


ICSU-WDS and Open Science (TBC)

- “Open Science” as Data-Driven Science Ecosystem
--- from a viewpoint of Japan, and with past community practices

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Colleagues of Cabinet Office of Japan and National Diet Library

WDS International Programme Office Hosted by 
Based in Tokyo, Japan


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My position in Science & OS scenes

Geophysics, Atmospheric/Space Science


 Board member of Japan Geoscience Union (2014-2015)


 Adjunct Professor, Kyoto University, (2013-2014)

 American Geophys. Union Earth & Space Sci. Informatics Section Exec. Comm

 IUGG Union Commission of Data & Information (2017-)


 Member, Science Council of Japan

 Research Executive Director, Strategic Program Office, NICT

 ICSU-World Data System Scientific Committee, ex officio member

 Member, Expert Panel of Open Science, Cabinet Office

 EC's High Level Expert Group of European Open Science Cloud (2015-2016)

 G7 Open Science Working Group (cont.)

Data Management Advocacy, Science Policy

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What I wish to talk today

- Political Background
政策動向
- System of Scientific Research
科学研究のシステム
- ICSU-World Data System
国際アカデミーにおける科学データマネジメント活動
- Dawn? For Societal Digital Transformation
デジタル社会へ転換する兆し?
- Specific Science Community
科学コミュニティ事例

Political Background 政策動向

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G8 2013 Science Ministers' Meeting (UK)

G8 Science Ministers Statement London

Introduction

3. Open Scientific Research Data

Open enquiry is at the heart of scientific endeavour and has profound implications for the way that science is communicated. It can provide society with the new challenges. We are committed to openness in science to the progress of scientific discovery, create innovat

G7 2016 Science Ministers' Meeting (Japan)



Photos provided by Cabinet Office of Japan, Ibaragi Prefectural Government, and Tsukuba City Government

- "Open Science" was one of six themes (focusing research data)
- Agreed to create a new G7 Working Group of Open Science.



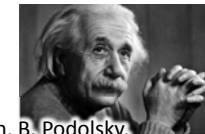
- WG Report was accepted.
- Discussing next topics

Data

Data issues

- Mutual trustworthiness of Science and Society
- Information asset for the human society
- Fuel to drive/accelerate science & technology
 - ➔ Data Driven Innovation (OECD, etc.)
- Data as a "first class" research output/resource
- What is the best practice for both Science and Society?

<http://meigen-ijin.com/einstein/>



A. Einstein, B. Podolsky, and N. Rosen (1935)



Quantum Encryption Technology

<http://www.iflscience.com/technology/encryption-today-how-safe-it-really>

Expert Panel on Open Science based on Global Perspectives (Cabinet Office, Japan)

[adapted from H. Manago, 2015]

Promoting Open Science in Japan

"Promoting Open Science in Japan: Opening up a new era for the advancement of science", published by Cabinet Office of Japan March 30, 2015.

Executive summary: http://www8.cao.go.jp/cstp/sonota/openscience/150330_openscience_summary_en.pdf and other texts available on web

Yuko Harayama, Executive Member, Council for Sci. Tech. Innovation (CSTI; hosted by Cabinet Office)

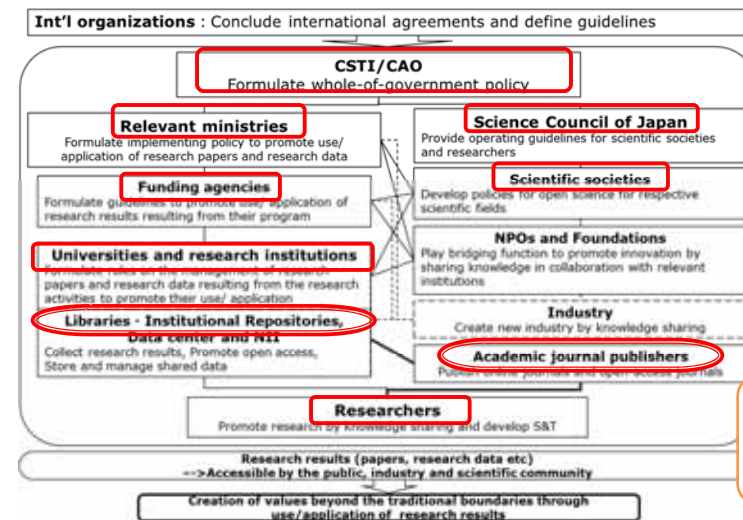
Cabinet Office/CSTI: National Principle of Open Science

Cabinet Office "Expert Panel of Open Science" (Dec, '14 --March '15)

[H. Manago, 2015]

<http://www8.cao.go.jp/cstp/sonota/openscience/>

⇒ Final Report was published at the Web site 30 March 2015.



Input to the 5th National Basic S&T Plan ('16-'20)

A Promotion of “Open Science” in Japan

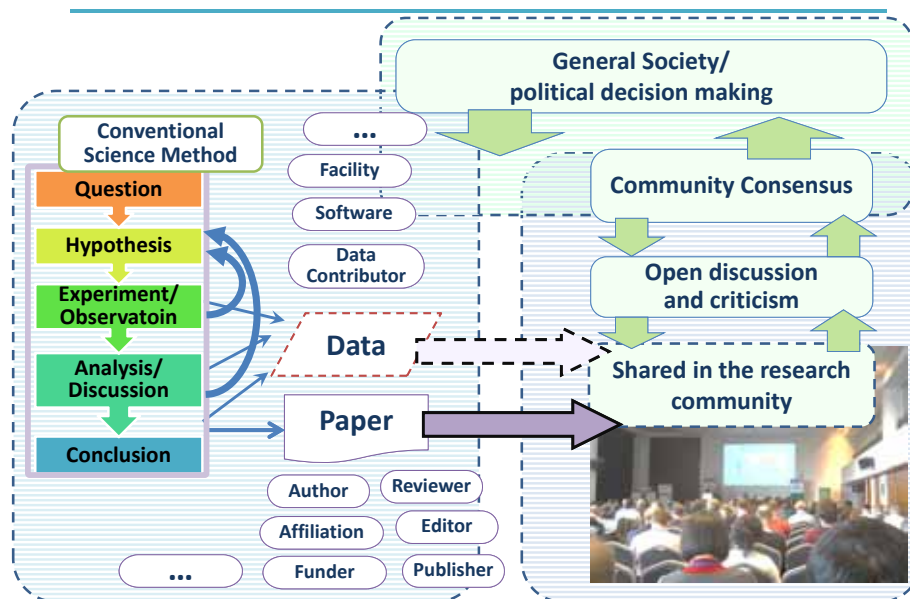
- The “national principle” is not obligation nor mandatory rules, but “guiding principle” rather.
- To be followed by stakeholders’ discussions
→ related ministries, scientific societies, universities/ national institutes
- Accepted by not all scholars. Depends on their disciplines and past practice/culture.
- New funding mechanism is also required
– to encourage researchers, journal editors, publishers, data producers, data infrastructure managers/developers.

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System of Scientific Research 科学研究のシステム

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Flow from Research to Society



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Example in IPCC (1)

– Community Consensus of Scientific Knowledge by Thousand Scientists

科学的知識の創造と利用 : IPCCの事例 (1)

- 1000人規模の専門家が科学的知識を創る

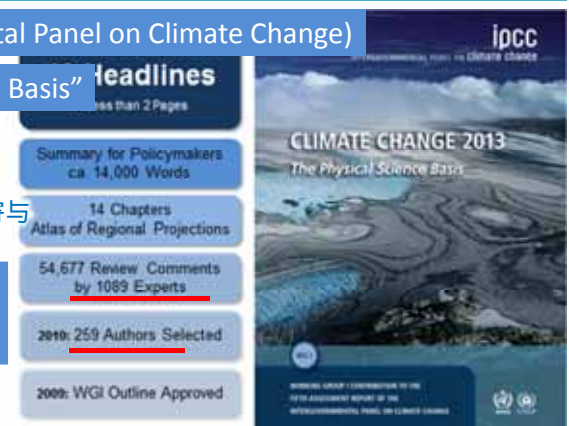
IPCC (Intergovernmental Panel on Climate Change)

WG1 “Physical Science Basis”

Approx. 1,300 scientists worked for the IPCC WG1.
1300人の専門家がWG1へ寄与

コミュニティのコンセンサス
Consensus of professional community is necessary.

科学の社会的有用性
Social benefit of Science



[IPCC, 2013]

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Example from IPCC (2)

— Treatment of Uncertainty of Scientific Knowledge

vi. AR5における「確信度」の表現
Degree of Certainty and Confidence

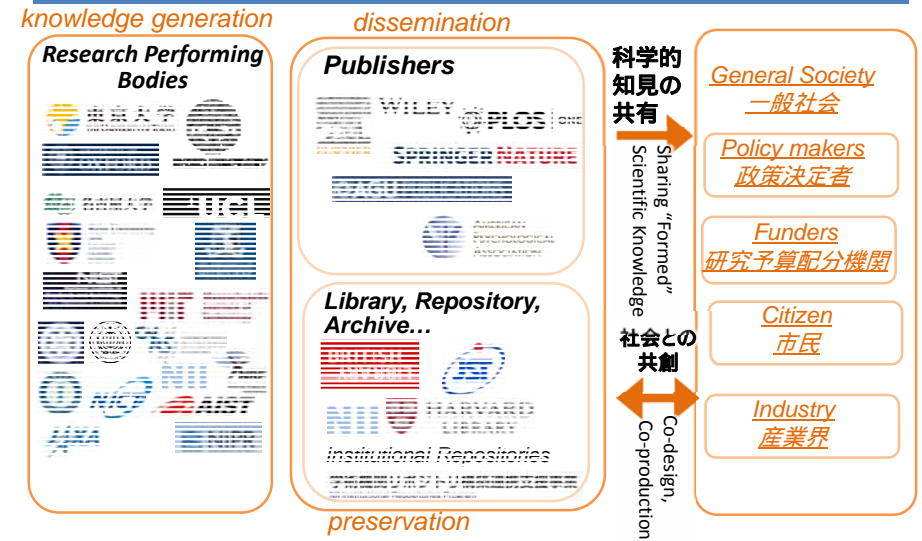
「確信度」とは、機構的理解、理論、データ、モデル、専門家の判断などの証拠の種類、量、質、整合性及び見解の一致度に基づいて、妥当性を定性的に表現する用語である (参考 IPCC AR5 WG1 TS Box TS.1)



Evidence (type, amount, quality, consistency)

[IPCC/環境省, 2014] 13

“Science as a Social System”

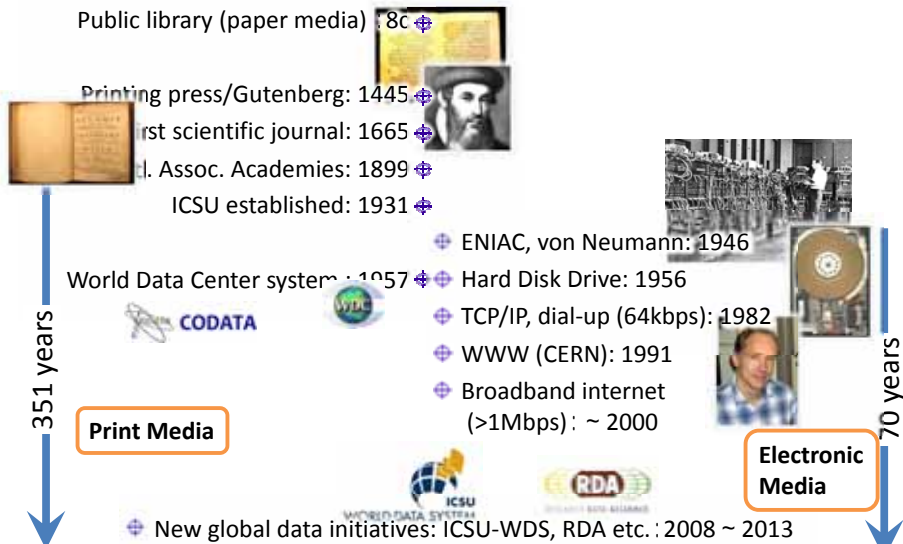


...on “Printing” Publication Technology/Culture in Past!

Data! -> Publishers? Librarians? to research new workflows?

Print & Electronic Technologies as Social Info. Infrastructures

--- 百年の印刷文化の基礎支えと、成長途中のデジタル・サイエンス

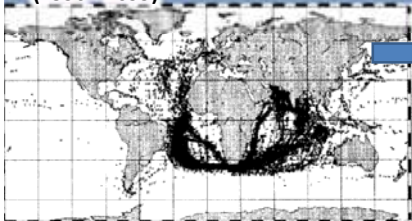


ICSU-World Data System
国際アカデミーにおける
科学データマネジメント活動

Learn from the past for future of the Science

16 to 17th Centuries

Geomagnetic data collection over oceans (1590 - 1699)



[Araki, 2015; Jonkers et al., 2003]

20th Century

International Committees were established for data preservation/services.

International Geophysical Year (1957-1958)



<http://www.kakioka-jma.go.jp/intro/enkaku.html>

Federation of Astronomical & Geophysical Data Analysis Services

21st Century

New body ICSU -WDS was established (2008) for a new data management, for all disciplines.

Increasingly Required:

- Use advanced IT/ICT
- More multi & interdisciplinary
- Global interoperable system

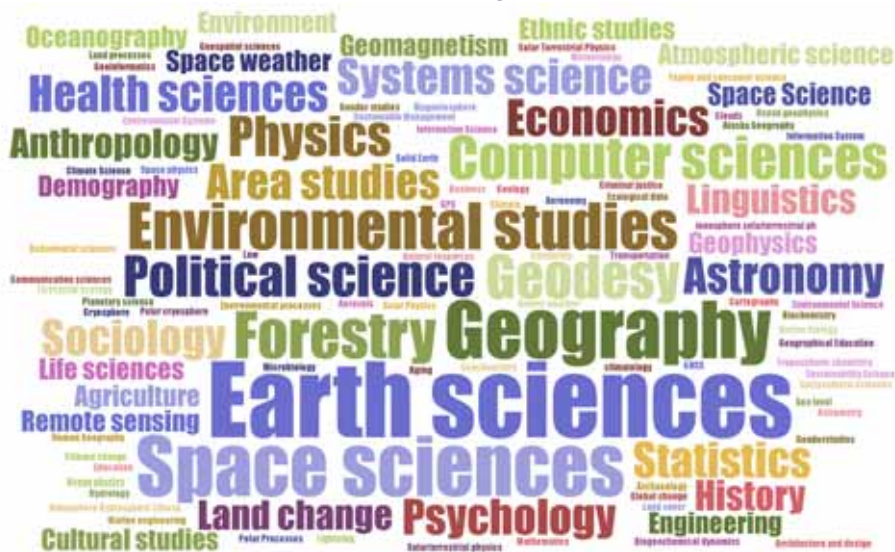
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WDS Membership



- Regular Members
- Network Members

Disciplinary coverage



Community-driven certification of Trusted Data Repository (TDR)

Core level Certification

16 Requirements 16個の要件

- Context
- Organizational infrastructure (6)
- Digital object management (8)
- Technology (2)
- Applicant feedback



www.icsu-wds.org/services/certification



デジタルデータの信頼性とは？

Context: What is a Trust of Digital Data

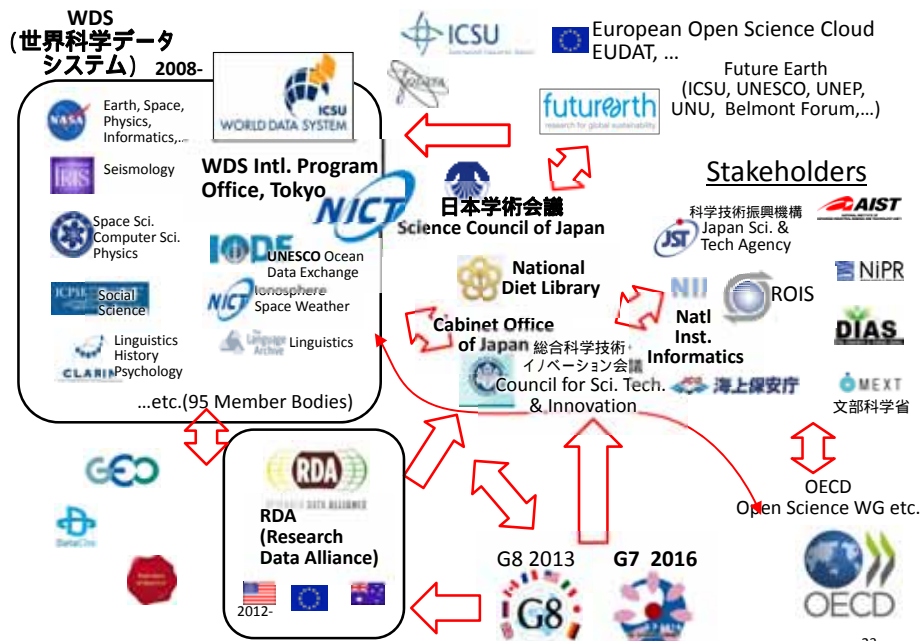
- 業務設計、予算計画... Works, workflow, budget plan in repository
 - データマネジメント設計 Design of metadata, IDs, data curation, and their management
 - 情報工学、ICT技術、サイバーセキュリティ技術など Cyber security technologies, electronic watermark, block chain...
- Data creation 生成
 - Storing & curation of data 保存、整備(キュレーション)
 - Long-term preservation/ archive, PID, metadata 長期保存、メタデータ整備、永続的識別子 (PID)整備
 - Cyber security of data inf. system データ公開技術基盤のセキュリティ
 - Security against unauthorized access and alteration データや公開内容の詐称、不正な変更、不正なアクセスなど

International Framework of "Trustworthy Data Repository" Certification

	コア認証	'拡張'認証	本格的な認証
LEVEL	CORE	EXTENDED	FORMAL
Organization(s)	WDS: ICSU World Data System DSA: Data Seal of Approval	DIN : German Institute for Standardization	ISO : International Organization for Standardization
No. of Requirements	16	34	100+
Standards	Mandatory Requirements	DIN 31664	ISO 14721 (OAIS) ISO 16363 ISO 16919 ISO 17021
Audit Process	Self-assessment + independent peer review (2)	Self-assessment + independent peer review (2)	ISO certified audit with accredited auditors
Certification Cost	Free	€500	\$10,000
Designation	World Data System logos or Data Seal of Approval	nestor Seal for Trustworthy Digital Archives	TBD
Certification lifespan	3 years	Indefinite	3 years
No. of Certified Repositories	130+ (WDS DSA)	2	Coming Soon

https://datascience.nih.gov/Trusted_Digital_Repository

Community Overview of Open Science (in connection to WDS Japan)



Dawn? For Societal Digital Transformation デジタル社会へ転換する兆し?

Science & Economy & Data, in EU & Japan

Economical Strategy of European Union

Digital Single Market: supporting cloud in Europe



European Open Science Cloud
Interoperability, Standard of data, ...

<https://twitter.com/openforurope>

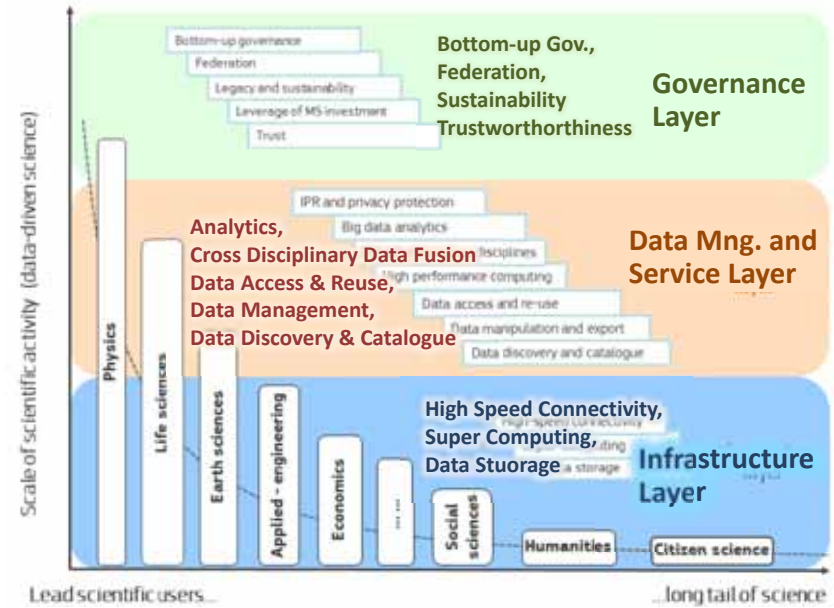
Sci. Tech. 5-Year Strategy of Japan



- "Society 5.0" ("Super Smart Society")
Info. & services on demands from social stakeholders
- Social transformation
- Integrating cyber + physical spaces
- Systemizing & coordinating multiple systems: "Society 5.0 Service Platform" co-working w/industry, academia, government and ministries.

http://www8.cao.go.jp/cstp/english/basic/5thbasicplan_outline.pdf

European Open Science Cloud



Leading to a digitally integrated economy and society

From ITU Forum



- Internet = stand-alone vertical
- Economies of scale
- Internet = universal platform
- Economies of scope

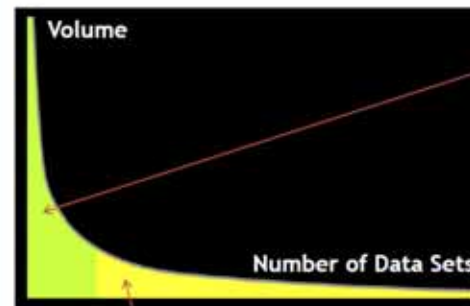
The role of the government is to facilitate advancement of an Internet economy with the vision to instill interoperability in order to usher in the digital economy

[John Ure, Univ. Hong Kong, ITU Forum on Digital Economy in Thailand, Bangkok, 2015]

<https://www.slideshare.net/trpcbiz/digital-thailand>

Remind the Long Data Tail

[Peter Wittenburg, 2011]



- Focus on Big Data**
- in general raw data
 - in general regular structure
- Data Intensive Science**
domain of numbers
- find patterns across globally spread collections
 - fit parameters using big data

- Focus also on Small Data**
- often covers domain knowledge
 - much more heterogeneous
 - in general special structures and difficult semantics

- Smart Information Science**
domain of symbols just one example
- semantically join kindred collections
 - exploit using semantic knowledge

For Global Framework of Science with Research Data Sharing



Specific Science Community 科学コミュニティ事例



- Transformation of a scientific community

Home / Author Resources / Publication Policies / AGU Publications Data Policy

AGU PUBLICATIONS DATA POLICY

First adopted by Publications Committee November 1993 [Revised March 1994, December 1995, October 1996, October 2013]. Adopted by Council December 2013. Updated in 2016.

AGU affirmed in its 2012 [position statement](#) that "Earth and space science data should be widely accessible in multiple formats and long-term preservation of data is an integral responsibility of scientists and sponsoring institutions." Following this statement and to advance scientific exploration and discovery, and allow a full assessment of results presented in AGU's journals, all data necessary to understand, evaluate, replicate, and build upon the reported research must be made available and accessible whenever possible.

Earth and Space Science Data Should Be Widely Accessible in Multiple Formats and Long-term Preservation of Data is an Integral Responsibility of Scientists and Sponsoring Institutions

Earth and space sciences data bases are a world heritage that should be made available to the scientific community and public as soon as possible (in some cases in real-time), should be organized and preserved in useable format, and should be conserved long-term for future use. The responsibility for achieving this falls upon individual scientists and their sponsoring institutions, and should be considered an integral part of conducting scientific research.

Earth and space science data collection, analysis, and archiving are essential to our

AGU理事 K.Lehnert 氏のスライドから引用

Coalition for Publishing Data in the Earth and Space Sciences

COPDESS connects Earth & space science publishers and data facilities to help translate the aspirations of open, available, and useful data from policy into practice.

COPDESS Suggested Author Instructions and Best Practices for Journals

COPDESS Statement of Commitment

May 23, 2017 JpGU 2017: Toward Open and Beyond (K.Lehnert & B. Hanson)

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AGU: Focus on Data



AGU Data Engagement Activities

AGU's [Data Position Statement](#) (First developed in 1997) Data should be well documented, preserved, and treated as a world heritage.

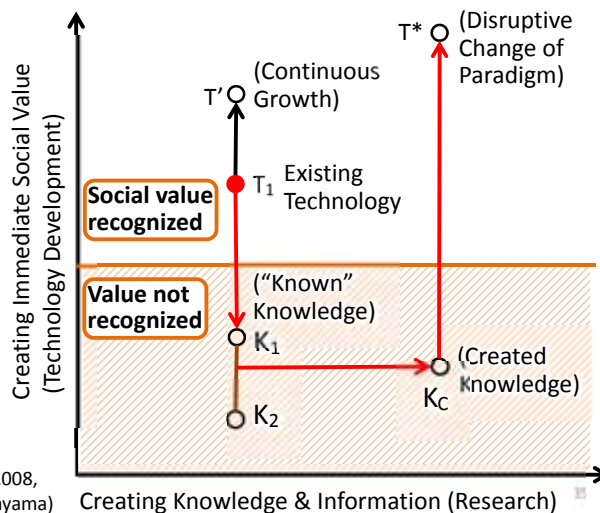
- Started *Earth and Space Science* in 2014
 - Data and methods papers (along with research)
- Data Management Assessment Program
- AGU Data Blog (Part of GeoSpace)
- Coalition on Publishing Data in the Earth and Space Sciences (COPDESS.org) and many other community efforts aimed at elevating best practices.
- Participating in *elevating data best practices*
 - Several Policy pieces in *Eos.org* and, with others, *Science*
- Data Fair at AGU Fall Meeting—Information to scientists around data skills and resources
- Many sessions around open data at meetings, including this one:
 - [M-GI27] [EE] Challenges of Open Science: Research Data Sharing, Infrastructure, and Scientific Communications, Tue. May 23, 2017 9:00 AM - 10:30 AMA08

Cost of Data Sharing

- Transition to “digital”?:
 - not only scientific data, but toward including most of the social activity (European Commission’s view).
- Costs: data management work, human costs, servers & storage etc. (even for daily life of scientists)
 - locally more cost than before, but will (be toward) benefit in total (in future).
 - → **Not good idea to do all within research budget.**
- “Digital” investment needs to be not only academic funding, but also **“social investment”**.

Innovation & Open Science/Research Data Sharing

- It may be challenging to get immediate outputs from Open Science at present.
- However, “Disruptive paradigm change” will be increasingly important for Society. (scientific findings, new industries...)
- Facilitating new linkage of knowledge pieces may be the way of paradigm change.



(Eiichi Yamaguchi, 2008, adapted by Y. Murayama)

For Global Framework of Science with Research Data Sharing



FIN.