# IUNI Web of Science Data: An Introduction for Beginners

**Katy Börner and Robert Light**

Cyberinfrastructure for Network Science Center
School of Informatics and Computing and Indiana University Network Science Institute
Indiana University, USA

January 11, 2016

INDIANA UNIVERSITY NETWORK SCIENCE INSTITUTE

CNS Cyberinfrastructure for Network Science Center



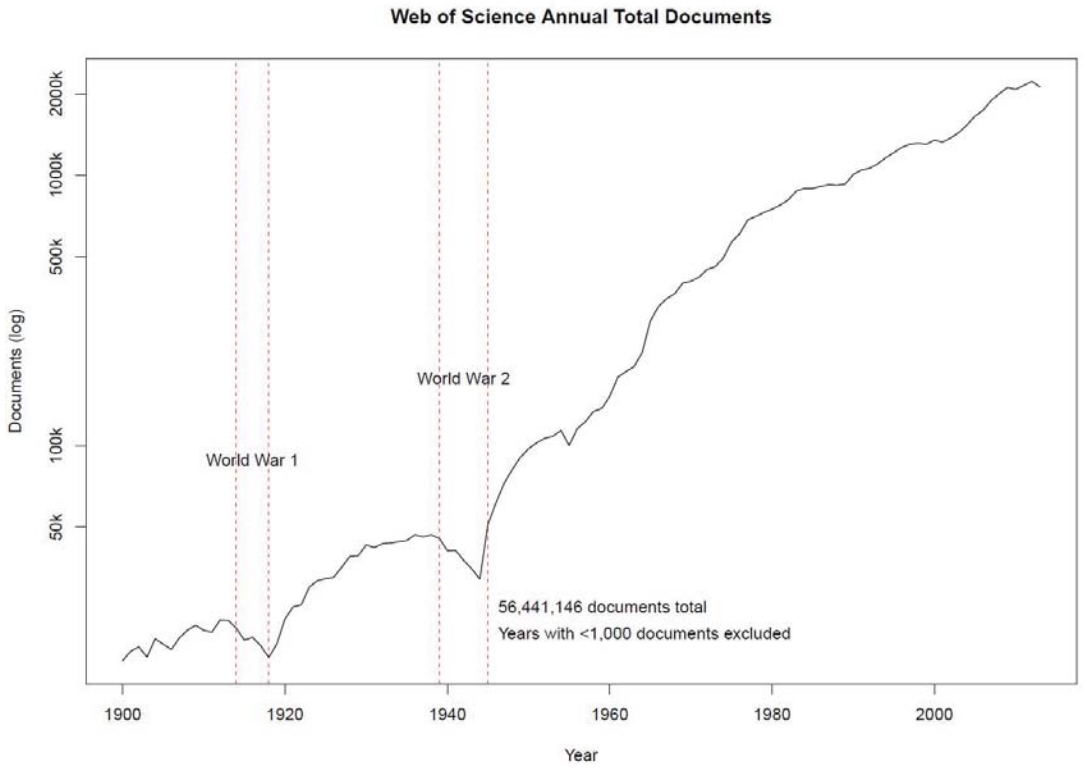
**Data Acquisition**

The IUNI Science of Science Hub acquired the complete set of Thomson Reuters' Web of Science XML raw data (Web of Knowledge version 5) comprising

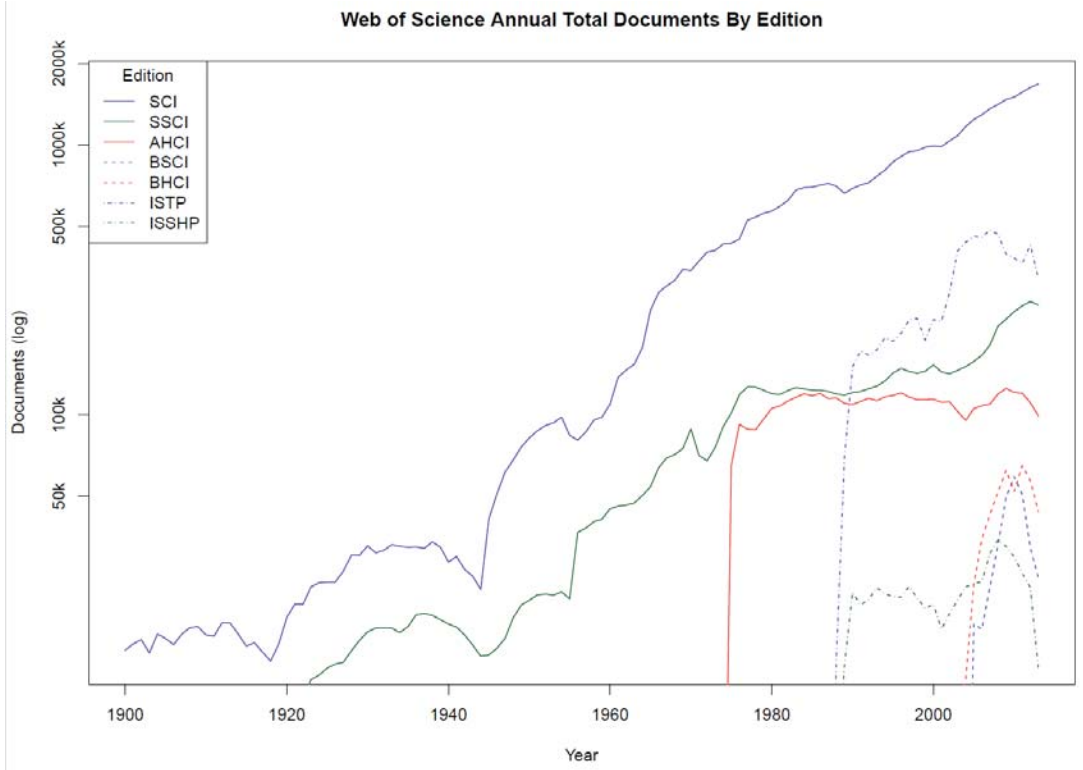
- Science Citation Index Expanded from 1900-2013
- Social Sciences Citation Index from 1900-2013
- Arts & Humanities Citation Index from 1975-2013
- Book Citation Index -- Science from 2005-2013
- Book Citation Index -- Social Sciences & Humanities from 2005-2013
- Conference Proceedings Citation Index -- Science & Technical from 1990-2013

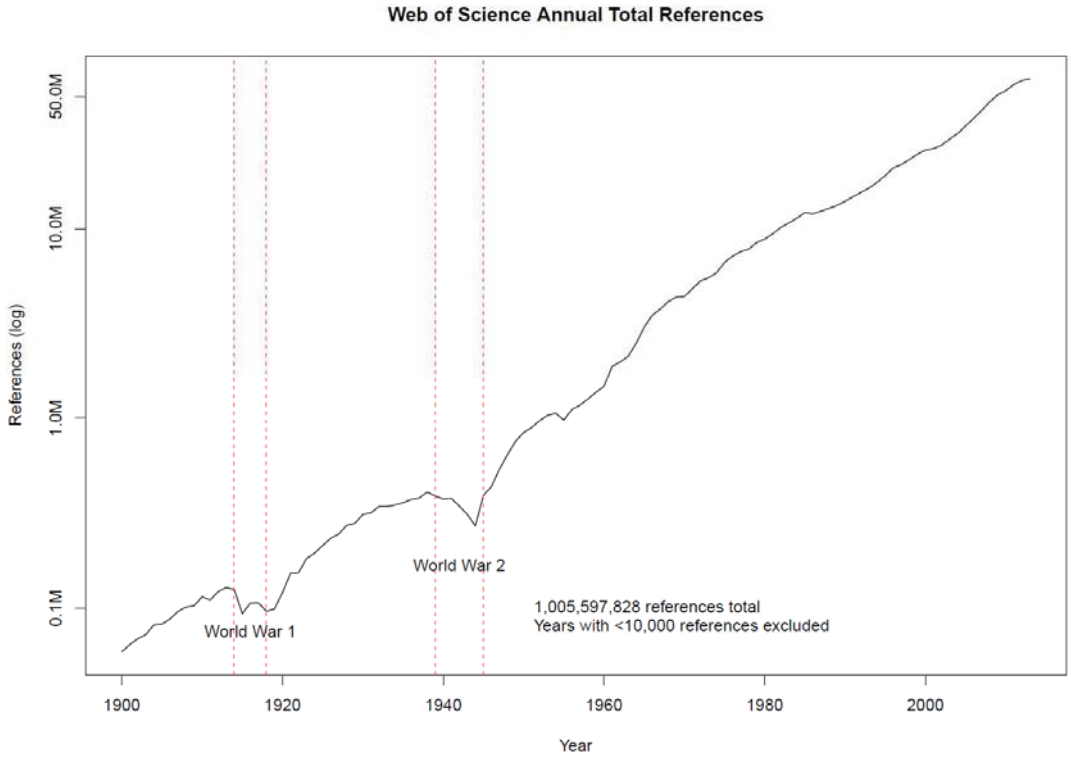
**Basic Statistics:**

- Web of Science Core Collection: The number of total items from 1900 through 2013 is 56,442,146.
- There are 1,005,597,828 references to all items in the collection.
- Items By Edition (some documents span multiple editions)
  - SCIE (Science Citation Index Expanded) - 42,263,961 [828.9 M references]
  - SSCI (Social Sciences Citation Index) - 7,690,154 [131.6 M references]
  - AHCI (Arts & Humanities Citation Index) - 4,281,088 [35.3 M references]
  - BSCI (Book Citation Index – Science) - 307,091 [15.6 M references]
  - BHCI (Book Citation Index – Social Sciences & Humanities) - 452,559 [14.2 M references]
  - ISTP (Index to Scientific & Technical Proceedings) - 7,291,457 [72.7 M references]
  - ISSHP (Index to Social Sciences & Humanities Proceedings) - 564,970 [9.4 M references]




CNS Cyberinfrastructure for Network Science Center
IUNI Web of Science Data






CNS Cyberinfrastructure for Network Science Center IUNI Web of Science Data

**Data Cleanliness**

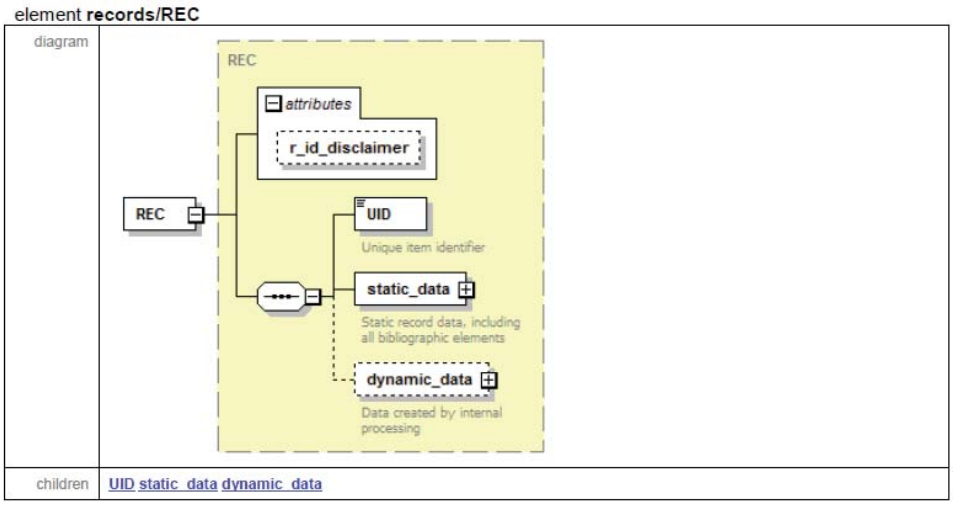
Not all data is as pristine as we'd wish. For instance, grant agencies are very much taken as is from the Acknowledgement section of papers, making a simple question like "How many papers are derived from NIH funding?" rather challenging to address until some form of data cleaning is done.

```
1 | 2008    | National Institutes of Health (NIH) of the United States
2 | 2009    | National Institutes of Health (NIH) of the United States
1 | 2011    | National Institutes of Health (NIH) of the United States
1 | 2012    | National Institutes of Health (NIH) of the United States
1 | 2013    | National Institutes of Health (NIH) of the United States
1 | 2011    | National Institutes of Health (NIH) of the United States of America
1 | 2012    | National Institutes of Health (NIH) of the United States of America
1 | 2013    | National Institutes of Health (NIH) of the United States of America
1 | 2013    | National Institutes of Health (NIH) of the USA
1 | 2013    | National Institutes of Health (NIH) of the USA (GPI synthesis)
1 | 2013    | National Institutes of Health (NIH) of the U.S. Department of Health and Human Services
1 | 2012    | National Institutes of Health (NIH) of United States of America
1 | 2008    | National Institutes of Health (NIH) of USA
1 | 2011    | National Institutes of Health (NIH) of USA
1 | 2013    | National Institutes of Health (NIH) of USA
1 | 2013    | National Institutes of Health (NIH) Pacific Southwest Regional Center of Excellence
1 | 2012    | National Institutes of Health (NIH) part of the NIH Roadmap for Medical Research
2 | 2011    | National Institutes of Health (NIH), part of the NIH Roadmap for Medical Research
1 | 2012    | National Institutes of Health (NIH), part of the NIH Roadmap for Medical Research
1 | 2013    | National Institutes of Health (NIH), part of the NIH Roadmap for Medical Research
1 | 2012    | National Institutes of Health (NIH) (Pathogenesis and Diagnosis of Multiple System Atrophy)
```

How do we avoid every team doing this data cleaning repetitively?

**Raw Data**

Provided by Thomson Reuters in the form of 166 XML files (561 GB).
The 127-page documentation of the XML data format is available on the Enclave at /WoS/Documentation.




CNS Cyberinfrastructure for Network Science Center IUNI Web of Science Data

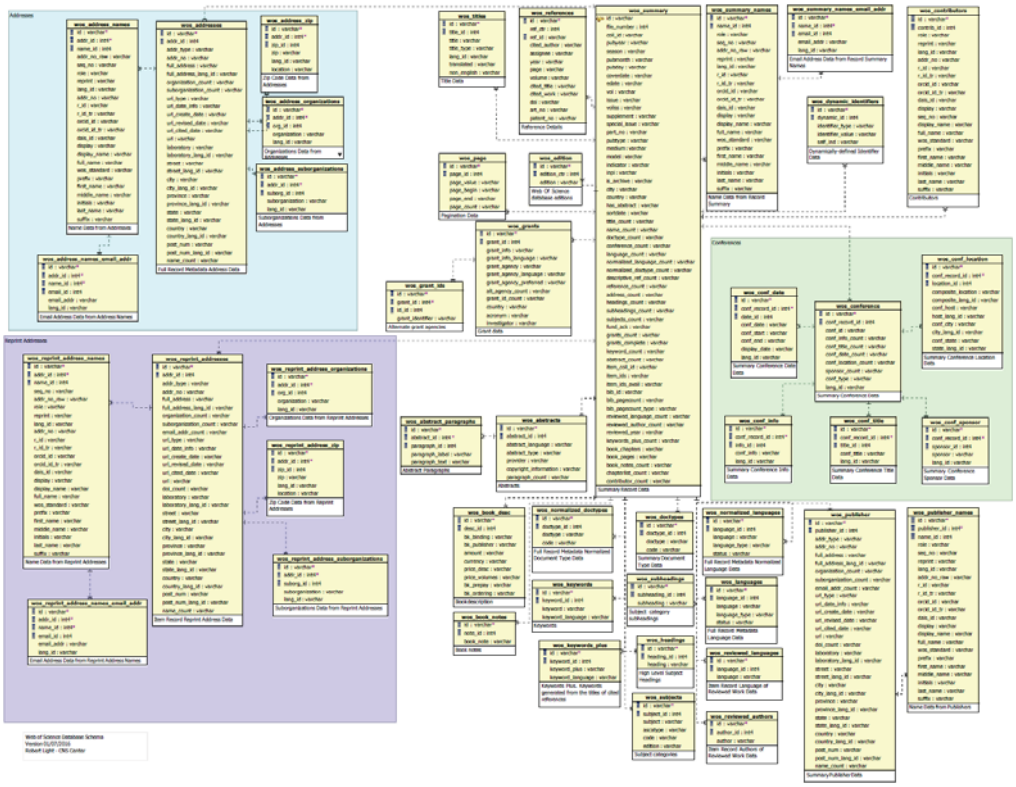
**WoS Database**

- PostgreSQL database with a fully parsed set of ALL data.
- Database schema and Data Dictionary documentation for ease of use.
- Planned: Simple user interface for running common queries.

Table Schema is at /WoS/Documentation on the Enclave and will be added to the public site soon.

Data Dictionary work is in progress (expected mid-to-end of Jan).

Reduced need for XML parsing will free up Enclave compute cycles for running network analysis and visualization algorithms.



CNS Cyberinfrastructure for Network Science Center IUNI Web of Science Data

**Data Enclave**

Setup

- Created by IU as a secure environment for working with the data.
- Powered by the Karst cluster and maintained by UITS administrators.
- Overseen by the Data Steward and the Data Advisory Board.
- Opened for testing in September 2015.
- Currently houses the raw XML files, along with statistical and analysis software.

Usage

- Login from campus (or via VPN) using any computer.
- Use virtual desktop setup to run queries, analyzes, generate visualizations.
- To extract data/results, save files in dedicated /mbx directory for your research team and contact Data Steward.
- So far, over twenty data extraction requests have been issued and the average response time is less than 30 minutes (median response is less than ten minutes)
- Consider writing papers in the enclave to reduce data extraction requests.

**Data Access**

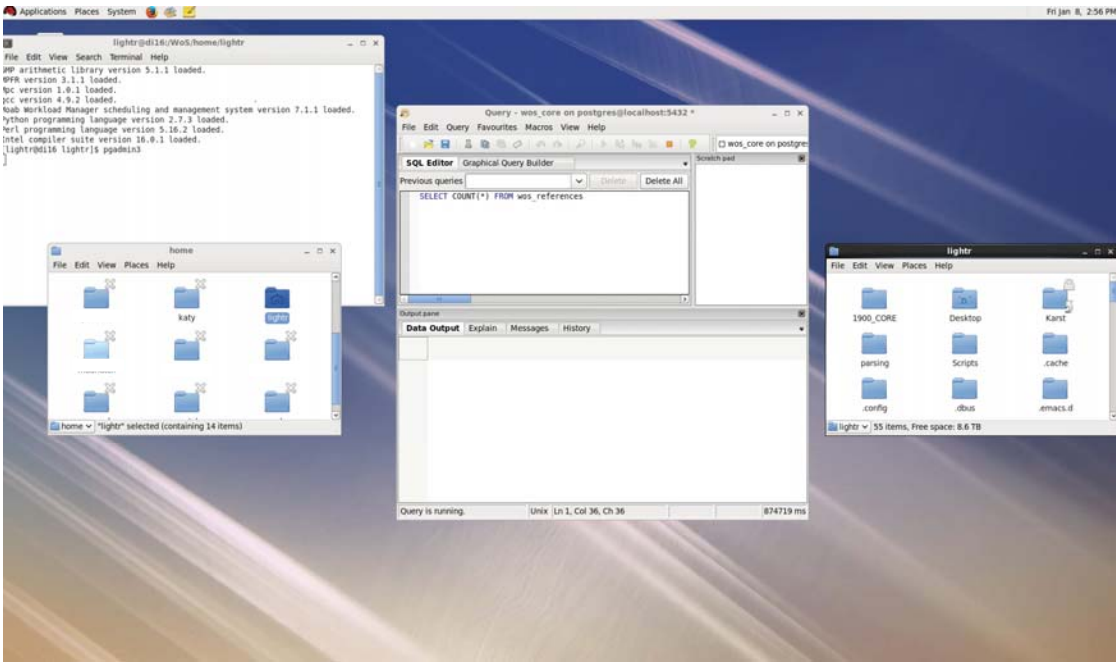
This data can be used by any employee of Indiana University for academic research and without any sharing of data. Data details and information on how to access the data are detailed at http://www.indiana.edu/~iuni/resources/wos.html

To request data access, please complete the IUNI Web of Science Data (WoS) Access Request Form

So far, five teams have requested and gained access to the data.

CNS Cyberinfrastructure for Network Science Center IUNI Web of Science Data

**Data Enclave Screenshot**



**WoS Data Usage**

The WoS data is a core asset of the IUNI Science of Science Research Hub. It is essential for R&D related to the Science Observatory, see http://iuni.iu.edu/about.
Ultimately, the Science Observatory will provide an extensible, secure infrastructure and expertise to study the science, technology, and innovation system in near real-time and to communicate results to a broad audience of researchers, practitioners, educators, patients, and interested policymakers.

The IUNI Science of Science Research Hub is collaborating in/leading the following grant development efforts:

- NSF Mid-West Data HUB - "Impact Assessment" and "Community Engagement" IU lead is Beth Plale, SOIC
- NSF EAGER XDMoD Value Analytics (with UITS)
- NWB on Jetstream/XSEDE (with UITS)
- "Science of Science" NSF Expeditions in Computing lead by Alex Vespignani, NEU
- "Science Observatory" NSF Science and Technology Center lead by Katy Borner, SOIC
- NSF NRT proposal lead by Luis Rocha, SOIC

Please let us know how we can maximize the value of the IUNI WoS data for your R&D.

CNS Cyberinfrastructure for Network Science Center IUNI Web of Science Data

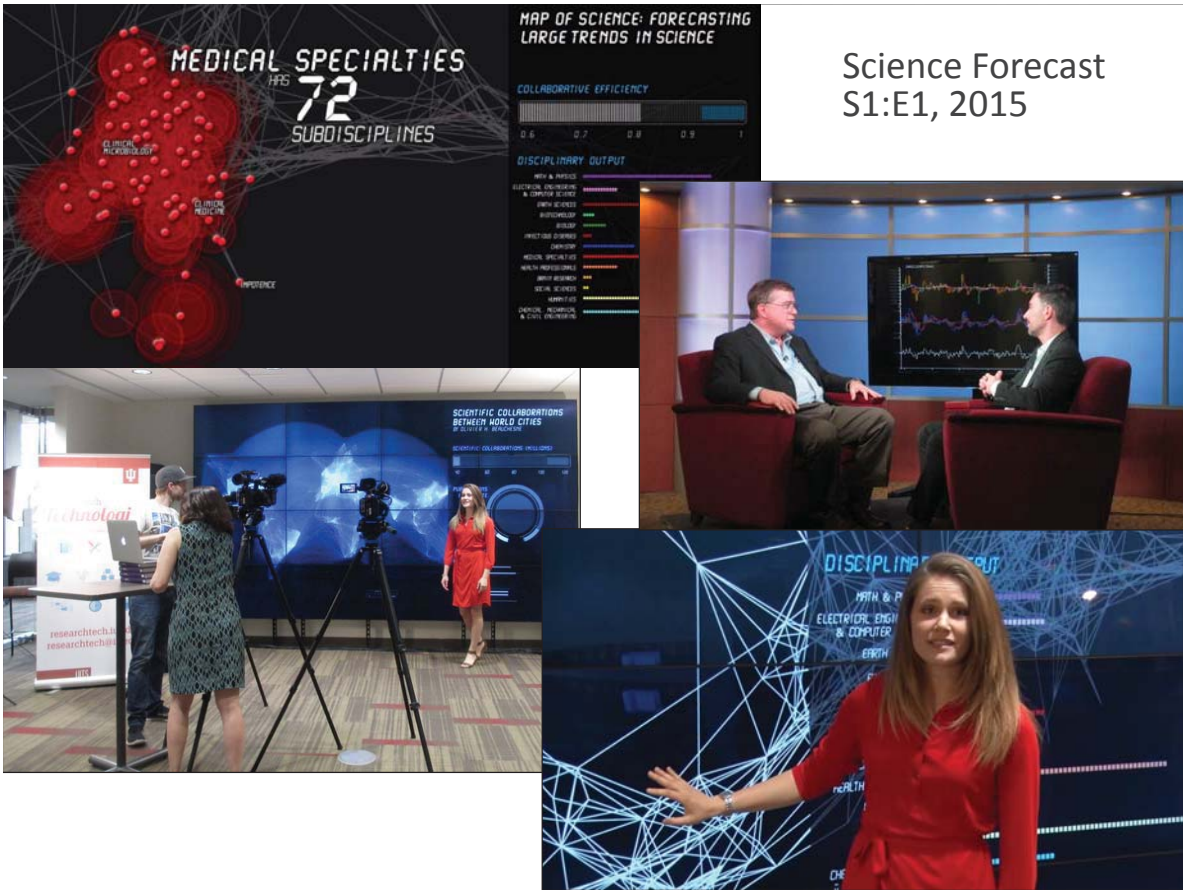
**Planned WoS Data Usage**

Special agreements exist for using WoS publications by IU faculty. Data can be used to

- Bulk-fill and pre-populate FAR-like systems on an annual basis.
- Visualize IU's impact—since 1900—as part of the bicentennial celebrations.
- Serve Researcher Networking systems like http://nrn.cns.iu.edu that empower all faculty, staff, students, alumni, funders to identify expertise based on publications but also funding, teaching data provided by IU production systems.

The IUNI Science of Science Research Hub is currently

- Working on the deployment of the Network Workbench that is used by 100k experts around the globe on Jetstream/XSEDE, see *IU to launch Jetstream* video at https://www.youtube.com/watch?v=t63c12A6bds.
- Learning Analytics, IU Grand Challenges proposal
- Organizing a NSF SciSIP agenda setting conference on “Modelling Science, Technology, and Innovation” that will take place at NAS, DC on May 17-18, 2016, see http://modsti.cns.iu.edu
- Prototyping moderated “Science and Technology Forecasts” in collaboration with Journalism, see next slide.




Science Forecast
S1:E1, 2015