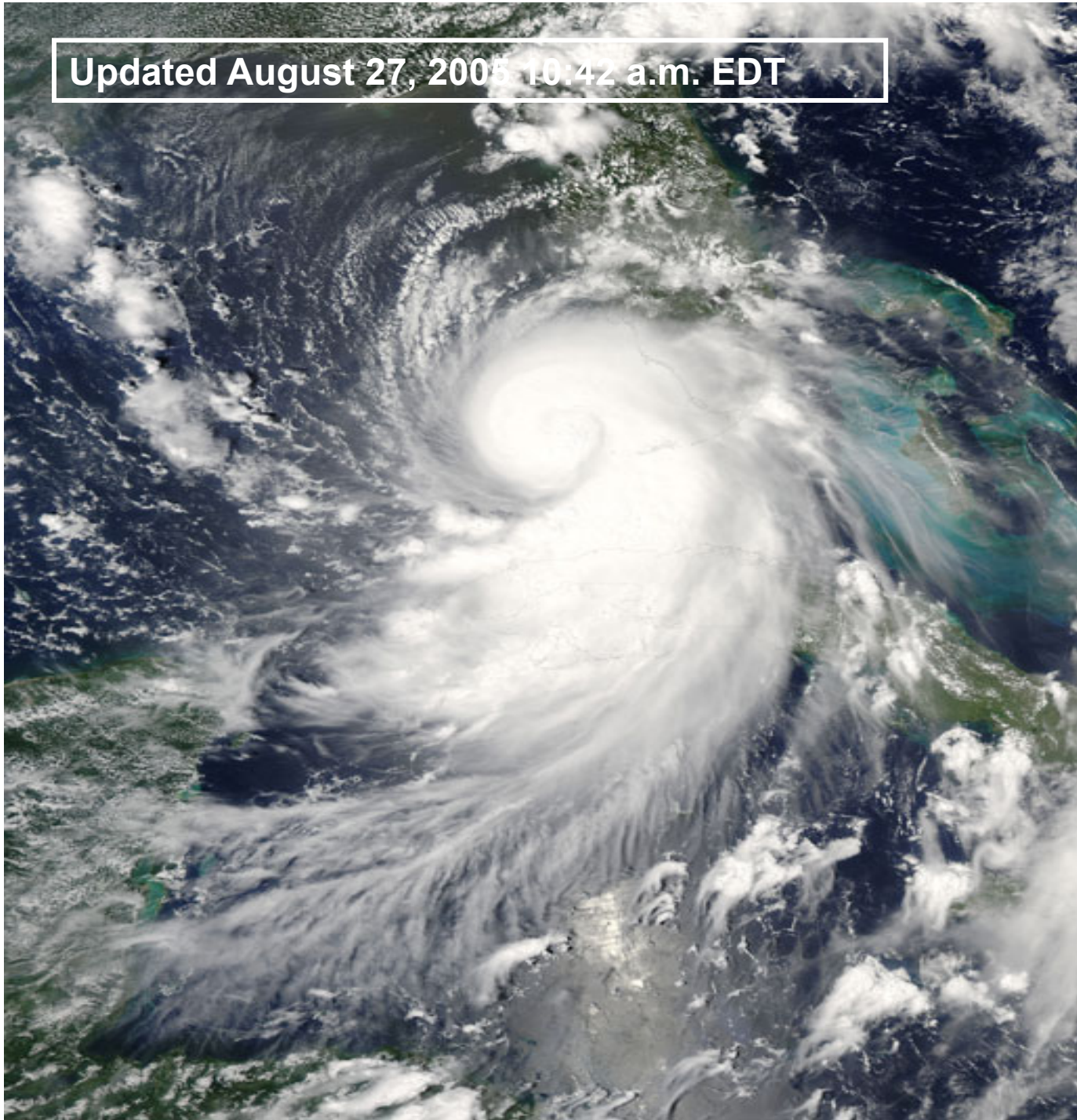
***“A representation of the cholera epidemic
of the nineteenth century”***

<http://history.nih.gov/exhibits/history/index.html>

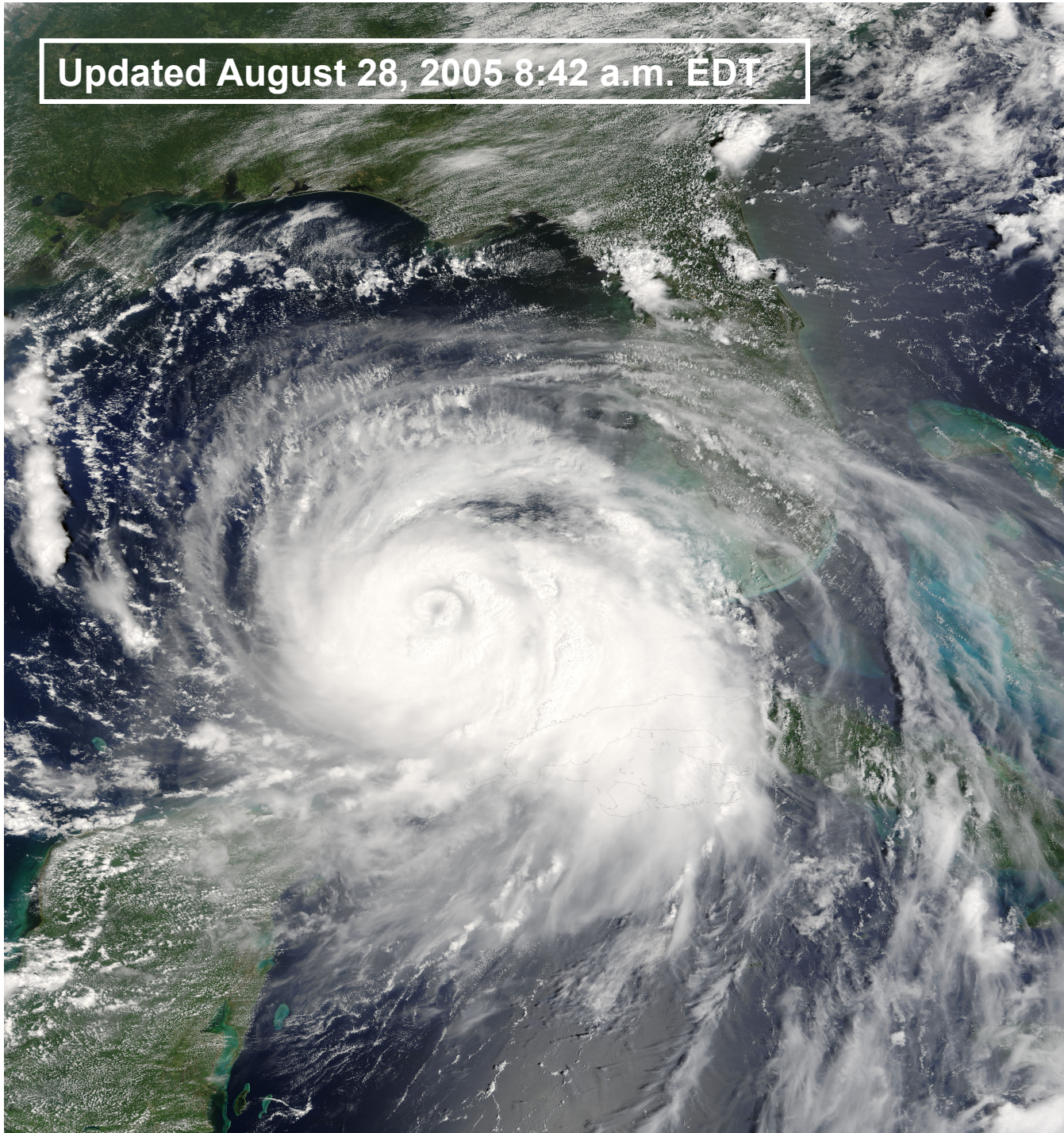
August 25, 2005, at 12:30 p.m., Eastern Daylight Savings Time



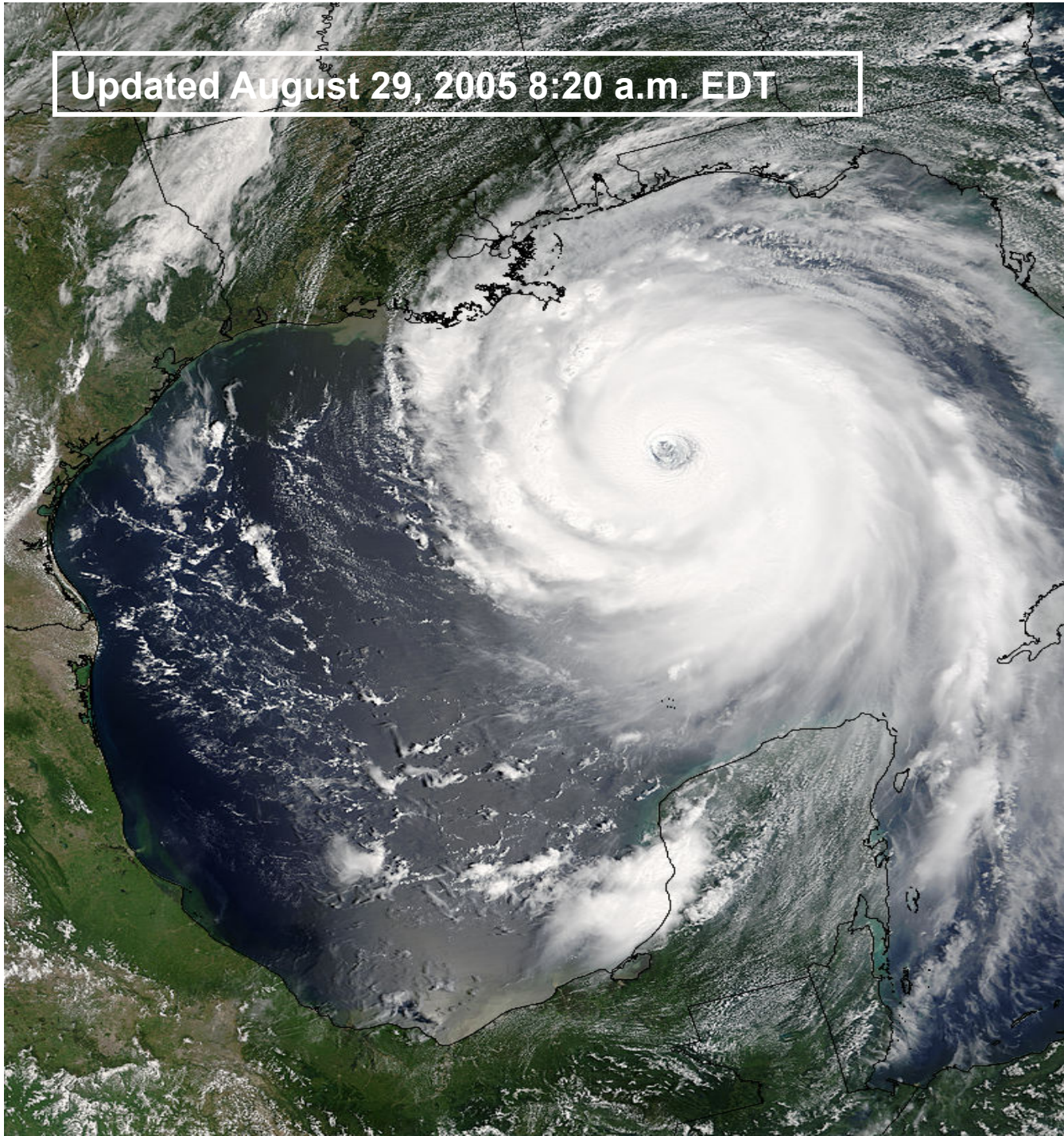
Updated August 27, 2005 10:42 a.m. EDT



Updated August 28, 2005 8:42 a.m. EDT



Updated August 29, 2005 8:20 a.m. EDT



New Orleans -- September 8, 2005



***Assuming the Burden
of Proof:
Some Reflections on
"Data as Evidence"***



***Tom Moritz
Monk, Bean & Moritz
Los Angeles***

objet trouvé – gutter, 10th & Colorado, Santa Monica

ESIP Winter 2011
Washington, DC
January 4, 2011

***“In order to diagnose,
one must observe and reason.”***

– Galen of Pergamon (2nd Century AD)

[Luis Garcia-Ballester, 2002, Galen and Galenism, Burlington: Ashgate-Variorum, page 1663]

“KNOWLEDGE RESOURCES”:

- 1 = specific data collection
- 2 = basic research
- 3 = governmental research
- 4 = decision making
- 5 = education

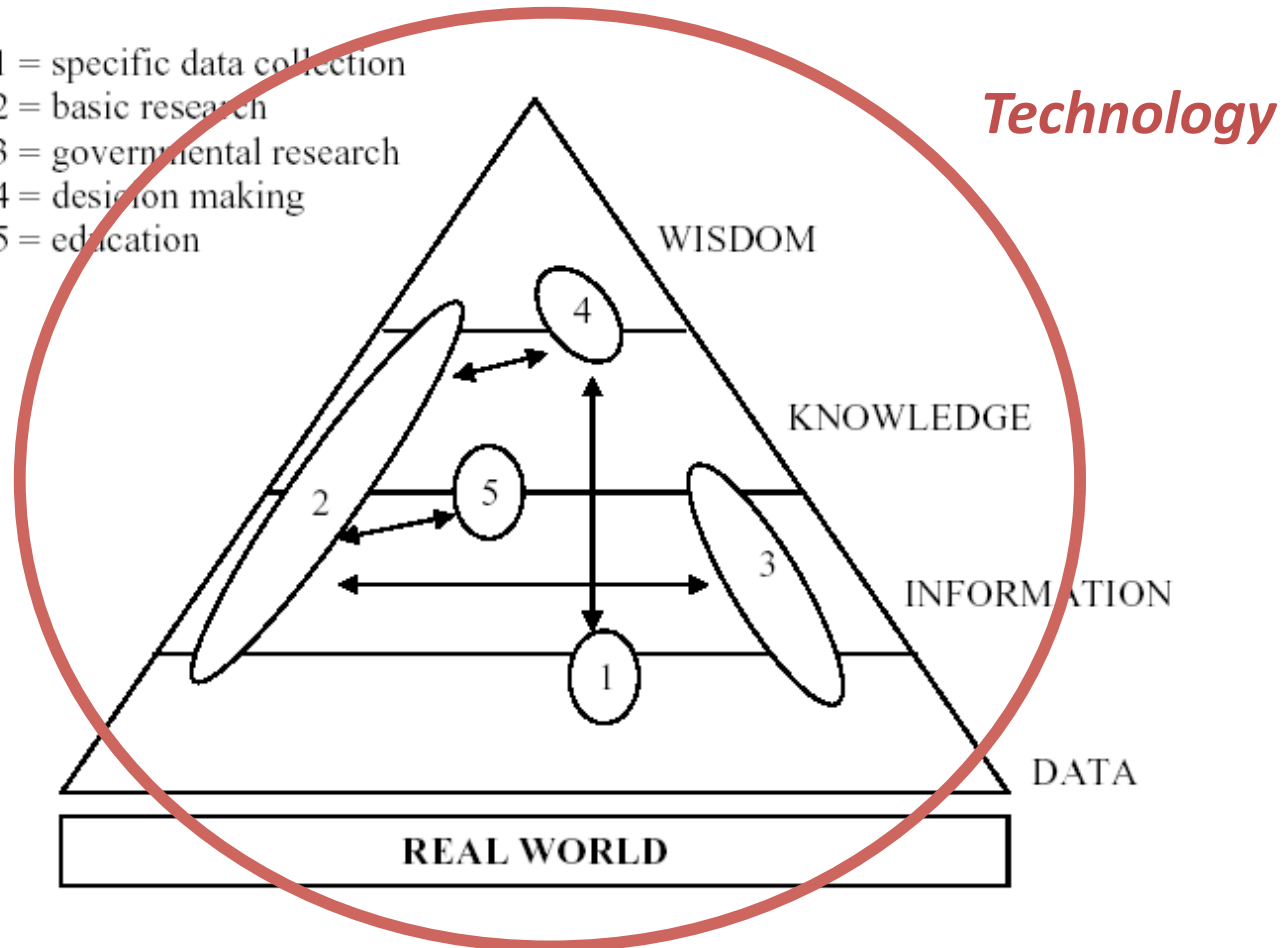


Figure I: Biodiversity information hierarchy. (Modified from the original, source: Laihonon *et al.* 2003.)

Repatriation of biodiversity information through Clearing House Mechanism of the Convention on Biological Diversity and Global Biodiversity Information Facility; Views and experiences of Peruvian and Bolivian non-governmental organizations. Ulla Helimo Master's Thesis University of Turku Department of Biology 6.10. 2004 p.

11. <http://enbi.utu.fi/Documents/Ulla%20Helimo%20PRO%20GRADU.pdf> [06-06-05]

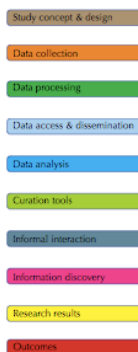
Links: activities are linked by straight lines with arrow-heads indicating a relationship i.e. A 'may lead to' B. Links act in the direction of the arrow and are positive.

Different colours are used for different types of activity within an information cycle, adapted from a model developed by Charles Humphrey (2006).

We produced maps for each individual diary and then combined them into a single composite for the case study.

These maps are a way of summarising the information given in the case studies and demonstrating clearly the links between various aspects of information activities, which enables comparison between the activities in different case studies. We discussed the composite maps with the focus groups and amended them as necessary.

Knowledge transfer activities (including grant writing, technical reports, journal articles, presentations and popular articles) were found to be common across the case studies and have been separated out from these diagrams and are reported in Section 5.



Complex knowledge resources support research

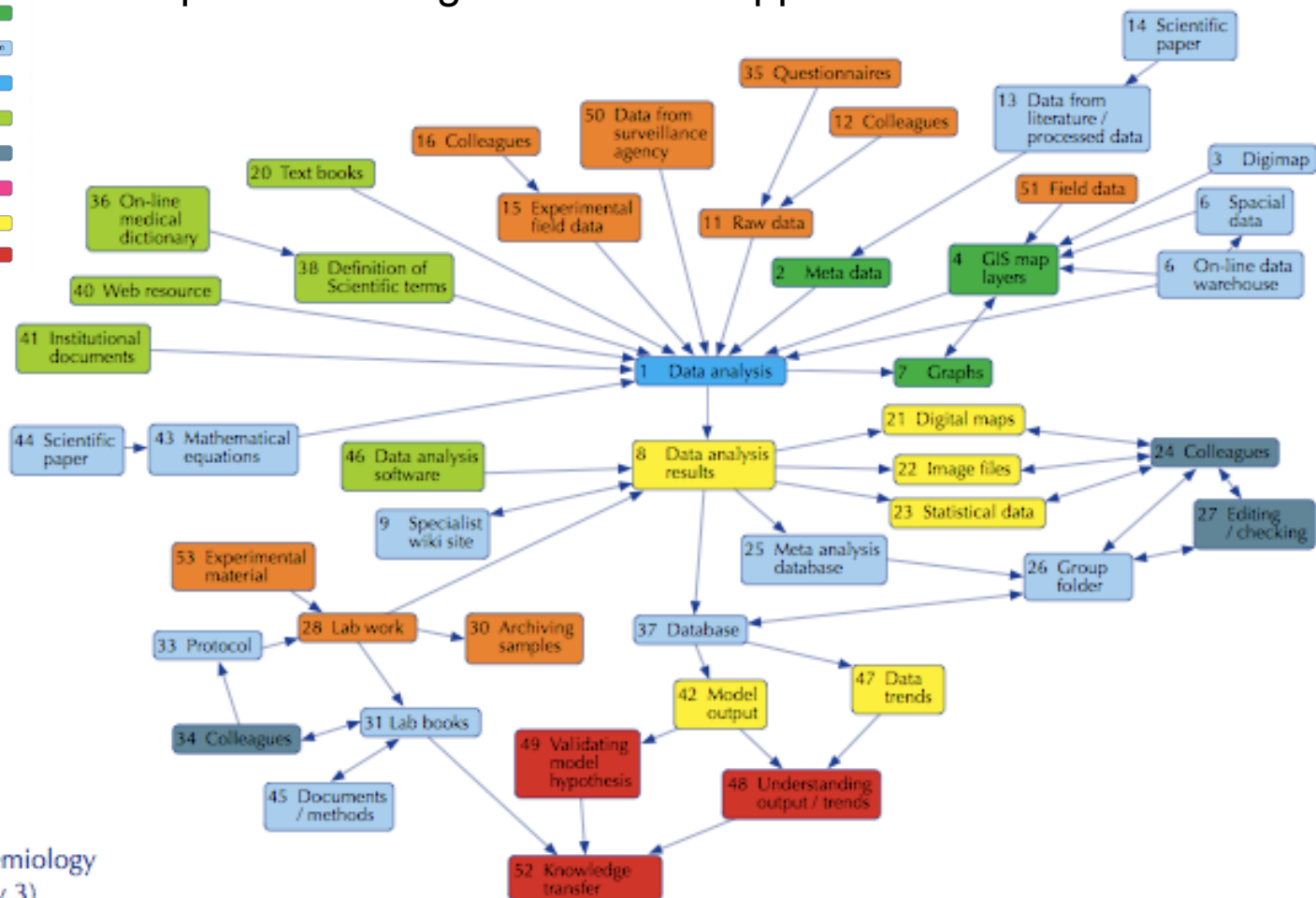


Figure 3:
Information flow map for epidemiology
of zoonotic diseases (case study 3)

Research Information Network and British Library "Patterns of information use and exchange: case studies of researchers in the life sciences"

http://www.rin.ac.uk/system/files/attachments/Patterns_information_use-REPORT_Nov09.pdf

Essential Definitions: “Data”?

“Data” – a philosophical definition

The Diaphoric Definition of Data (DDD):

*“A datum is a putative fact
regarding some difference or lack of uniformity
within some context.”*

Luciano Floridi <luciano.floridi@philosophy.ox.ac.uk> “Semantic
Conceptions of Information”
(First published Wed Oct 5, 2005) Stanford Encyclopedia of Philosophy
<http://plato.stanford.edu/entries/information-semantic/> [visited 11/12/09]

Definition: “Data” ? [technical]

“... ‘data’ are defined as any information that can be stored in digital form and accessed electronically, including, but not limited to, numeric data, text, publications, sensor streams, video, audio, algorithms, software, models and simulations, images, etc.”

-- US NSF Program Solicitation 07-601

“Sustainable Digital Data Preservation and Access Network Partners (DataNet)”

Taken in this broadest possible sense, “data” are thus simply coded electronic forms of information (bits and bytes).
Virtually *anything* can be represented as “data” so long as it is electronically machine-readable.

“Most commonly, computer scientists are concerned with digital objects that are defined as a set of sequences of bits. One can then ask computationally based questions about whether one has the correct set of sequences of bits, such as whether the digital object in one's possession is the same as that which some entity published under a specific identifier at a specific point in time... However, this is a simplistic notion. There are additional factors to consider.” [!]

Clifford Lynch, “Authenticity and Integrity in the Digital Environment: An Exploratory Analysis of the Central Role of Trust,”

<http://www.clir.org/pubs/reports/pub92/lynch.html>

Definition: “Data” [epistemic]

“Measurements, observations or descriptions of a referent -- such as an individual, an event, a specimen in a collection or an excavated/surveyed object -- created or collected through human interpretation (whether directly “by hand” or through the use of technologies)”

-- AnthroDPA Working Group on Metadata (May, 2009)

Raw Data and “Native” Metadata

“manzanita_sapflow_12-5-07_to_7-7-08.xls”

“instantaneous sap flow data (as temperature differences on a constant temperature heat dissipation probe) for multiple branches of Manzanita, collected with a datalogger. used to correlate physiological activity with below-ground measures of root grown and CO2 production.”

sbid battery datetime heater_voltage Manz1Sap1 Manz1Sap2 Manz1Sap3 Manz1Sap4 Manz2Sap5 Manz2Sap6 Manz2Sap7 Manz3Sap10 Manz3Sap8 Manz3Sap9 Manz4Sap11 timestamp Datagap Julian

2	12.365	1196796112	2018.8	0.5585	0.51029	0.55517	0.54354	0.6067	0.52858	0.55351	0.59008	0.59506	0.60337	0.56514	12/4/07 11:21		4.47351
3	12.348	1196796232	2017.9	0.55682	0.51028	0.5535	0.54352	0.60669	0.52857	0.55017	0.59007	0.59505	0.60336	0.56513	12/4/07 11:23	0	4.47490
4	12.357	1196796352	2018.6	0.55514	0.51027	0.55348	0.54351	0.60501	0.52855	0.55016	0.59005	0.59504	0.60501	0.56512	12/4/07 11:25	0	4.47628
5	12.354	1196796472	2017.6	0.55514	0.51026	0.55181	0.5435	0.60334	0.52855	0.54849	0.59004	0.59503	0.60334	0.56511	12/4/07 11:27	0	4.47767
6	12.334	1196796592	2018.3	0.55347	0.51026	0.55015	0.5435	0.60333	0.52854	0.54682	0.59004	0.59502	0.605	0.56511	12/4/07 11:29	0	4.47906
7	12.34	1196796712	2018.5	0.55014	0.50859	0.55014	0.54349	0.60332	0.53019	0.54349	0.59003	0.59501	0.60498	0.56676	12/4/07 11:31	0	4.48045
8	12.337	1196796832	2017.8	0.55013	0.50692	0.55013	0.54348	0.60332	0.53019	0.54182	0.59002	0.59501	0.60498	0.56675	12/4/07 11:33	0	4.48184
9	12.328	1196796952	2017.5	0.5468	0.50691	0.5468	0.54347	0.60331	0.53018	0.53849	0.59001	0.595	0.60497	0.56674	12/4/07 11:35	0	4.48323
10	12.323	1196797072	2017	0.54679	0.50524	0.54679	0.54347	<u>0.59998</u>	0.53017	0.53682	0.59	0.59499	0.60496	0.56674	12/4/07 11:37	0	4.48462
11	12.328	1196797192	2018.9	0.54679	0.50191	0.54512	0.5418	0.59665	0.53017	0.53349	0.59	0.59498	0.60496	0.56673	12/4/07 11:39	0	4.48601
12	12.319	1196797312	2017.7	0.54345	0.49857	0.54178	0.54178	0.59663	0.53015	0.53015	0.58998	0.5933	0.60327	0.56671	12/4/07 11:41	0	4.48740
13	12.311	1196797432	2017.3	0.54343	0.4969	0.54011	0.54177	0.59661	0.53014	0.52848	0.58997	0.59329	0.6016	0.5667	12/4/07 11:43	0	4.48878
14	12.316	1196797552	2018.6	0.5401	0.49357	0.53678	0.54176	0.59328	0.53013	0.5268	0.58995	0.59328	0.60325	0.56669	12/4/07 11:45	0	4.49017
15	12.31	1196797672	2016.8	0.53844	0.4919	0.53511	0.54176	0.59494	0.53013	0.52514	0.58995	0.59328	0.60325	0.56503	12/4/07 11:47	0	4.49156
16	12.31	1196797792	2017.1	0.53676	0.48856	0.53343	0.54174	0.59326	0.53011	0.5218	0.58993	0.59326	0.60323	0.56501	12/4/07 11:49	0	4.49295
17	12.31	1196797912	2017.1	0.53342	0.48523	0.5301	0.54173	0.59324	0.5301	0.51846	0.58826	0.59324	0.60321	0.56499	12/4/07 11:51	0	4.49434
18	12.301	1196798031	2017.5	0.53174	0.48521	0.52842	0.53839	0.59156	0.53008	0.51845	0.58824	0.59323	0.6032	0.56498	12/4/07 11:53	0	4.49573
19	12.301	1196798151	2016.3	0.53007	0.48188	0.52509	0.53838	0.59155	0.53007	0.51512	0.58823	0.59321	0.60152	0.5633	12/4/07 11:55	0	4.49712
20	12.303	1196798271	2016.6	0.5284	0.47855	0.52175	0.53837	0.59154	0.5284	0.51511	0.58821	0.59154	0.60151	0.56163	12/4/07 11:57	0	4.49851

Datum: “0.59998”

“Quality of Data”???

“Validity”: logical decisive force in support of an hypothesis or proposition – may be discipline or domain specific (in United States Law, generally, the Popperian notion of falsifiability or testability is normative)

“Reliability”: acquisition of data: *The use of certified expert personnel, methods and properly calibrated, deployed and operated equipment/apparatus to collect and/or record data?* (Were these methods and equipment appropriately selected, calibrated, deployed and operated properly? Were the human agents properly trained and certified for the work they performed? Was the work performed properly?)

“Integrity”:

- **Management and Maintenance of Data**: *Secure maintenance and proper management of data?* (Accordance with established best practices?) Maintenance of the integrity of original data includes appropriate description, documentation of the chain of custody and uses all appropriate methods and metrics that establish data have not been inadvertently lost or changed.
- **Transformations of Data**: *Proper selection, execution and documentation of all data transformations.* (Have all transformations been validly applied to insure the integrity of original data? Can the complete documented “audit trail” of data be analyzed to reveal provenance and lineage, the integral, original data sources?)

TABLE 6
Sampling Methods Used at Ten Inventory Sites

Methods ^a	Inventories ^b									
	LaSe	BaCo	Kart	Arat	Cunu	MCSE	Xing	Balt	CC/P	CuAm
Conventional trapping	some	yes	?	yes	some	yes	yes	yes	yes	yes
Tree trapping	no	some	?	no	no	yes	no	no	some	no
Pitfall trapping	no	no	some	no	no	no	no	no	no	some
Diurnal hunting/census ^c	some	yes	yes	yes	some	yes	yes	yes	yes	some
Nocturnal hunting/census ^c	some	yes	?	yes	some	yes	yes	some	yes	some
Interviews ^d	no	no	no	no	no	no	no	yes	no	no
Ground-level netting	yes	yes	—	yes	yes	—	yes	yes	yes	yes
Canopy netting	no	no	—	yes	no	—	no	no	some	no
Searching for roosts	yes	some	—	yes	some	—	some	some	some	some

^a See table 3 and accompanying text for explanations.

^b See appendices 2–11 for more detailed descriptions of methods. Abbreviations: LaSe, La Selva (Costa Rica); BaCo, Barro Colorado (Panama); Kart, Kartabo (Guyana); Arat, Arataye (French Guiana); Cunu, Cunucunuma (Venezuela); MCSE, MCSE Reserves (Brazil); Xing, Rio Xingu (Brazil); Balt, Balta (Peru); CC/P, Cocha Cashu/Pakitza (Peru); CuAm, Cuzco Amazónico (Peru).

^c Haphazard observations by personnel primarily engaged in other activities are recorded as “some.”

^d Explicitly cited as a source of unvouchered records.

Source: Voss &
Emmons, AMNH
Bull. No. 230, 1996
(by permission)

Data transformations and the risks of loss of integrity -- (we must fully analyze the etiology of data degradation!)

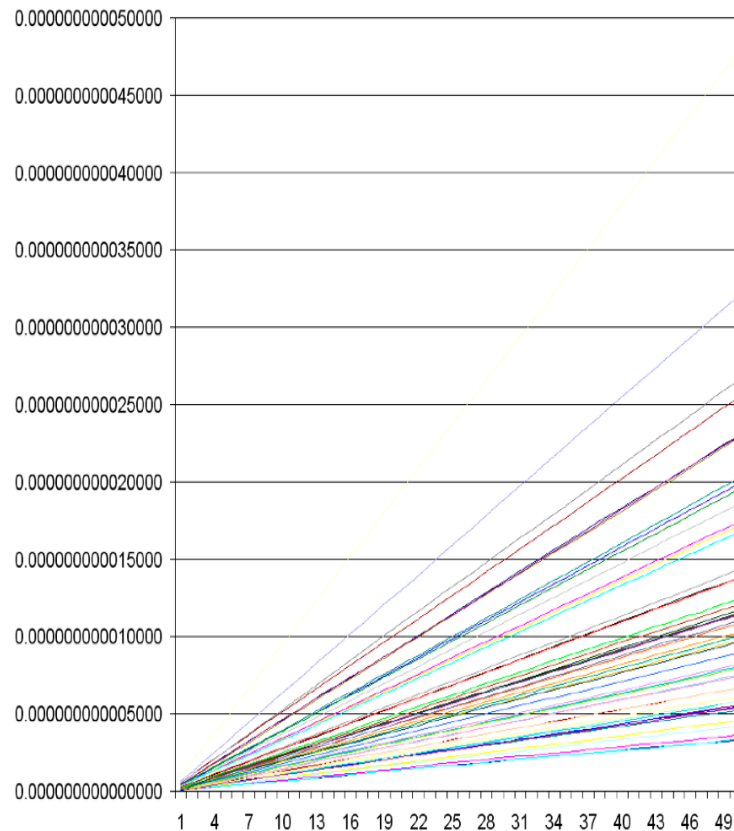


Figure 2. Increasing levels of coordinate digit noise associated with repeated projection transformations

“Rice (2005) looked at the accumulation of noise in the coordinate digits of a cartographic dataset subjected to repeated projection transformations. Although many distinct trends emerged... there was an increasing level of noise as the number of projection transformations increased, as seen in Figure 2, showing U.S. state centroids projected from geographic to a Lambert Conformal Conic projection and back, fifty times.”ⁱ

ⁱ Matt Rice, “Authentication, Characterization, and Control Methods for Cartographic Data,” http://icaci.org/documents/ICC_proceedings/ICC2005/htm/pdf/oral/TEMA6/Session%203/MAT%20RICE.pdf

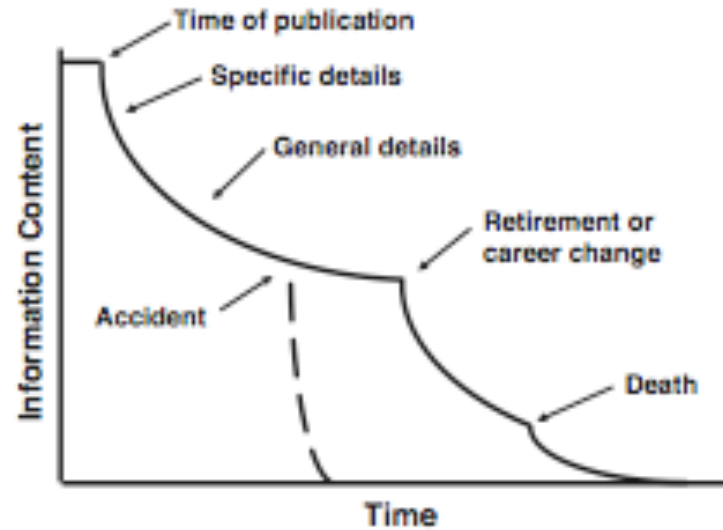


Fig. 1 - Illustration of the natural degradation in information content associated with data and metadata—information entropy (from Michener et al., 1987, by permission of the Ecological Society of America).

“...data longevity is increased. Comprehensive metadata counteract the natural tendency for data to degrade in information content through time (i.e. information entropy sensu Michener et al., 1997; Fig. 1).”

W. K. Michener “Meta-information concepts for ecological data management” *Ecological Informatics* 1 (2006) 3-7

“Evidence”?:

“Data having potentially decisive probative value.”

***In terms of applicable rules of evidence
within a domain of knowledge***

- ***Being demonstrably valid (i.e. well supported by scientific logic)***
- ***Being reliable by conformity to expert consensus and expert practice***
- ***Having integrity as demonstrated by well documented lineage and provenance.***

“the institutional ecology of the digital environment”
(Yokai Benkler)

Sectoral and Jurisdictional Scale

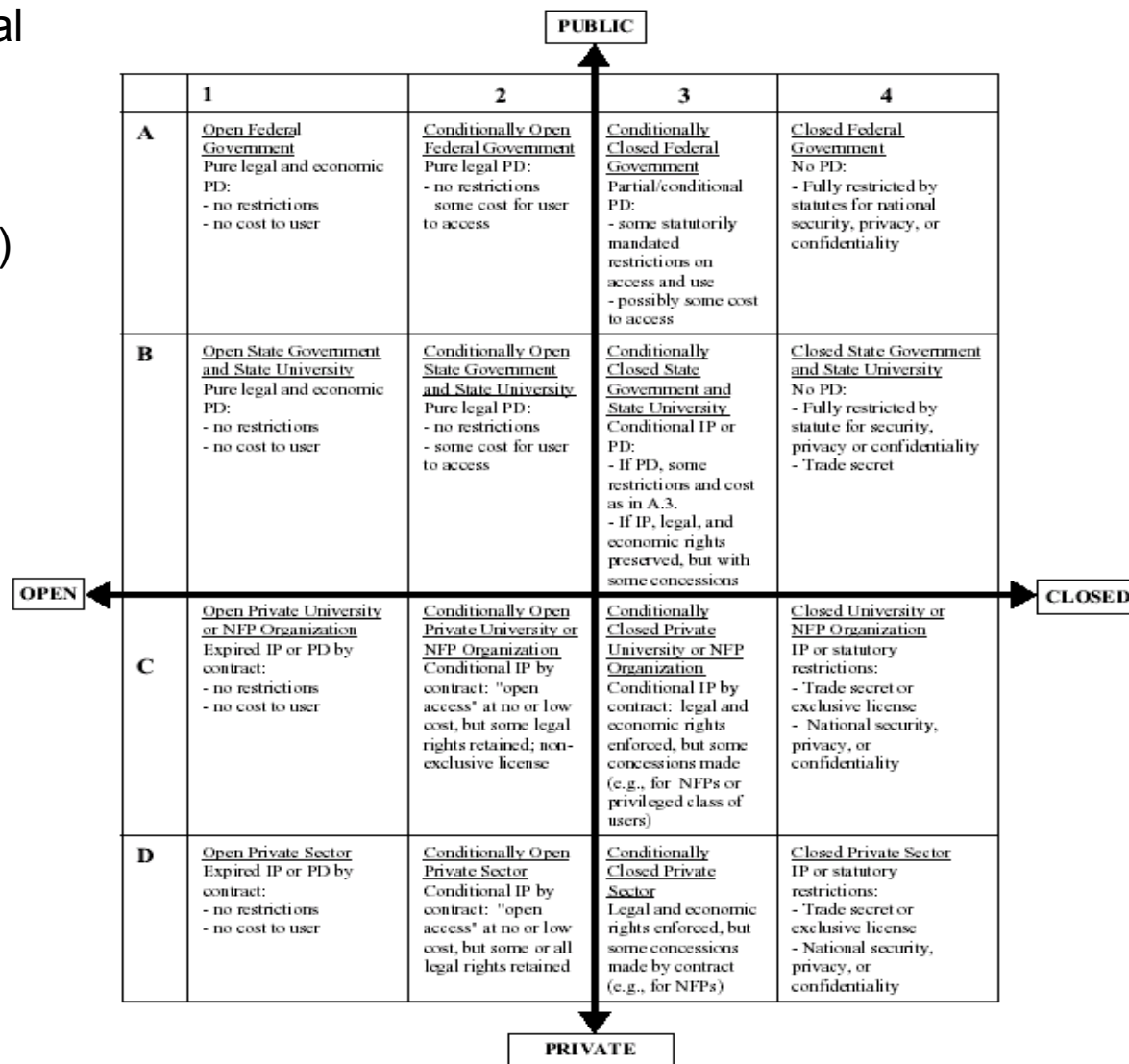
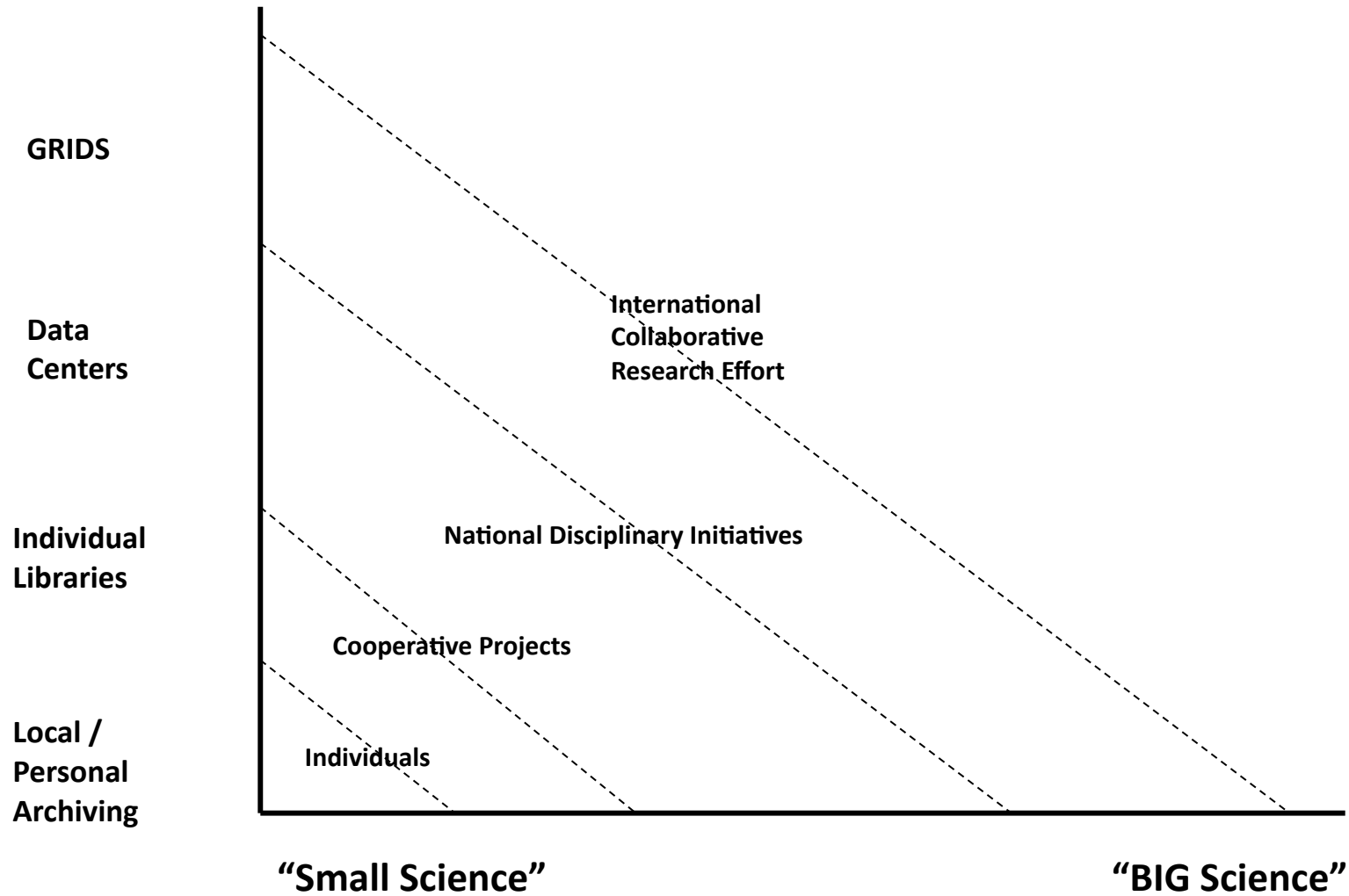


FIGURE 1-1 Conceptual framework for analysis of the S&T information regime. Copyright 2000 by Paul F. Uhler. Notes: “PD”—public domain; “IP”—intellectual property; “NFP”—not-for-profit.

“Big Science” / “Small Science” ?



The “small science,” independent investigator approach traditionally has characterized a large area of experimental laboratory sciences, such as chemistry or biomedical research, and field work and studies, such as biodiversity, ecology, microbiology, soil science, and anthropology. The data or samples are collected and analyzed independently, and the resulting data sets from such studies generally are heterogeneous and unstandardized, with few of the individual data holdings deposited in public data repositories or openly shared.

The data exist in various twilight states of accessibility, depending on the extent to which they are published, discussed in papers but not revealed, or just known about because of reputation or ongoing work, but kept under absolute or relative secrecy. The data are thus disaggregated components of an incipient network that is only as effective as the individual transactions that put it together. Openness and sharing are not ignored, but they are not necessarily dominant either. These values must compete with strategic considerations of self-interest, secrecy, and the logic of mutually beneficial exchange, particularly in areas of research in which commercial applications are more readily identifiable.

The Role of Scientific and Technical Data and Information in the Public Domain: Proceedings of a Symposium. Julie M. Esanu and Paul F. Uhler, Eds. Steering Committee on the Role of Scientific and Technical Data and Information in the Public Domain Office of International Scientific and Technical Information Programs Board on International Scientific Organizations Policy and Global Affairs Division, National Research Council of the National Academies, p. 8

The Ethos of Science

“Declaration of Scientific Principles”
in “The Commonwealth of Science”

“7. The pursuit of scientific inquiry demands complete intellectual freedom. And unrestricted international exchange of knowledge...”

from “The Commonwealth of Science ” *Nature* No.3753
October 4, 1941.

“The substantive findings of science are a product of social collaboration and are assigned to the community. They **constitute a common heritage** in which the equity of the individual producer is severely limited...”

“The scientist’s claim to “his” intellectual “property” is limited to that of recognition and esteem which, if the institution functions with a modicum of efficiency, is **roughly commensurate with the significance of the increments brought to the common fund of knowledge.**”

Robert K. Merton, “A Note on Science and Democarcy,” Journal of Law and Political Sociology 1 (1942): 121.

*The erosion of the ethic of data sharing:
“Could you patent the sun? “*

In a 1954 interview with Edward R Murrow, Jonas Salk responded to a question suggesting the patenting of the polio vaccine : “Could you patent the sun?”

and then ca 50 years later

In a 2002 study, 47% of surveyed geneticists had been rejected at least once in their efforts to gain access to key genetics data (this result indicated a significant increase over a previous survey).

EG Campbell et al. “Data Withholding in Academic Genetics: Evidence From a National Survey”
JAMA, Jan 2002; 287: 473 – 480; Massachusetts General Hospital (2006). “Studies examine withholding of scientific data among researchers, trainees: Relationships with industry, competitive environments associated with research secrecy.” News release (January 25). Massachusetts General Hospital. <http://www.massgeneral.org/news/releases/012506campbell.html>,
as of November 17, 2008.

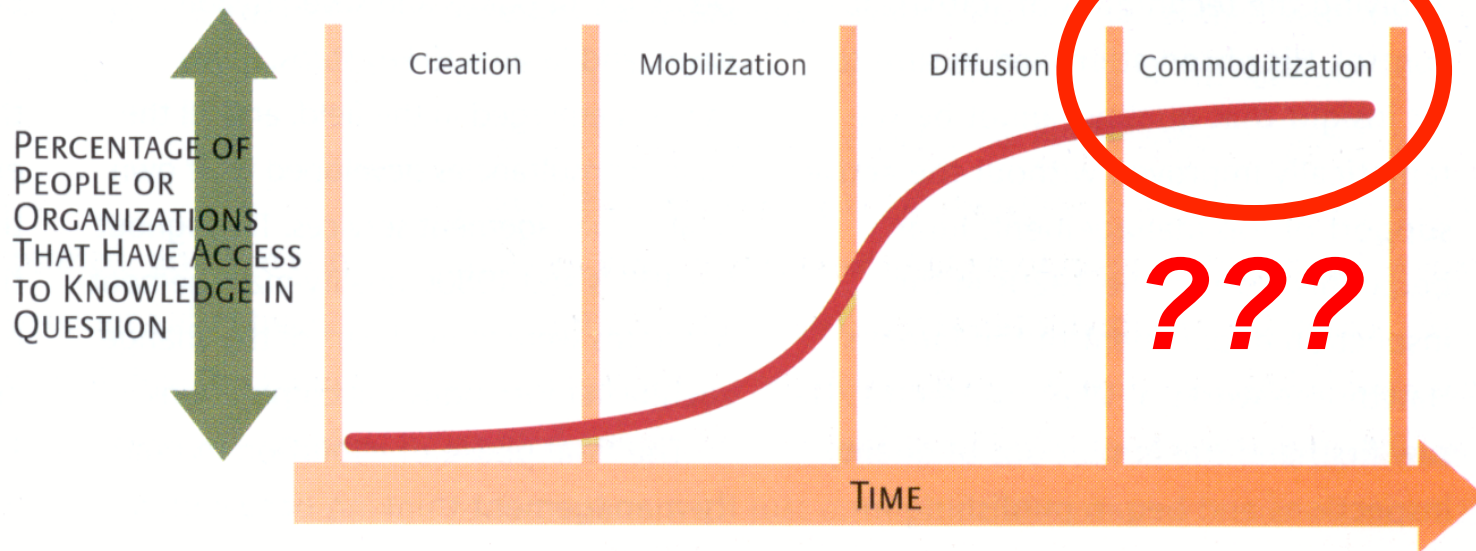
“Factual data are fundamental to the progress of science and to our preeminent system of innovation. Freedom of inquiry, the open availability of scientific data, and full disclosure of results through publication are the cornerstones of basic research, which both domestic law and the norms of public science have long upheld.”

J.H. Reichman and P.F. Uhler. “A contractually reconstructed research commons for scientific data in a highly protectionist intellectual property environment.” in *The Public Domain*. J.Boyle, ed. Durham, NC: school of Law, Duke University. (*Law and Contemporary Problems*, Vol.66 nos 1&2) 2003

*Is scientific knowledge a “commodity” ???
What are the implications of this view?*

The Knowledge Life Cycle

Knowledge progresses through four stages as it develops over time. As it becomes accessible to more and more people — first in one organization, then in many, and finally to the general public — companies must use different strategies to realize its maximum value.



*Julian Birkinshaw and Tony Sheehan, “Managing the Knowledge Life Cycle,”
MIT Sloan Management Review, 44 (2) Fall, 2002: 77.*

Science - Some Observations

Interdisciplinarity and The “Unity of Science”

- *Applied sciences* -- like biodiversity conservation or epidemiology or earthquake engineering -- must inevitably draw on the practices and knowledge bases of *multiple domains and disciplines*.
- Domains and disciplines previously inaccessible to each other may now – at least potentially -- share knowledge much more effectively and consequentially.
- Discovery and combination of previously unavailable, dissociated, heterogeneous data creates the possibility for construction of longitudinal studies and new meta-analyses

New capacity for historical (“longitudinal”) studies: **ICOADS Marine Data Rescue**

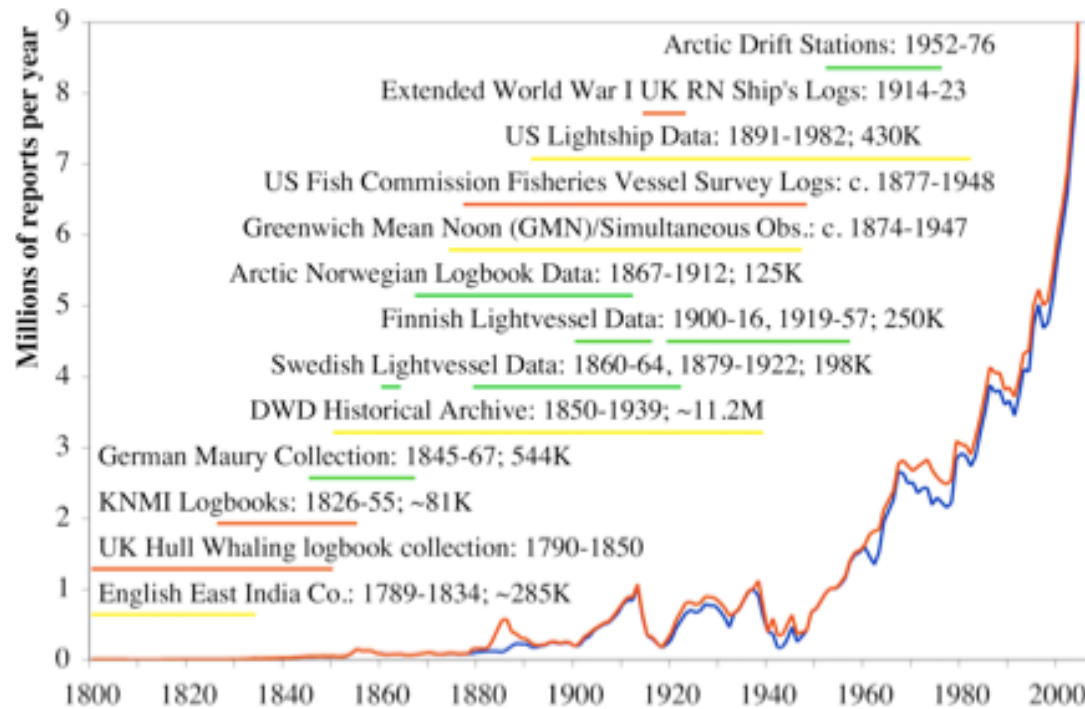


Figure 1. The time periods of selected candidate historical data sources (discussed in more detail in Wilkinson et al. 2009) to be blended into ICOADS, are spanned by horizontal colored lines: green candidates are fully digitized but require format translation, yellow are partially digitized, and red are in the planning stages for digitization. Each dataset name is appended with the date range and approximate number of reports (if known). The solid blue curve is the number of reports in ICOADS Release 2.4; the solid red curve is the number in Release 2.5 (R2.5). We hope that datasets available by 31 March 2010 can be included in the next major ICOADS ("R2.6") required by the start of FY2011 to meet reanalysis requirements.

Scott Wodruff et al. "ICOADS Marine Data Rescue: Status and Future CDMP Priorities": http://icoads.noaa.gov/reclaim/pdf/marine-data-rescue_v15.pdf

New capacity for historical (“longitudinal”) studies: NCAR Research Data Archive (RDA)

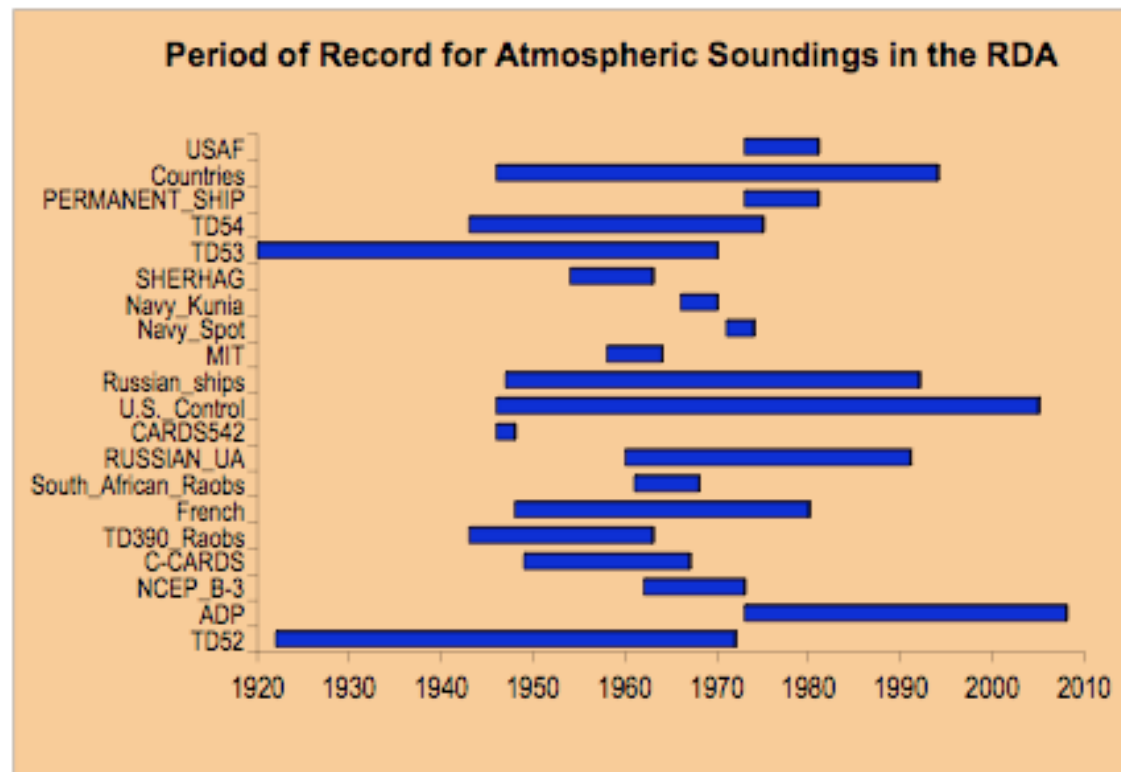


Figure 2 Period of record for major sources of atmospheric sounding data in the NCAR Research Data Archive. The name of each dataset source is shown along with date range covered.

C.A. Jacobs, S. J. Worley, “Data Curation in Climate and Weather: Transforming our ability to improve predictions through global knowledge sharing,” from the **4th International Digital Curation Conference December 2008** , page 7.

www.dcc.ac.uk/events/dcc-2008/programme/papers/Data%20Curation%20in%20Climate%20and%20Weather.pdf [03 02 09]

Full Life Cycle Management

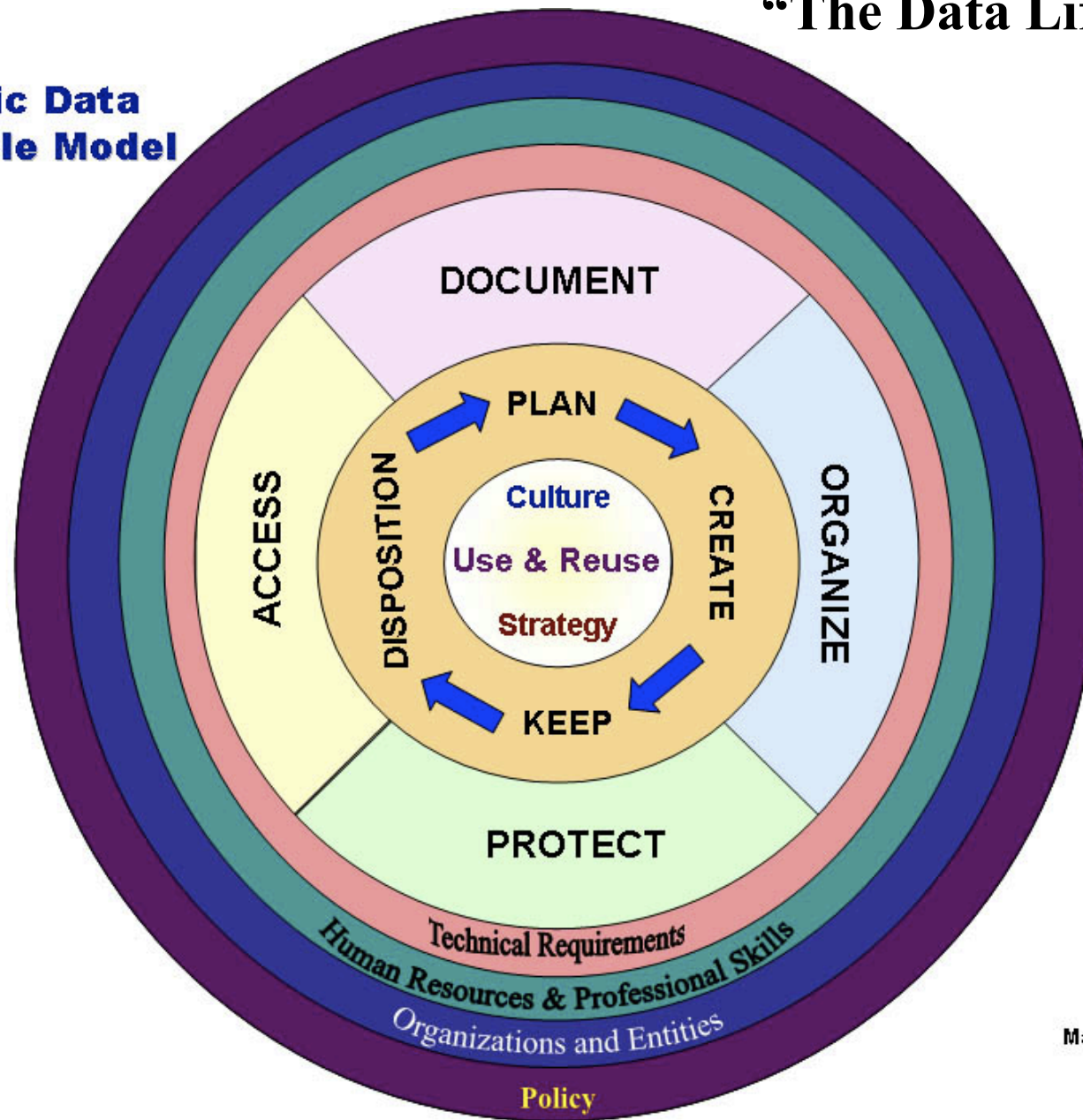
“The Data Life Cycle” #1

US NSF “DataNet” Program: “the full data preservation and access lifecycle”

- ***“Acquisition”***
- ***“Documentation”***
- ***“Protection”***
- ***“Access”***
- ***“Analysis and dissemination”***
- ***“Migration”***
- ***“Disposition”***

“The Data Life Cycle” #3

**IWGDD
Scientific Data
Life Cycle Model**



May 2008

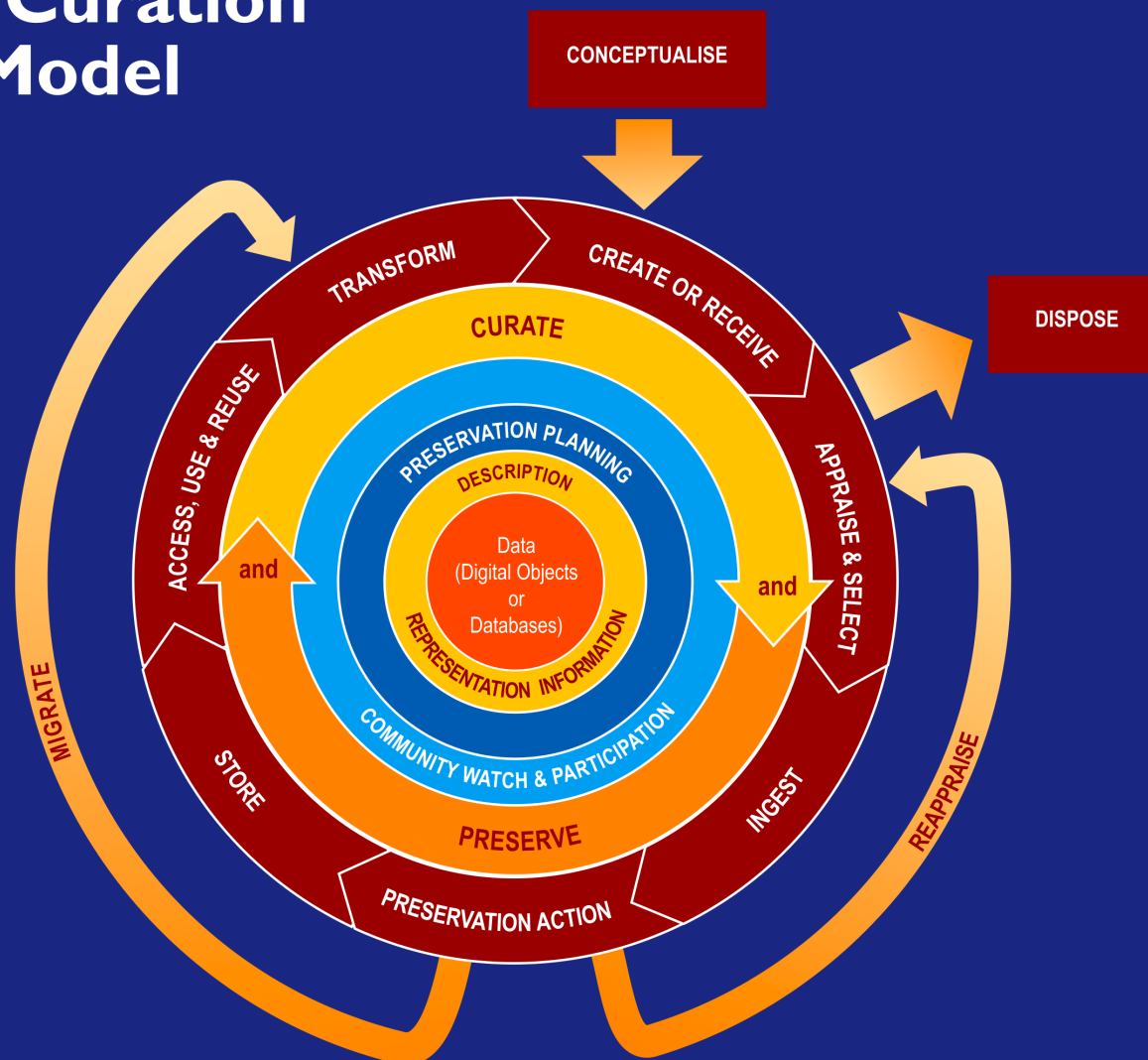
<http://wiki.esipfed.org/images/c/c4/IWGDD.pdf>

“The Data Life Cycle” #2



D | C | C

The DCC Curation Lifecycle Model



The Curation Lifecycle

The DCC Curation Lifecycle Model provides a graphical high level overview of the stages required for successful curation and preservation of data from initial conceptualisation or receipt. The model can be used to plan activities within an organisation or consortium to ensure that all necessary stages are undertaken, each in the correct sequence. The model enables granular functionality to be mapped against it; to define roles and responsibilities, and build a framework of standards and technologies to implement. It can help with the process of identifying additional steps which may be required, or actions which are not required by certain situations or disciplines, and ensuring that processes and policies are adequately documented.

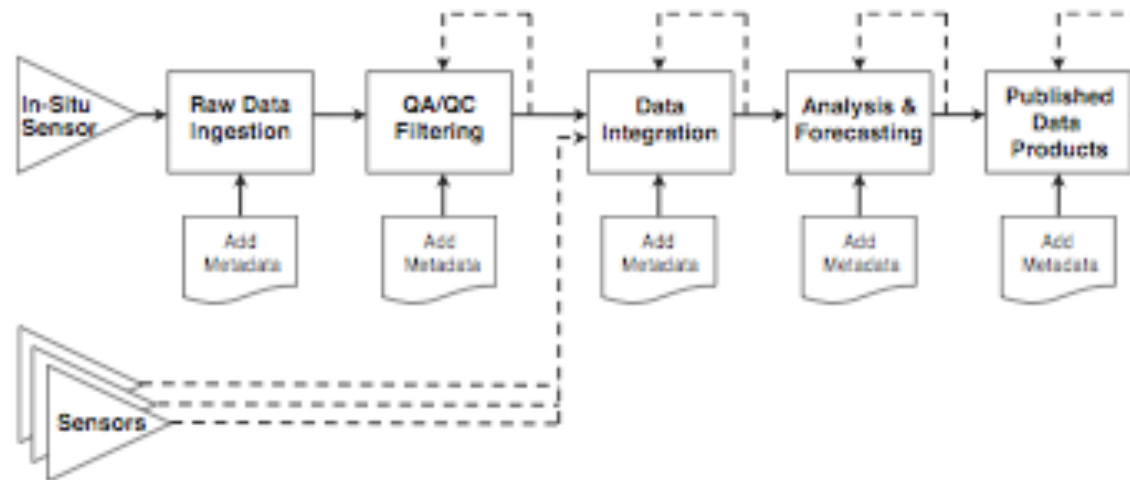


Fig. 2-Example of end-to-end flow of in situ environmental sensor data from ingestion through quality assurance/quality control (QA/QC) filtering, integration with additional data streams, analysis and modeling, and publication of data products. Metadata may be added at every step of the process and each major step from QA/QC through publication of data products may be performed multiple times.

W. K. Michener “Meta-information concepts for ecological data management”
Ecological Informatics 1 (2006) 3-7

“Evidence”?:

“Data having potentially decisive probative value.”

***In terms of applicable rules of evidence
within a domain of knowledge***

- ***Being demonstrably valid (i.e. well supported by scientific logic)***
- ***Being reliable by conformity to expert consensus and expert practice***
- ***Having integrity as demonstrated by well documented lineage and provenance.***

“...the “validation” of any scientific hypothesis rests upon the sum validity, reliability and integrity of all original data and on the iterative validation of all subsequent sequences of data transformation to which original data have been subject. “

*T. Moritz
“The Burden of Proof”*

Data as Evidence:

- “Evidence” assumes probative force
 - Clear distinctions between “rules of evidence” applied in different domains: (i.e. appropriate fitness for use within domains)
 - In science pure/applied
 - In law (forensics)
 - In policy formation (deliberation/legislation/ law)
 - In regulation (administrative code, enforcement, professional/ industrial norms)
 - In survey and monitoring
 - In decision-making
 - Journalistic: corroboration and review (including letters to editor)
 - Politics
- +++++
- “Peer review” / professional consensus in various forms is arbiter (academy, profession, discipline, jury, review board, public...)
 - “Independence” / “impartiality” is essential quality of such reviews

Domains of Knowledge/ “Rules of Evidence”?

- Research Science:
 - professional/disciplinary standards
 - peer review / certification
 - citation
- Regulatory Science: (code)
- Survey and monitoring
- Decision Making
- Law/Forensics: (“Daubert standard”)
 - Codified “Rules of Evidence”
 - Precedent/ judicial review
 - “Reasonable Doubt” (the “clear conscience” standard)
- Deliberation /Policy Formation (polemical/rhetorical)
- Journalistic: corroboration and review (including letters to editor)
- “Politics” – elections, etc.

+++++

- Religious: authority (textual and clerical) and testimonials (evidence of miracles)

Scientific Research: forms of confirmative consensus /
peer review (“organized skepticism”) and “jurying” in science:

Existing scientific conventions and practices:

- Admission to scientific programs
- Academic performance
- Internships, “apprenticeships” , “post-docs”
- Awarding degrees
- Hiring, promotion and tenure
- Collegiality and mentoring (personal communications)
- Editorial board reviewing
- Grant Reviewing
- Book reviews
- Citation
- Letters / Notes
- Blogs and recommender-style “commenting”
- Annotation
- Appointments, awards, prizes and other recognition

US NSF: “Science and the Law”

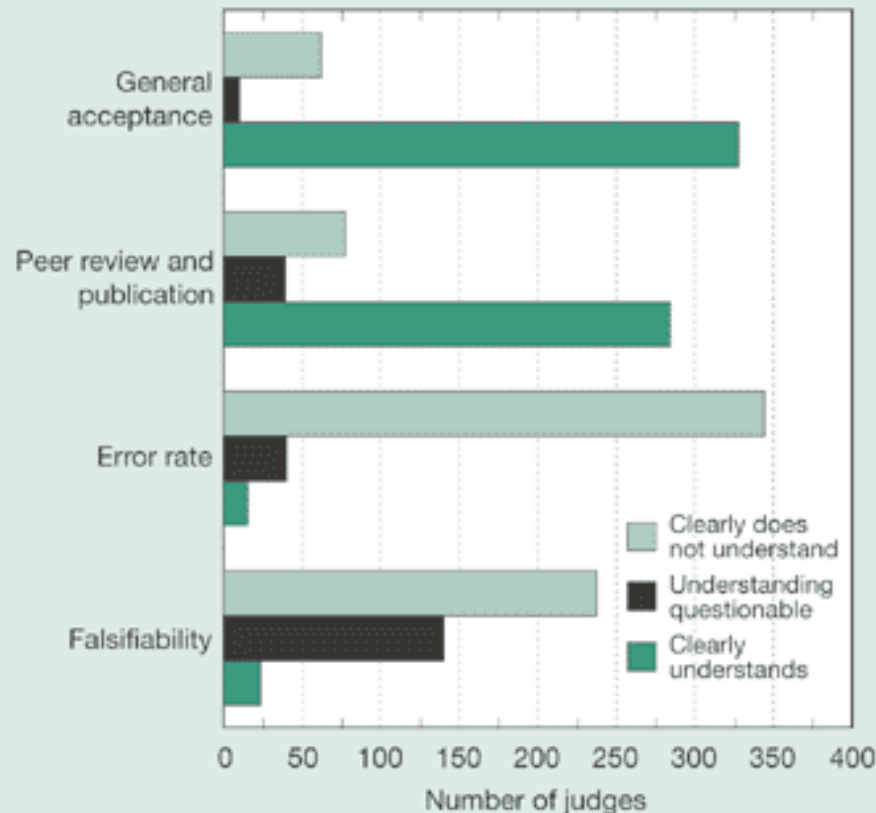
“In 1993, the U.S. Supreme Court issued a landmark decision in the case of *Daubert v. Merrell Dow Pharmaceuticals*. Daubert articulated standards judges should use ((1) falsifiability, (2) error rate, (3) peer review, and (4) general acceptance) to determine the admissibility of expert testimony in court. It affirmed that judges had a responsibility to be gatekeepers, keeping evidence that did not meet these standards out of the courtroom.”

<http://www.nsf.gov/statistics/seind04/c7/c7s2.htm>

[SEE Also, “Federal Rules of Evidence” Rule #702 “Testimony by Experts”:

<http://www.law.cornell.edu/rules/fre/rules.htm#Rule702>]

Figure 7-7
Understanding of *Daubert* guidelines for admitting scientific evidence: 2001



SOURCE: S. Gatowski et al. 2001. Asking the gatekeepers: A national survey of judges on judging expert evidence in a post-*Daubert* world. *Journal of Law and Human Behavior* 25(5): 433–58.

Science & Engineering Indicators – 2004

Judges as “gatekeepers in white coats” ???

“...researchers surveyed 400 state trial court judges in all 50 states...the survey results suggest that ‘many judges may not be fully prepared to deal with the amount, diversity and complexity of the science presented in their courtrooms’ and that *‘many judges did not recognize their lack of understanding’*. “ – US NSF [emphasis added]

<http://www.nsf.gov/statistics/seind04/c7/c7s2.htm#sb2>

“Evidence-Based” Policy:

Development of the of Science / Policy Dynamic

- “Jeffersonian Science” as a middle alternative to the opposed paradigms of:
 - “pure” science - “Newtonian” science
 - “applied” science - “Baconian” science
- The “Carter-Press initiative” (ca 1980): US governmental agencies were surveyed about primary research that would be most likely to yield research of practical benefit to agency mission
- IPCC and “climate-gate” as “public exposure and potential economic impact increases, “fault tolerance” of the system diminishes
 - *viz* recent IPCC – efforts to regulate *expressions of probability* – levels of confidence-- (practical differences among 3 primary IPCC Working Groups)

SEE: Gerard Holton, “*Science and Anti-science*,” and

***An example of industrial standards for peer-certification:
“A regulatory standard from the US Pharmaceutical Industry”***

“The objective of the analytical procedure should be clearly understood since this will govern the validation characteristics which need to be evaluated. Typical validation characteristics which should be considered are listed below:

“Accuracy”: “The accuracy of an analytical procedure expresses the closeness of agreement between the value which is accepted either as a conventional true value or an accepted reference value and the value found.”

“Precision”: “The precision of an analytical procedure expresses the closeness of agreement (degree of scatter) between a series of measurements obtained from multiple sampling of the same homogeneous sample under the prescribed conditions.”

“Repeatability”: “Repeatability expresses the precision under the same operating conditions over a short interval of time. Repeatability is also termed intra-assay precision “

“Intermediate Precision”: “Intermediate precision expresses within laboratories variations: different days different analysts, different equipment, etc.”

“Reproducibility”: “Reproducibility expresses the precision between laboratories”

“Specificity”: “ability to assess unequivocally the analyte in the presence of components which may be expected to be present.”

“Detection Limit”: “...the lowest amount of analyte in a sample which can be detected but not necessarily quantitated as an exact value.”

“Quantitation Limit”: “...the lowest amount of analyte in a sample which can be quantitatively determined with suitable precision and accuracy.”

“Linearity Range”: “ability (within a given range) to obtain test results which are directly proportional to the concentration (amount) of analyte in the sample.”

“Robustness”: “capacity to remain unaffected by small, but deliberate variations in method parameters and provides an indication of its reliability during normal usage.”

“Guideline for Industry Text on Validation of Analytical Procedures” by The Expert Working Group (Quality) of the International Conference on Harmonisation of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH) - endorsed by the ICH Steering Committee at *Step 4 of the ICH process, October 27, 1994.*

Journalism: the case of the BBC and “climate-gate”?

- BBC accountability for presenting irresponsible “counterpoints” to climate change diagnosis [*sensationalist* approach to journalism?]
- Distinctions between journalism / punditry / entertainment?
- Why are “climate deniers without scientific credentials presented as “counterpoints” to serious scientific consensus on climate change
- Should “flat-earther”s” or “gravity-deniers” be accorded such respect and given such a platform?

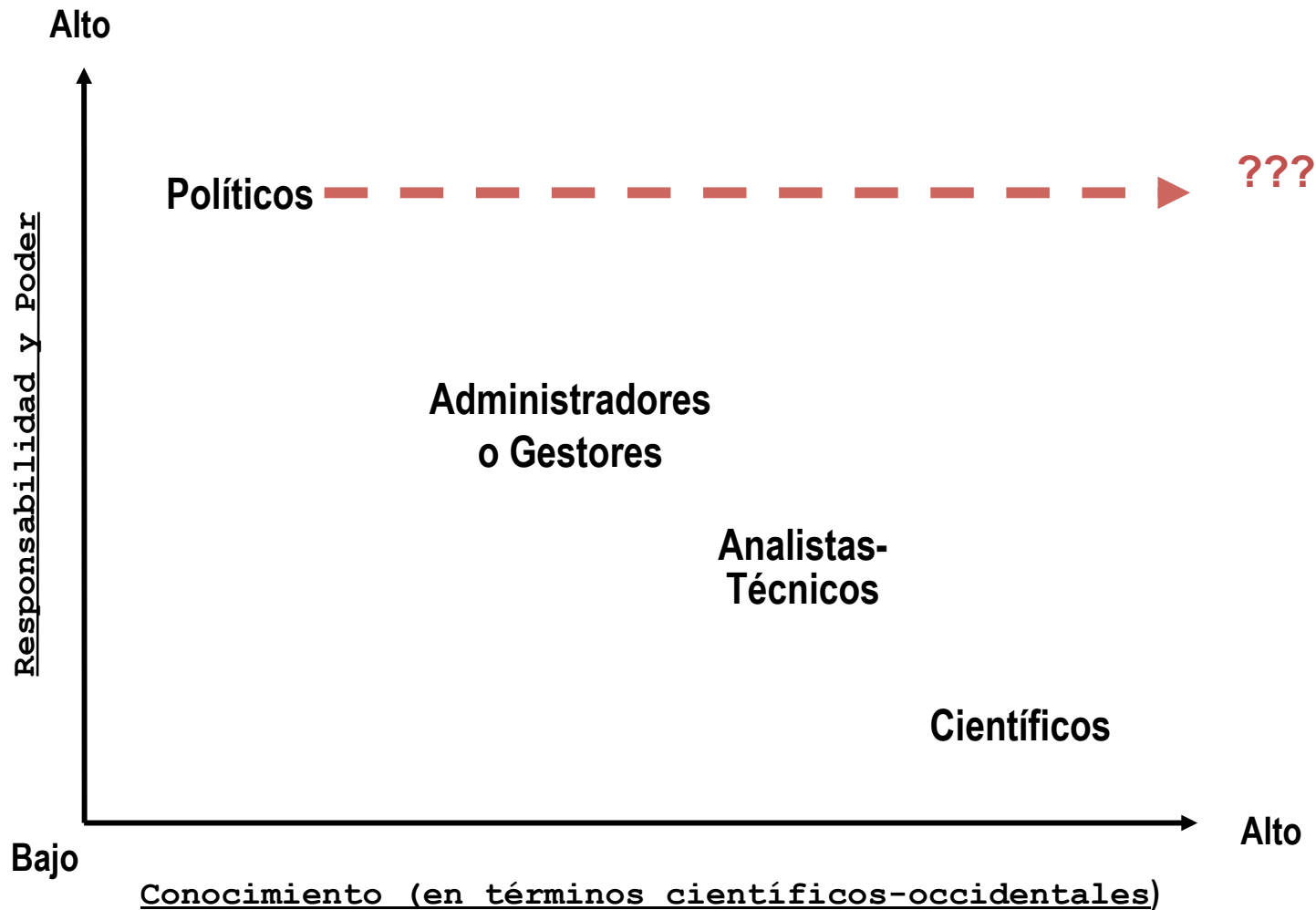
SEE: *Nature* editorial comment ca Oct. 18, 2010

“PUBLIC REASON?”

***“Nothing is required for this enlightenment,
however, except freedom; and the freedom
in question is the least harmful of all, namely,
the freedom to use reason publicly in all matters.”***

***-- Immanuel Kant
from “What is Enlightenment?”***

Poder Político y Conocimiento



(Sutton, 1999)

From: [Organizaciones que aprenden, países que aprenden: lecciones y AP en Costa Rica](#) by Andrea Ballesteros Directora ELAP

Civic Science Literacy ?

“...the capacity to use scientific knowledge, to identify questions, and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity.”

Organization for Economic Cooperation and Development, “Measuring Student Knowledge and Skills: A New Framework for Assessment”. Paris: (1999).

http://www.oecd.org/document/58/0,3343,en_32252351_32236159_33688954_1_1_1_1,00.html

"First Person Ontology"

EXPRESSION

PERCEPTION

***[Physical
Sciences]***

[Engineering]

***[Biological
Sciences]***

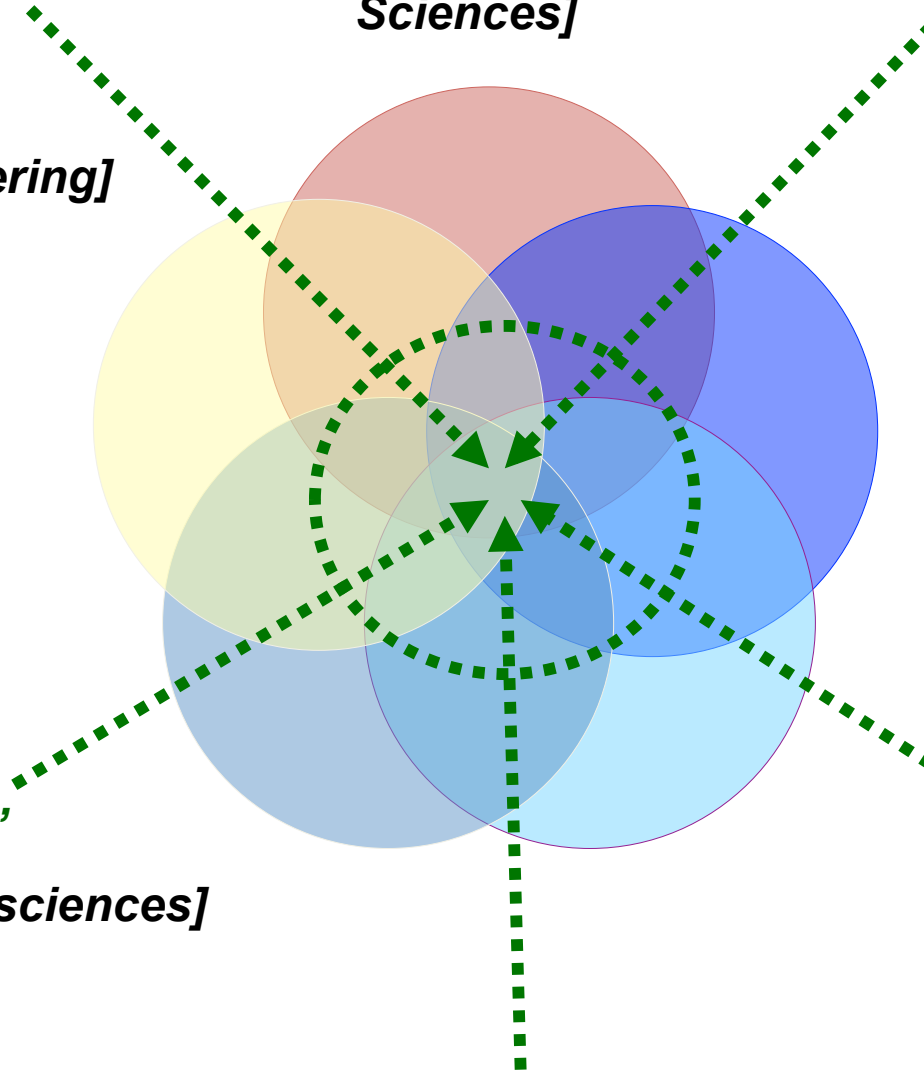
"INTUITION"

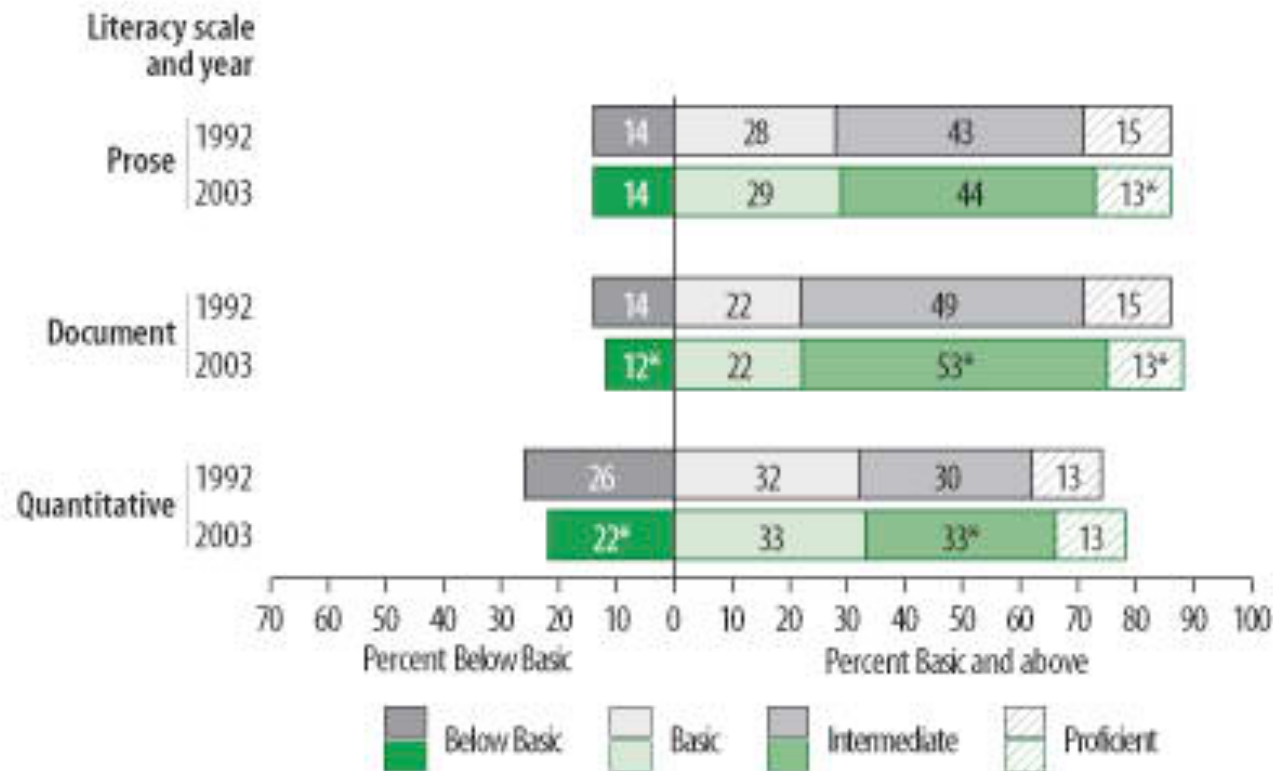
[Social sciences]

"VALUATION"

***[Cognitive
Studies]***

REASON





“Percentage of adults in each prose, document, and quantitative literacy level: 1992 and 2003” – *US Dept of Education Institute of Education Sciences, National Center for Education Statistics*

http://nces.ed.gov/naal/kf_demographics.asp

“E pur si muove!”

“After 350 Years, Vatican Says Galileo Was Right: It Moves”

by Alan Cowell *New York Times* October 31, 1992

“ROME, Oct. 30 — More than 350 years after the Roman Catholic Church condemned Galileo, Pope John Paul II is poised to rectify one of the Church's most infamous wrongs -- the persecution of the Italian astronomer and physicist for proving the Earth moves around the Sun.

“With a formal statement at the Pontifical Academy of Sciences on Saturday, Vatican officials said the Pope will formally close a 13-year investigation into the Church's condemnation of Galileo in 1633. The condemnation, which forced the astronomer and physicist to recant his discoveries, led to Galileo's house arrest for eight years before his death in 1642 at the age of 77.

“The dispute between the Church and Galileo has long stood as one of history's great emblems of conflict between reason and dogma, science and faith. The Vatican's formal acknowledgement of an error, moreover, is a rarity in an institution built over centuries on the belief that the Church is the final arbiter in matters of faith.”

<http://www.nytimes.com/1992/10/31/world/after-350-years-vatican-says-galileo-was-right-it-moves.html>

“...government is not the solution to our
problem;
government is the problem”

Ronald Reagan
First Inaugural Address
January 20, 1981

[http://www.reaganlibrary.com/reagan/
speeches/first.asp](http://www.reaganlibrary.com/reagan/speeches/first.asp)



For much of the past 30 years we have worked in a climate of increased skepticism about – if not hostility to -- public investment and public science

The Social Enterprise Spectrum

Purely Philanthropic



Purely Commercial

<i>Motives</i>	Appeal to Goodwill	Mixed Motives	Appeal to Self Interest
<i>Methods</i>	Mission Driven	Mission and Market Driven	Market Driven
<i>Goals</i>	Social Value	Social and Economic Value	Economic Value

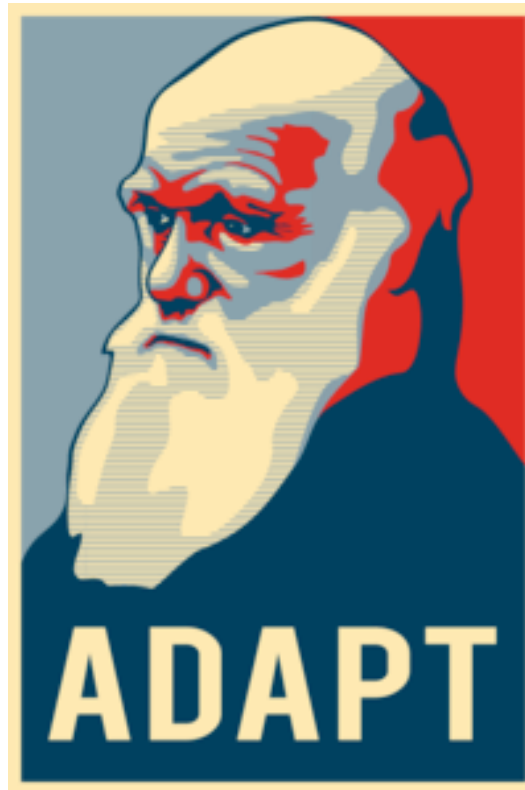
“CO2 is green.”

“Congress is considering a law that would classify carbon dioxide as pollution. This will cost us jobs. There is no scientific evidence that CO2 is a pollutant. In fact, higher CO2 levels than we have today would help the earth's ecosystems and would support more plant and animal life. Please take action. Contact your senator and congressman today and remind them CO2 is not pollution and more CO2 results in a greener earth. Go to CO2isgreen.com, because we all need CO2.”

-- “CO2 is green: the TV advert making viewers choke,” The Guardian, September 28, 2009

<http://www.guardian.co.uk/environment/blog/2009/sep/28/co2-is-green-tv-advert>

http://www.youtube.com/watch?v=TxCQHn-w0Bw&feature=player_embedded



<http://www.mikero.com/blog/2009/02/20/more-darwin>

<http://www.zazzle.com/darwin2009>

8"



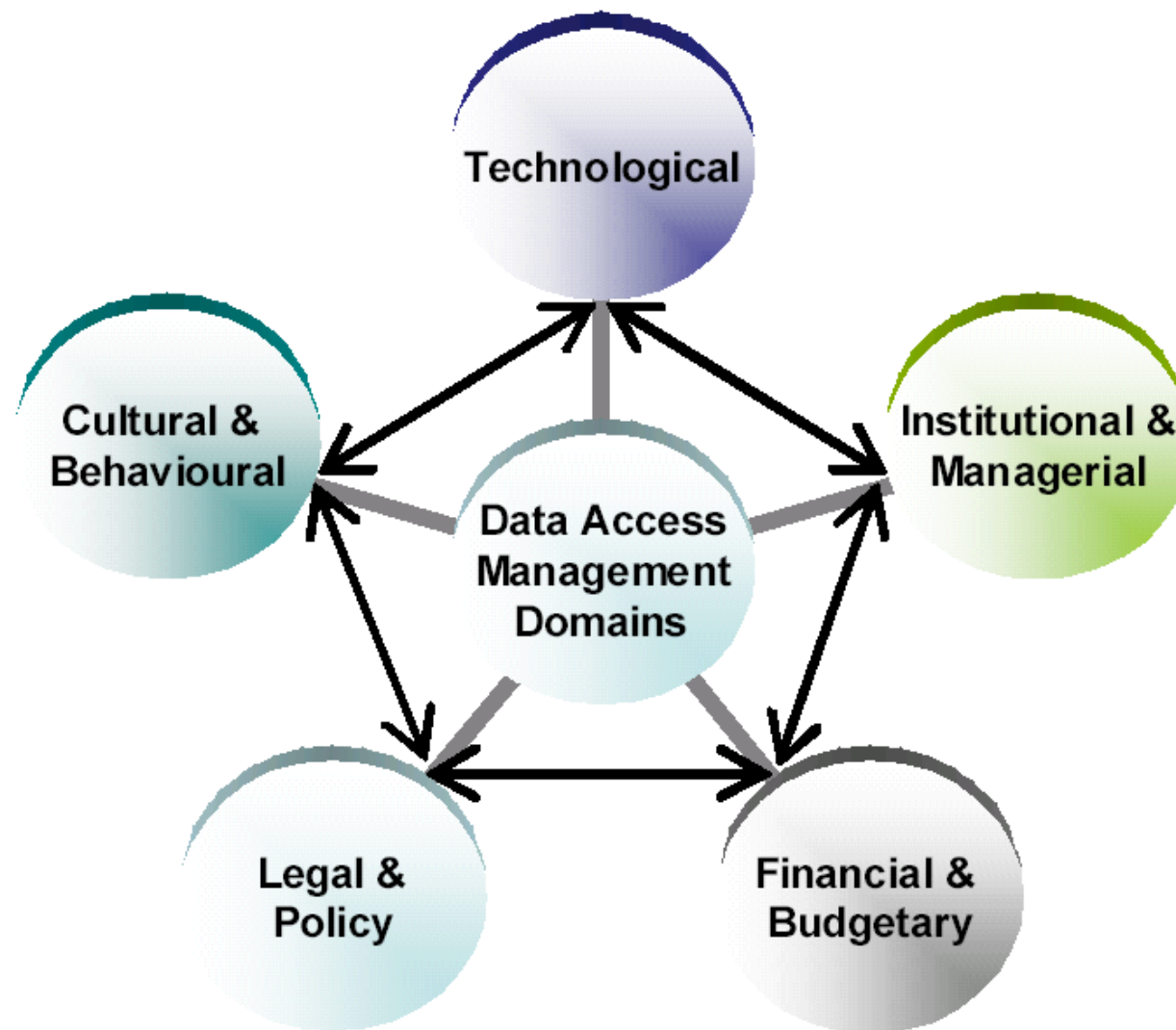


Figure 1. Components of a Data Access Regime

OECD Follow Up Group on Issues of Access to Publicly Funded Research Data.
*Promoting Access to Public Research Data for Scientific, Economic, and Social
Development: Final Report March 2003*



Table 6.2. Performance evaluation studies of mitigation passages for wildlife.

Source and Location	Hypothesis stated?	Objectives stated?	N structures	DATA COLLECTION			ANALYSIS			
				Method ^a	Duration (months)	Monitoring frequency	Level ^b	Species ^c	Criteria for success?	Observed/Expected ^d
Reed et al. 1975 Wyoming, USA	No	Yes <i>Do deer use underpass and what is the extent of behavioral reluctance associated with it?</i>	1	Counters <i>Transects</i>	48	Weekly	S (S)	Mammal (u)	No	Obs
Ballon 1985 Upper Rhine, France	No	No	4	Transects	9	Weekly	S (M)	Mammal (u)	No	Obs
Hunt et al. 1987 NSW, Australia	No	Yes Do tunnels facilitate movement?	5	Traps Transects	2	1 per 8 days	S (M)	Mammal (s, m)	No	Obs
Jackson and Tynning 1989 Massachusetts, USA	No	Yes Are tunnels effective?	2	Observation	<1	Daily	S (S)	Amphibian	Yes	Obs
Woods 1990 Alberta, Canada	No	Yes Are underpasses used, and do they allow access to seasonal ranges?	8	Transects Telemetry	36	1 per 3 days	S (M)	Mammal (u)	Yes	Obs
Foster and Humphrey 1995 Florida, USA	No	Yes Do underpasses effectively allow panthers to cross highway?	4	35mm camera	2-16	Continuous	S (M)	Mammal (m, lc, u), Bird, Reptile Human	No	Obs
Yanes et al. 1995 Central Spain	No	Yes Are passages used, and what are the features influencing use?	17	Transects	12	16 days per year	G (M)	Mammal (s, m), Reptile	No	Obs
Land and Lotz 1996 Florida, USA	No	Yes Are underpasses effective?	4	35mm camera Transects	24	nr ^e	S (M)	Mammal (m, lc, u), Reptile	No	Obs
Rodríguez et al. 1996 South-central Spain	Yes	Yes Which taxa use underpasses, how frequently, and what are the features affecting use?	17	Transects	11	1 per 3 days	G (M)	Mammal (s, m, u), Reptile, Amphibian, Human	No	Obs
Roof and Wooding 1996 Florida, USA	No	No	1	Transects 35mm camera Telemetry	12	1 per 3 days	S (M)	Mammal (s, m, lc)	No	Obs
AMBS Consulting 1997 NSW, Australia	No	Yes Inventory species in the area; assess the level of use at underpass.	3	35mm camera	9	Continuous	S (M)	Mammal (s, m)	No	Obs
Pfister et al. 1997 Switzerland, Germany, France, Netherlands	No	Yes Which species use overpasses? How often? Are they effective?	16	Video camera	24	nr ^e	S (M)	Mammal (s, m, u) Bird, Reptile, Amphibian, Invertebrate	Yes	Obs
Rodríguez et al. 1997 South-central Spain	Yes	Yes Which taxa use underpasses, how frequently, and what are the features affecting use?	17	Transects	10	1 per 3 days	S (M)	Mammal (m), Human	No	Obs
Rosell et al.	No	Yes	56	Transects	12	1 per 3 days	S (M)	Mammal (m), Human	No	Obs

Abraham Lincoln:

“...a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation, or any nation, so conceived and so dedicated, can long endure... It is rather for us to be here dedicated to the great task remaining before us... that we here highly resolve... that this nation, under God, shall have a new birth of freedom—and that government of the people, by the people, for the people, shall not perish from the earth.”

Recommendation:
“A Global Knowledge Commons” ?

***“There is a universal public right
to access and to use
of all forms of data and information
essential to the formation of public policy,
to public decision making and to public regulation.***

***Similarly, all data and information
essential to the evaluation and understanding of public policy
must be freely and openly available in a form that is
complete, meaningful and usable.***

***Universal science literacy is
a fundamental, corollary right.”***

“Polity”???

polity (pälə tē) noun pl. polities -ties

1. political or governmental organization
2. a society or institution with an organized government; state; body politic
3. a specific form of church government

Etymology: MFr *politie* < L *politia*: see *policy*

Collecting Effort

TABLE 3
Summary of Essential Methods for Neotropical
Rainforest Mammal Inventories
 (See text for detailed explanations.)

Method	Target taxa
Conventional trap- ping ^a	Marsupials and small ro- dents
Tree trapping ^b	Arboreal marsupials and ro- dents
Pitfall trapping	Small marsupials and ro- dents
Diurnal hunting/cen- sus	Primates, squirrels, and oth- er diurnal species
Nocturnal hunting/ census	Nonvolant nocturnal species
Interviews	Xenarthrans, primates, car- nivores, ungulates, and large rodents
Ground-level mist- netting	Understory bats
Canopy mist-netting	Molossids and other high- flying bats
Searching for roosts	Many bats, but especially small insectivorous spe- cies

^a With traps suitable for species weighing 10–500 g, placed 0–3 m above ground.

^b At least 10 m above ground, preferably higher.

Source: Voss &
 Emmons, AMNH
 Bull. No. 230, 1996

(by permission)

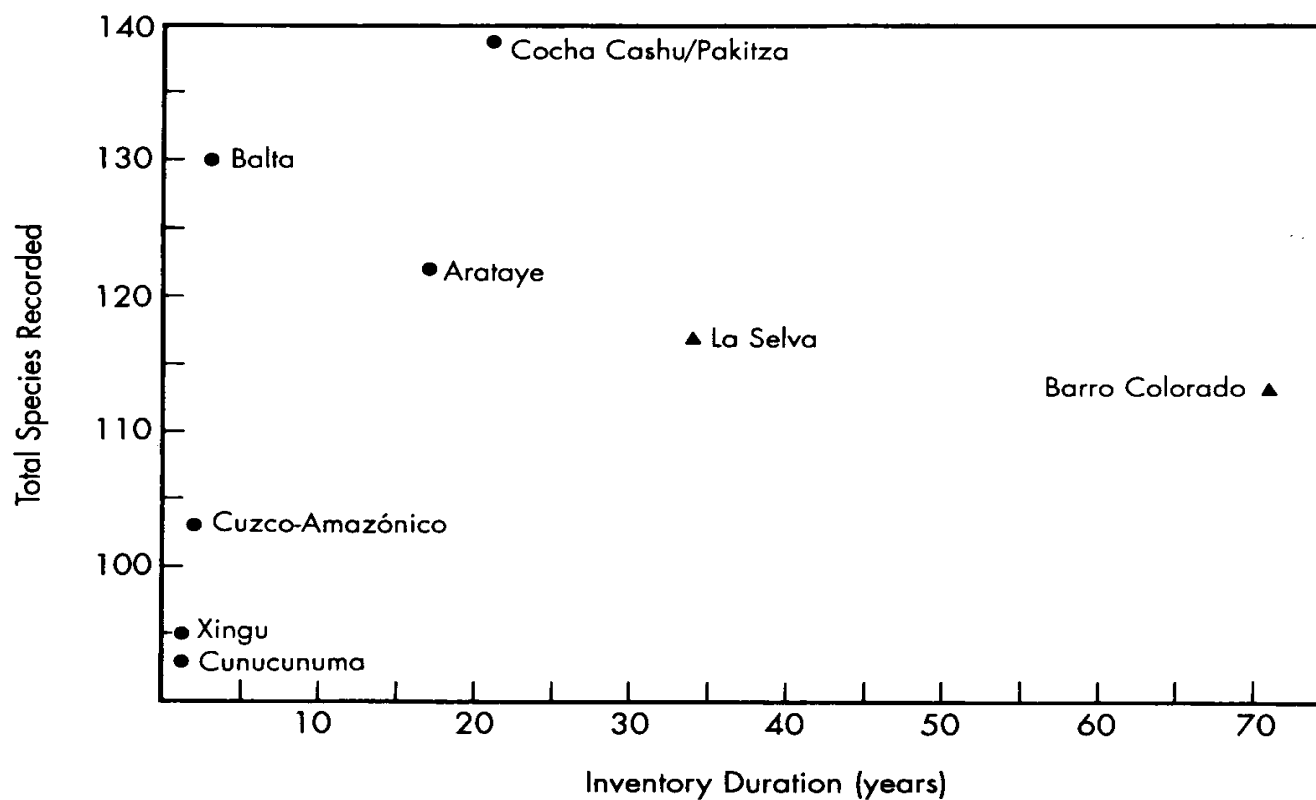


Fig. 20. Number of species recorded versus inventory duration at eight Neotropical rainforest localities; only faunal surveys that included bats are shown (see tables 4 and 5 for data). Amazonian localities are represented by dots, Central American localities by triangles.

Source: Voss &
Emmons, AMNH
Bull. No. 230, 1996
(by permission)

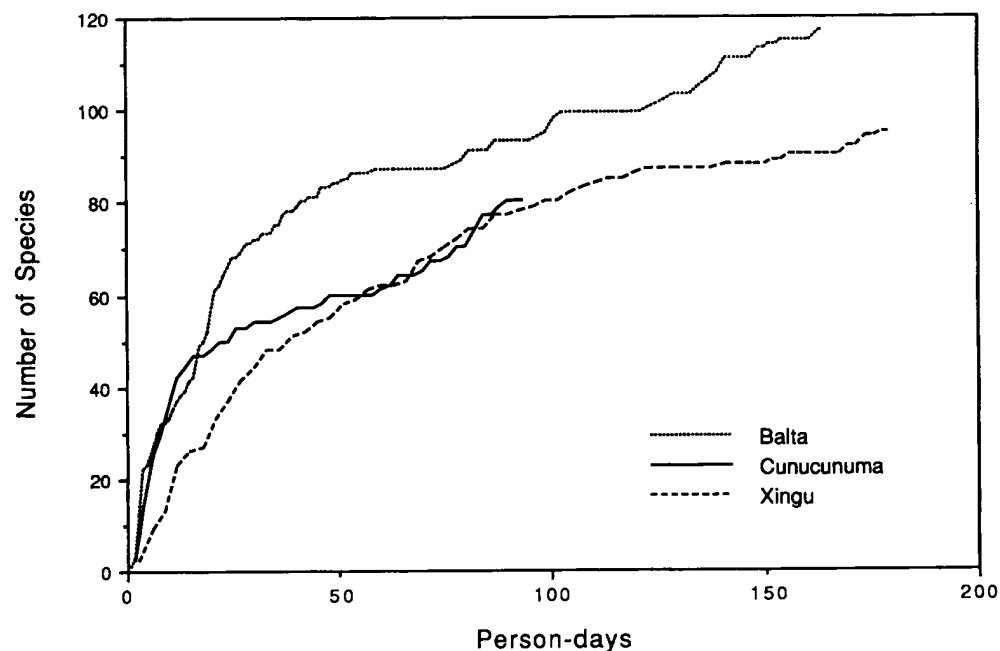


Fig. 21. Species accumulation curves reconstructed from specimen records and fieldnotes for three inventory sites. Person-days were calculated by multiplying the number of collectors by the number of productive field days (excluding dates with no mammals observed or collected). The Río Cunucunuma curve represents collecting at Culebra ("Belén") by M. D. Tuttle and F. L. Harder from 30 December 1966 to 21 February 1967, but omits two sight records for which dates are unavailable and does not include specimens purchased from Yekuanas at nearby Acanaña (see appendix 6). The Río Xingu curve represents collections and sight records by USNM personnel near their base camp (50–54 km SSW Altamira) from 13 August to 23 October 1986; collections at other sites up- and down-river are excluded (see appendix 8). The Balta curve represents collections made by A. L. Gardner and J. L. Patton from 1966 to 1971, but omits miscellaneous specimens obtained at the same locality by other researchers not continuously engaged in mammal inventory work (see appendix 9).

Source: Voss &
Emmons, AMNH
Bull. No. 230, 1996
(by permission)

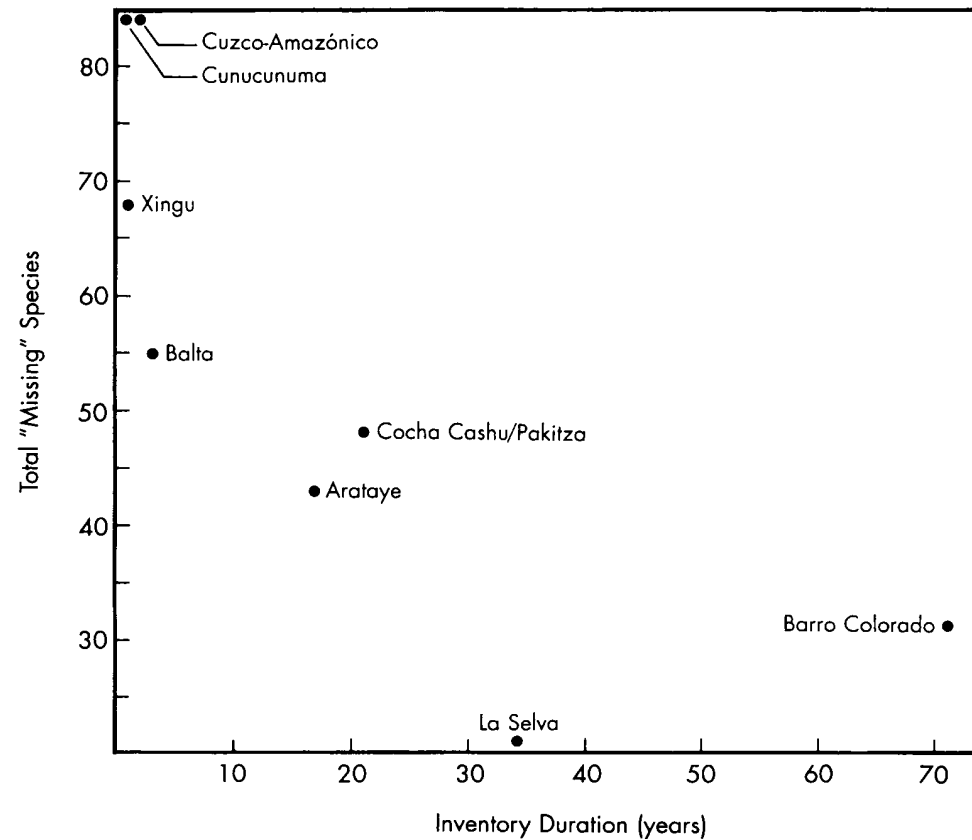


Fig. 24. "Missing" species (those expected but not observed) versus inventory duration at eight Neotropical rainforest localities where total mammal faunas (including bats) were sampled (from data in table 10).

Source: Voss &
Emmons, AMNH
Bull. No. 230, 1996
(by permission)

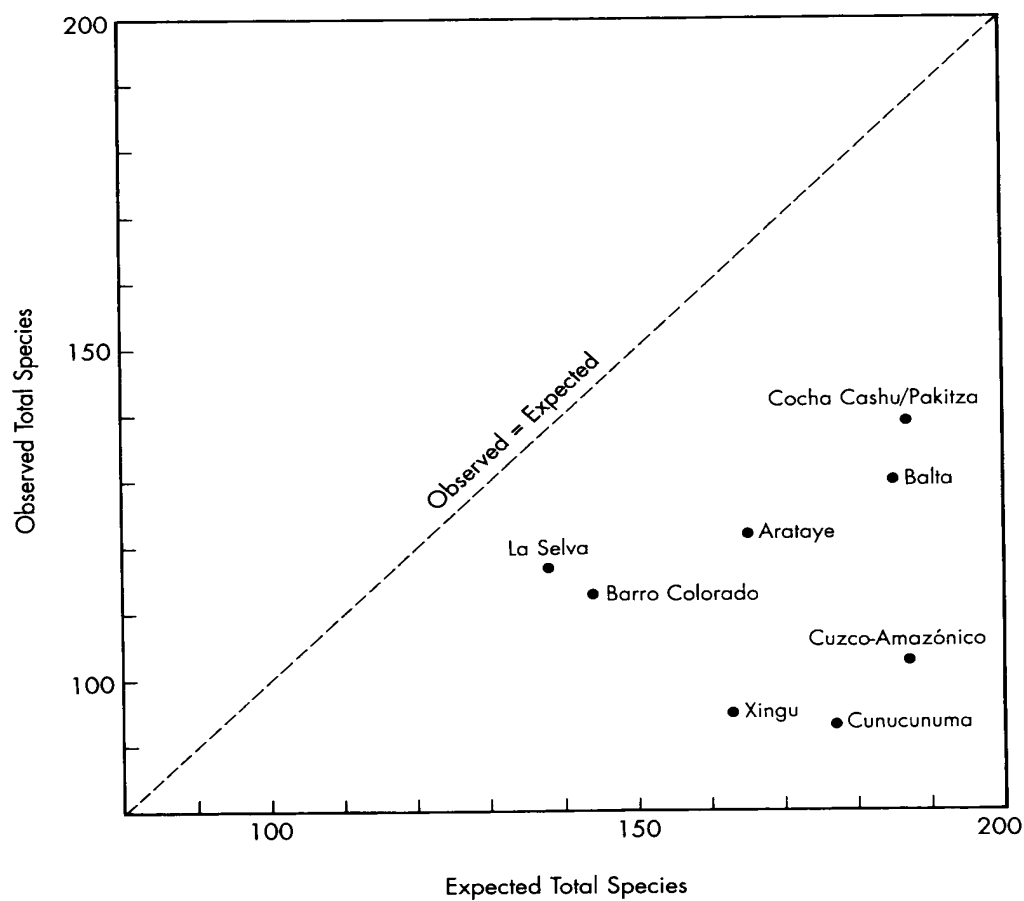


Fig. 23. Observed versus expected total species richness (including bats) at eight Neotropical rain-forest localities (from data in table 10). The vertical distance of each point from the dashed diagonal is proportional to the number of "missing" species (those expected but not observed) at each inventory site.

Source: Voss &
Emmons, AMNH
Bull. No. 230, 1996

(by permission)

The Arbitrary Legacy of “Evidence”?

“...the great trouble with the world
was that which survived
was held in hard evidence as to past events.
A false authority clung to what persisted,
as if those artifacts of the past
which had endured had done so
by some act of their own will.”

-- Cormac McCarthy *The Crossing*

“The General Definition of Information (GDI)”

σ is an instance of information, understood as semantic content, if and only if:

- *(GDI.1) σ consists of one or more data;*
- *(GDI.2) the data in σ are well-formed;*
- *(GDI.3) the well-formed data in σ are meaningful.*

Luciano Floridi <luciano.floridi@philosophy.ox.ac.uk> “Semantic Conceptions of Information”
(First published Wed Oct 5, 2005) Stanford Encyclopedia of Philosophy
<http://plato.stanford.edu/entries/information-semantic/> [visited 11/12/09]

The Diaphoric Definition of Data (DDD):

“According to GDI, information cannot be dataless but, in the simplest case, it can consist of a single datum. Now a datum is reducible to just a lack of uniformity (diaphora is the Greek word for “difference”), so a general definition of a datum is:

The Diaphoric Definition of Data (DDD): A datum is a putative fact regarding some difference or lack of uniformity within some context.

“Depending on philosophical inclinations, DDD can be applied at three levels:

1. data as diaphora de re, that is, as lacks of uniformity in the real world out there. There is no specific name for such “data in the wild”. A possible suggestion is to refer to them as dedomena (“data” in Greek; note that our word “data” comes from the Latin translation of a work by Euclid entitled Dedomena). Dedomena are not to be confused with environmental data (see section 1.7.1). They are pure data or proto-epistemic data, that is, data before they are epistemically interpreted. As “fractures in the fabric of being” they can only be posited as an external anchor of our information, for dedomena are never accessed or elaborated independently of a level of abstraction (more on this in section 3.2.2). They can be reconstructed as ontological requirements, like Kant's noumena or Locke's substance: they are not epistemically experienced but their presence is empirically inferred from (and required by) experience. Of course, no example can be provided, but dedomena are whatever lack of uniformity in the world is the source of (what looks to information systems like us as) as data, e.g., a red light against a dark background. Note that the point here is not to argue for the existence of such pure data in the wild, but to provide a distinction that (in section 1.6) will help to clarify why some philosophers have been able to accept the thesis that there can be no information without data representation while rejecting the thesis that information requires physical implementation; ...”

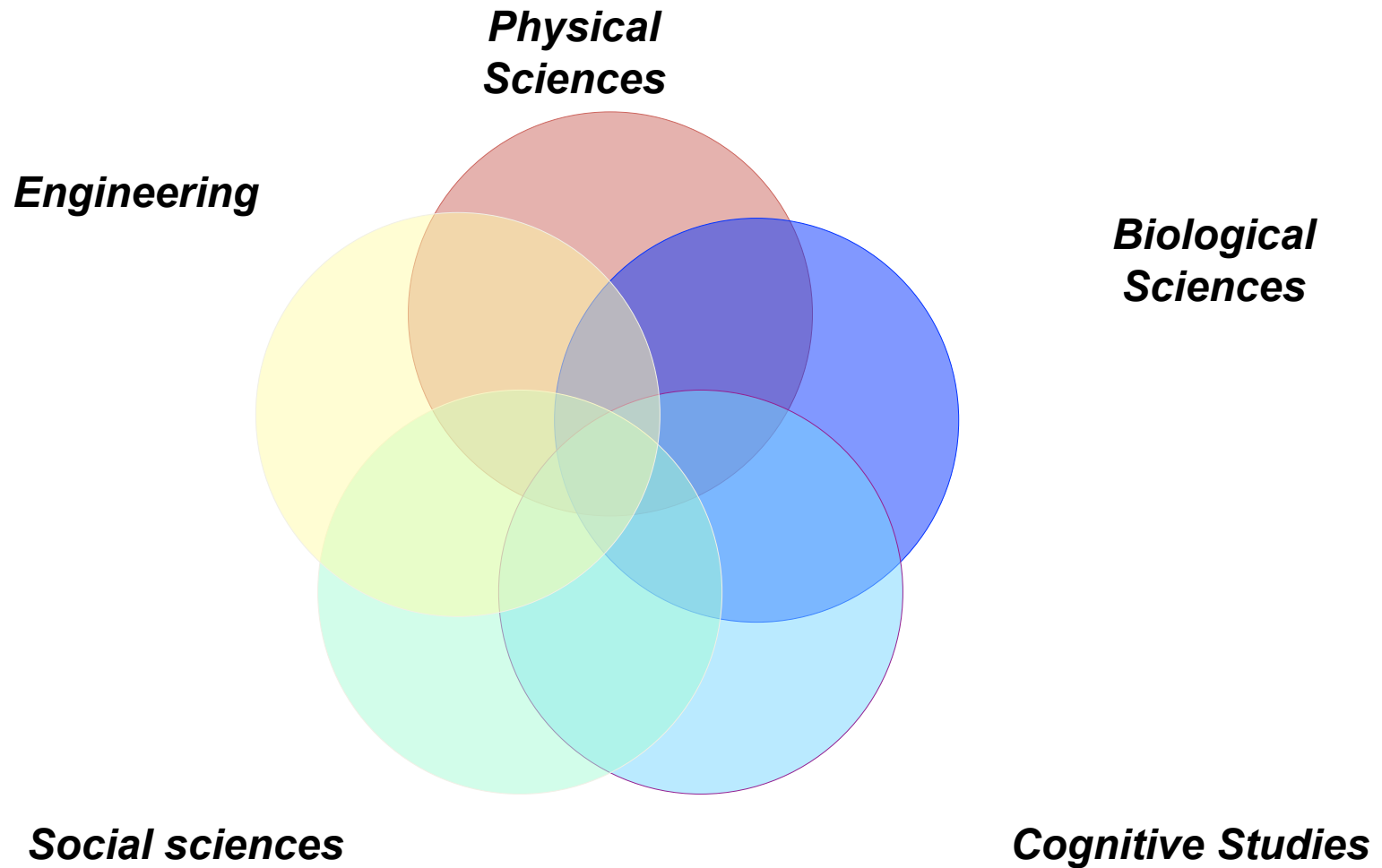
The Diaphoric Definition of Data (DDD): (cont.)

- “2. data as diaphora de signo, that is, lacks of uniformity between (the perception of) at least two physical states, such as a higher or lower charge in a battery, a variable electrical signal in a telephone conversation, or the dot and the line in the Morse alphabet; and
3. data as diaphora de dicto, that is, lacks of uniformity between two symbols, for example the letters A and B in the Latin alphabet.”

Luciano Floridi <luciano.floridi@philosophy.ox.ac.uk> “Semantic Conceptions of Information”
(First published Wed Oct 5, 2005) Stanford Encyclopedia of Philosophy
<http://plato.stanford.edu/entries/information-semantic/> [visited 11/12/09]

"Third Person Ontology"?

Science claims to the properties of "objectivity" and "invariance"



August 4, 2009: the White House issued a memorandum stating unequivocally:
“Sound science should inform policy decisions”

“Science and Technology Priorities for the FY2011 Budget,” PR Orszag and JP Holdren August 4, 2009, Memorandum for the Heads of Executive Departments and Agencies, M-09-27.

http://www.whitehouse.gov/omb/assets/memoranda_fy2009/m09-27.pdf

“Qualitative”? / “Quantitative”?

“Civilization advances by extending the number of important operations which we can perform without thinking about them. Operations of thought are like cavalry charges in battle – they are strictly limited in number, they require fresh horses, and must only be made at decisive moments.”

A N Whitehead, *An introduction to mathematics*, Oxford Univ Press, London, 1911.

“Scientific debates have always involved controversies over the value and importance of particular classes of evidence, and this can be expected to continue. Moreover, all scientific knowledge always contains some level of uncertainty and any actions based on scientific evidence inevitably involves an assessment of risk and a process of risk management. Finally, given the dependence of major facets of IPCC assessments on vast data collections and complex models whose parameters are especially difficult to assess independently, risk assessments are especially challenging.”

Committee to Review the IPCC of the InterAcademy Council, “Climate Change Assessments: Review of the Processes and Procedures of the IPCC” 2010

<http://reviewipcc.interacademycouncil.net/>

Usage

Data: The word data is the Latin plural of *datum*, neuter past participle of *dare*, "to give", hence "something given".

“ *Data* leads a life of its own quite independent of *datum*, of which it was originally the plural. It occurs in two constructions: as a plural noun (like earnings), taking a plural verb and plural modifiers (as these, many, a few) but not cardinal numbers, and serving as a referent for plural pronouns; and as an abstract mass noun (like information), taking a singular verb and singular modifiers (as this, much, little), and being referred to by a singular pronoun. Both constructions are standard. The plural construction is more common in print, perhaps because the house style of some publishers mandates it.”

The Merriam-Webster Online Dictionary
<http://www.merriam-webster.com/dictionary/data>

“Keeping Raw Data in Context”

“...any initiative to share raw clinical research data must also pay close attention to sharing clear and complete information about the design of the original studies. Relying on journal articles for study design information is problematic, for three reasons. First, journal articles often provide insufficient detail when describing key study design features such as randomization (1) and intervention details (2). Second, some data sets may come from studies with no publications [only 21% of oncology trials registered in ClinicalTrials.gov before 2004 and completed by September 2007 were published (3)]. Finally, investigators cannot reliably search journal articles for methodological concepts like “double blinding” or “interrupted time series,” crucial concepts for proper interpretation of the data. A mishmash of non-standardized databases of raw results and unevenly reported study designs is not a strong foundation for clinical research data sharing. “

“ We believe that the effective sharing of clinical research data requires the establishment of an interoperable federated database system that includes both study design and results data. A key component of this system is a logical model of clinical study characteristics in which all the data elements are standardized to controlled vocabularies and common ontologies to facilitate cross-study comparison and synthesis. “

I Sim, et al. “Keeping Raw Data in Context”[letter] Science v 323 6 Feb 2009, p713.

The “ecology”, development and maturity
of scientific domains and disciplines

“Transparency” and “Accountability”

- ***“Transparency”*** means: visibility by *intentional disclosure*
 - In the digitally networked internet environment this implies *open, free and effective access* [see also: Peter Fox: *“translucency”*]
- ***“Accountability”*** means *proactive responsibility* for the “quality of data” insuring that data are open and free, informative and usable.
 - this means ability to satisfy a rigorous audit of:
 - (logical) *validity*,
 - (expert) *reliability*
 - (technical) *integrity*

“Polity”/ “Comity”

***polity* (pūlə tē) noun pl. *polities* --ties**

1. political or governmental organization
2. a society or institution with an organized government; state; body politic
3. a specific form of church government

Etymology: MFr *politie* < L *politia*: see *policy*

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***comity* (kāmə tē) noun pl. *comities* --ties**

1. courteous behavior; politeness; civility
2. comity of nations
3. agreement among cooperating Christian denominations to avoid duplication of churches, missions, etc. in specific areas
4. Law the principle by which the courts of one jurisdiction may give effect to the laws and decisions of another, or may stay their own proceedings in deference to those in another jurisdiction

Etymology: ME *comite*, association < L *comitas* < *comis*, polite, kind; earlier *cosmis*, prob. < co- (see *com-*), with + **smi-s* < IE base **smei-*, to smile

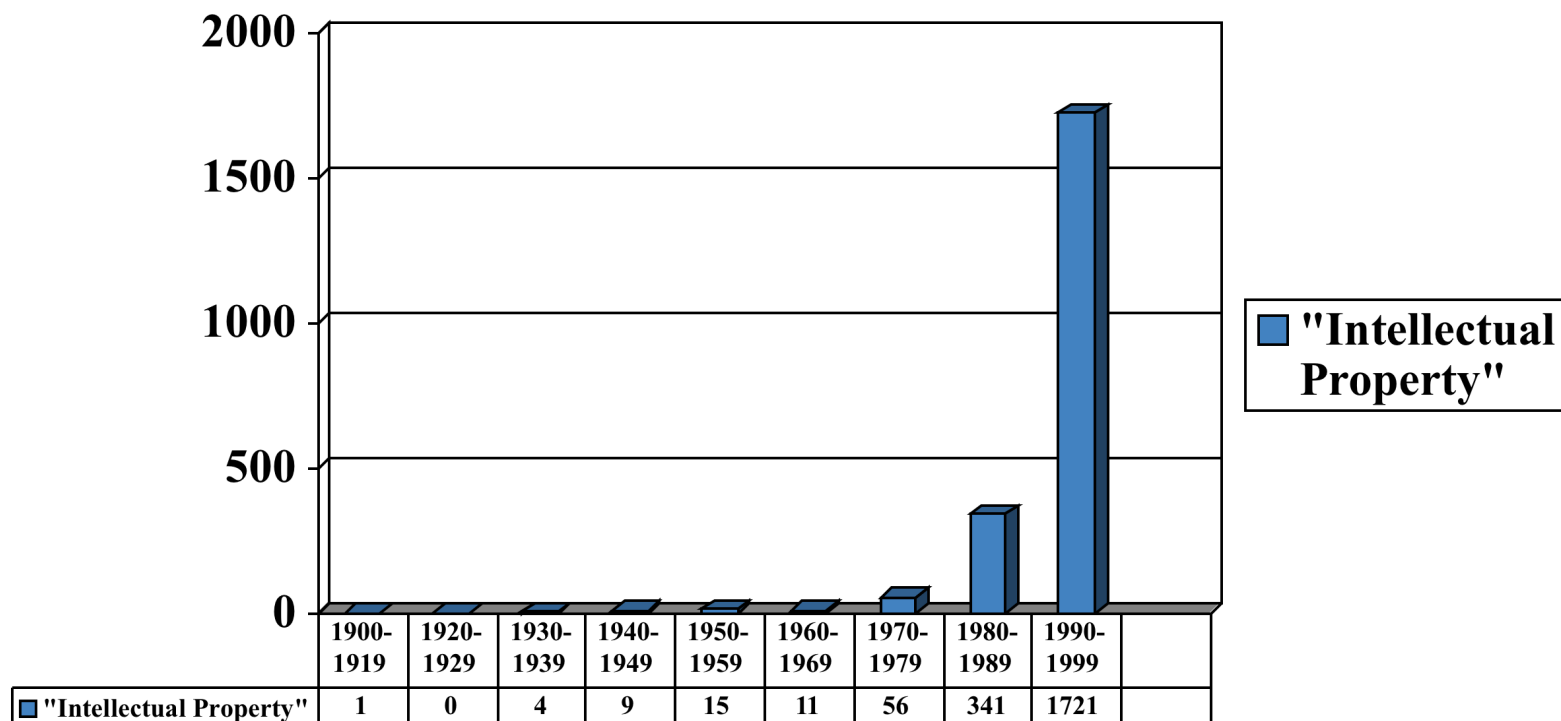
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“Forty-seven percent of geneticists who asked other faculty for additional information, data, or materials regarding published research reported that at least 1 of their requests had been denied in the preceding 3 years.”

[“Of a potential 3000 respondents, 2893 were eligible and 1849 responded, yielding an overall response rate of 64%. We analyzed a subsample of 1240 self-identified geneticists and made a limited number of comparisons with 600 self-identified nongeneticists.”]

E G Campbell, et al. “Data Withholding in Academic Genetics Evidence From a National Survey,” JAMA. 2002;287(15):1939-1940. <http://jama.ama-assn.org/content/287/4/473.abstract>

References to “*Intellectual Property*” in U.S. federal cases



“Professor Hank Greely” Cited in Lessig, L. *The future of ideas: the fate of the commons in a connrcted world*. NY, Random House, 2001. P. 294.

Table 1: Sharing of data and research materials on request.

Study	Requested datasets	Available datasets	Source journal(s)	Subject area
Savage and Vickers (2009) ⁹	10	1 (10%)	<i>PLoS Medicine, PLoS Clinical Trials</i>	Medicine
Piwowar et al. (2007) ¹⁰	85	41 (48%)	Various	Medicine, Cancer
Wicherts et al. (2006) ¹¹	141	64 (45%)	<i>Journal of Personality and Social Psychology, Developmental Psychology, Journal of Consulting and Clinical Psychology, Journal of Experimental Psychology: Learning, Memory, and Cognition.</i>	Psychology
Peng et al. (2006) ¹² *	69*	0 (0%)*	<i>American Journal of Epidemiology, Journal of the American Medical Association</i>	Epidemiology
McCullough et al. (2006) ¹³	193	69 (36%)	<i>Journal of Money, Credit and Banking</i>	Economics
Kyzas et al. (2005) ¹⁴	64	42 (66%)	Various	Cancer
McCullough and Vinod (2005) ¹⁵	15	6 (40%)	<i>American Economic Review, the International Journal of Industrial Organization, and the Journal of International Economics</i>	Economics
Reidpath and Allotey (2002) ¹⁶	29	1 (3%)	<i>British Medical Journal</i>	Medicine

* In the study by Peng et al., the authors did not attempt to contact other researchers, but noted the availability of data as described in the published article.

Hilary Spencer (Nature Publishing Group)

“Thoughts on the sharing of data and research materials and the role of journal policies,”

http://www.stanford.edu/~vcs/Nov21/hilary_spencer_rdcscsJan2010.pdf

“Seven Warning Signs of Bogus Science”

- “1. The discoverer pitches the claim directly to the media (thus bypassing the peer review process by denying other scientists the opportunity to determine the validity of the claim).
2. The discoverer claims that a powerful establishment is trying to suppress his or her work. (The mainstream science community may be deemed part of a larger conspiracy that includes industry and government.)
3. The scientific effect involved is always at the very limit of detection.
4. The evidence for a discovery is anecdotal.
5. The discoverer says a belief is credible because it has endured for centuries.
6. The discoverer has worked in isolation.
7. The discoverer must propose new laws of nature to explain an observation.”