Connecting the Research Lifecycle: How Organizational Collaboration and Intelligent Systems Can Deliver

Presented at NORDP 2018 by
Anne Maglia, University of Massachusetts Lowell
Kelsey Rosell, Digital Science & Research Solutions
Re-imagining discovery and access to research:
Grants, Publications, Citations, Clinical Trials and Patents
...in one place

Give me one source that provides a comprehensive overview of the research landscape. Show me the evolution of an idea from the time a grant is available to the final results of the research that the grant funded. Provide me with impact indicators. Make it intuitive and give me the ability to look at other institutions. Help me explore my research portfolio to validate strengths and guide the faculty member to new and novel areas of research or collaborators.
Digital Science – a portfolio of innovative companies

- Digital Science invests, supports and nurtures small innovative software companies
- Rooted in research, most founders are coming from an academic background and started a company around solving a self encountered problem
Challenges in the research information landscape

- Relevant information for universities, researchers and funders is highly fragmented and siloed (grants, publications, patents, clinical trials)
- The main focus of data for decades has come from publications and citations, which only reflects research from previous 2-5 years
- Vital data for the management of research orgs not accessible for the research community as required due to commercial interests and data monopolizing strategies
The Digital Science vision

- Democratize / commoditize data – a precondition for innovation
- Allow for a broader view of research
- Provide rich contextualization for discovery and research management
- Balance of interests – Digital Science in a unique position to do this
We leveraged resources within Digital Science to do something about these challenges.

**GRID**
Institution disambiguation, 80k+ organisation IDs, openly available

**über RESEARCH**
3.7 M projects in grants database, enrichment services and analytical application core

**Altmetric**
Tracking attention in news, social media and policy papers - as an immediate resonance

**ifi CLAIMS**
Global patent database - more than 100M patent records

**figshare**
Allowing researchers and institutions to store, manage and publish research related data

**SYMPLECTIC**
Research information management system - deep knowledge about institutional requirements for data and metrics

**readcube**
Serving publishers, access to +50M journal articles and books
The vision for Dimensions - created with our development partners

- More than publications / citations - complete view of grants
- Interlinked, contemporary approach to data
- As openly available as possible
- Reduce strain on institutional budgets, free for researchers
- Index full text for better search results and higher relevance
- Easy to use, modern application, focused on the core
- Powerful APIs for analysis and machine-machine interaction
- Fast access to full text for researchers
Key aspects which we wanted to change

- Citation data: High costs, limited use only! … available for researchers at no cost; fair costs for institutions!
- Simplistic metric driven impact assessment
- Data monopoly blocks innovation … data is a commodity, full innovation potential of the research community is enabled.
- Data is available to fuel multiple metrics, developed by the community.
Enriched and interlinked – a modern approach to research data management

Dimensions data
- Policy docs
- Patents
- Data sets
- Clinical trials
- Publications
- Grants
- Altmetric

Enrichment
- Institution identification
- Categorization
- Concept extraction
- Researcher disambiguation
- Reference extraction

Enriched metadata
- Concepts
- Researchers
- Organizations
- Classifications
- References
- Metrics
The data and links driving Dimensions...

- **90m Publications**
  - Improved metadata of 50m
  - 873M links
  - 350k Clinical trials
  - 139K links from Clinical trials

- **3.7m grants**
  - $1.3 trillion in funding
  - 9M links to Altmetric data points

- **9m Altmetric data points**
  - 9M links

- **34m patents**
  - 320M links
  - 11M links to Clinical trials

- **320k Policy papers**
  - (Q2 2018)
  - 380k Clinical trials
  - 9M links from Altmetric data points

- **350K links** from Clinical trials to grants

- **170K links** from Altmetric data points to patents

- **43K to funders** from grants to Clinical trials

- **32M to funders** from Altmetric data points to grants
Data integrated in multiple dimensions - pun intended

- Grants
- Research
- Conferences
- Data sets
- Publications
- Tweets Blogs
- Clinical Trials
- Citations
- Patents
- Policy docs

Pre-publication:
1-5 years from grant to publication

Post-publication:
- immediate
- 2-3 years
- years
- years
- decades
What questions do you need evidenced based answers for?

What insights do you need evidence for?
USE CASES

UMASS LOWELL

Anne Maglia, Associate Vice Chancellor for Research and Compliance
DATA-INFORMED DISCUSSIONS AND DECISIONS

CAMPUS-WIDE STRATEGY

• Improve Proposal Competitiveness
• Direct Strategic Investments/Activities
• Inform Faculty Hires
• Identify Opportunities for Industry Engagement
PROPOSAL COMPETITIVENESS

- Target funding opportunities
- Identify collaboration/competition
- Discover published outcomes
## Learning with Purpose

### AND FUNDING TRENDS

<table>
<thead>
<tr>
<th>PUBLICATIONS</th>
<th>GRANTS</th>
<th>PATENTS</th>
<th>CLINICAL TRIALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,463</td>
<td>302</td>
<td>3,269</td>
<td>1</td>
</tr>
</tbody>
</table>

**Grant Funding Example**

- **A Novel Hollow Fiber Membrane Reactor for High Purity Hydrogen Generation from Thermal Catalytic Ammonia Decomposition**
  - Funding: $1,590,999
  - Source: Advanced Research Projects Agency - Energy
  - Duration: 2017-2019

- **Cost-effective, Intermediate-temperature Fuel Cell for Carbon-free Power Generation**
  - Funding: $1,099,999
  - Source: Advanced Research Projects Agency - Energy
  - Duration: 2017-2019

**Research Categories**

- **0913 Interdisciplinary Engineering**: 154
- **0906 Physical Chemistry (incl. Structural)**: 127
- **0918 Chemical Engineering**: 72
- **0912 Materials Engineering**: 53
- **0907 Environmental Engineering**: 41

**Researcher Insights**

- **Jannah Johnson, Johnate Motluka**

**Funders**

- **Office of Science (DOE)**
  - Funding: $89.8 M
  - United States

- **Directorate for Engineering (NSF END)**
  - Funding: $20.4 M
  - United States

- **Department of Defense, Small Business**
  - Funding: $13.9 M
  - United States

- **United States Department of Energy (DOE)**
  - Funding: $4.1 M
  - United States

**Analytical Views**

- **Overview**
  - Aggregated funding amount: $155.7 M
  - Average funding amount:
    - USD 56.7 M
    - USD 404 K

- **Rational Enhancement of Enzyme Performance via Polymer-based Protein Engineering for Biodiesel**
  - Funding: $1,145,140
  - Source: National Science Foundation - Directorate for Engineering
  - Duration: 2017-2019

- **Reduction of air pollution through an LPG intervention trial to improve pulmonary health**
  - Funding: $69,750
  - Source: TIRSHDL SIDDHARTHAN
  - Duration: 2017-2019

**Fields of Research**

- **United States**: 302

**Research Organization**

- **National Institute of Environmental Health Sciences**: TIRSHDL SIDDHARTHAN

**Keywords**

- **LPG Intervention Trial**
- **Pulmonary Health**
"COOPETITION"

Collaborators

Viviane Vargue
McGill University, Canada
USD 581 K

Pierre A Vannestehe
Laval University, Canada
USD 581 K

Chris D McCallie
Tryne University, Canada
USD 581 K

Jennifer A Fairal
Oregon State University, United States
USD 421 K

Caleb J Banta Geers
University of Washington, United States
USD 396 K

Funders

Research Organizations

McGill University
Canada
USD 581 K

University of Washington (UW)
United States
USD 396 K

Arizona State University (ASU)
United States
USD 330 K

University of Puget Sound
United States
USD 121 K

Oregon State University (OSU)
United States
USD 32 K
Collaborative research: ABI Development: Ontology-enabled reasoning across phenotypes from evolution and model organisms

Grant

Collaborative research: ABI Development: Ontology-enabled reasoning across phenotypes from evolution and model organisms

Directorate for Biological Sciences to

Wausa Dahdah, Paula Mabee, Paul Sereno, more

University of South Dakota (Yankton, United States), University of South Dakota (Yankton, United States), University of South Dakota (Yankton, United States), more

Abstract

Collaborative grants are awarded to the University of South Dakota and the University of North Carolina to develop ontology-driven tools for machine reasoning over large volumes of phenotype data. Human-readable descriptions of "phenotypic" properties such as anatomy and behavior are not well-suited to computational analysis. Not in evolutionary biology, genomics and development, computational assistance is necessary to discover patterns within the enormous volumes of descriptive phenotype data that are being reported in the literature and in online databases. Ontologies are structured.

Details

Funding amount
USD 1.9 M

Funding period
2011 - 2018

1 Jul 2011 - 30 Jun 2018

Resulting publications

16

Grant number
5G62142

Original description

Automated Integration of Trees and Traits: A Case Study Using Paired Fin Loss Across Teleost Fishes.

Laura M Jackson, Pooja C Fernandi, Josh H Horasson, James P Balphoff, Paula M Mabee

2015. Systematic Biology - Article

Evolution of anatomical concept usage over time: mining 200 years of biodiversity literature

Prachanda Minda, Todd J Vision


The Cell Ontology 2016: enhanced content, modularization, and ontology interoperability

Alexander D Dahl, Tommaso M. Mili, Yvonne M. Bradford, Matthew H. Brush, Wausa M. Dahdah, David S. Dougall, Yong, ...
DATA-INFORMED DISCUSSIONS AND DECISIONS

CAMPUS-WIDE STRATEGY

• Improve Proposal Competitiveness
• Direct Strategic Investments/Activities
• Inform Faculty Hires
• Identify Opportunities for Industry Engagement
STRATEGIC INVESTMENTS AND PROGRAMMATIC FOCI

- Centers and Institutes
- Multidisciplinary collaborations
- Strategic planning
CURRENT STRENGTHS

- Health promotion
- Microbiome
- Gerontology
- Maternal child health
- Digital health
- Brain research
- Food safety
• Top funders ($$ and # projects)
• Funder trends ($$ and # active projects)
• Top funded state and region
• Top funded US
DATA-INFORMED DISCUSSIONS AND DECISIONS

CAMPUS-WIDE STRATEGY

• Improve Proposal Competitiveness
• Direct Strategic Investments/Activities
• Inform Faculty Hires
• Identify Opportunities for Industry Engagement
FACULTY HIRES

HELP INFORM DISCUSSIONS

- Identify opportunity areas
- Frame cluster hires across disciplines
- Leverage strengths, shared resources
MULTIPLE POSITIONS IN

- Biochemistry
- Computer Science
- Cybersecurity
- Polymer Science
• Top funders ($$ and # projects)
• Funder trends ($$ and # active projects)
• Top funded state and region
• Top funded US
• 100 recently funded projects for top five funders
• Recent awards for top funded in state in focus area
• Top cited papers in focus area
Tenure-Track Assistant Professor - Computer Science (Multiple Positions)

Job no: 492558

Work type: Faculty Full Time

Campus: UMass Lowell

Department: Computer Science

Categories: Computer Science

Preferred Qualifications:

- Preference will be given to outstanding candidates in any of the areas of Computer Vision, Cybersecurity, Data Science, Machine Learning, and/or Robotics
- Outstanding candidates in other major computer science areas will also be considered, and are thus encouraged to apply
- In addition to developing a strong research program, a successful candidate will be expected to teach undergraduate and graduate courses, including department core and specialty areas based on the candidate’s expertise

In addition to the broad range of research interests within the Computer Science Department, UMass Lowell has a diverse group of science and engineering faculty who use novel computer science techniques to enhance their research (e.g., physics,
DATA-INFORMED DISCUSSIONS AND DECISIONS

CAMPUS-WIDE APPROACH

• Improve Proposal Competitiveness
• Direct Strategic Investments/Activities
• Inform Faculty Hires
• Identify Opportunities for Industry Engagement
OFFICE OF ENTREPRENEURSHIP AND ECONOMIC DEVELOPMENT

IDENTIFY POSSIBLE PARTNERS

- Invite to clean-energy forum, potential for joint ventures
Learning with Purpose
DATA-INFORMED DISCUSSIONS AND DECISIONS

CAMPUS-WIDE APPROACH

• Improve Proposal Competitiveness
• Direct Strategic Investments/Activities
• Inform Faculty Hires
• Identify Opportunities for Industry Engagement
Thank you!

Anne Maglia, anne_maglia@uml.edu

Kelsey Rosell, k.rosell@digital-science.com