CHORUS FORUM
Real World Impact of Faculty Publications

Arthur Ellis, Senior Advisor, Elsevier
A.Ellis@Elsevier.com

September 26, 2023
Evaluation Framework

Academic performance evaluation

Input
Teaching
Research and education
Outcomes and Impact

Resources
Education
Research & Education Processes (Throughput)
Knowledge created (Output)
Outcomes and Impact

People, Funding, Equipment
Teaching and Learning Indicators
Culture, Collaborations
Quantity and Quality Indicators
Societal and Economic Impact

Quantitative and Qualitative
Evaluation Framework

**Input**
1. Resources
   1.A Human Capital: staff (researchers, PIs, teachers, support staff, etc.)
   1.B Funding: Block funds, Grants, Industry funds, Donations, IP Income, etc.
1.C Equipment

**Teaching**
2. Education
   2.A Teaching basic indicators: number of students, doctorates, bachelors
   2.B Reputation: Qualitative indicators related to the quality of teaching (courses, student experience)
2.C Learning environment
2.D Student outcomes and learning gains

**Research and education**
3. Research & Education Processes (Throughput)
   3.A Research culture: Is the research produced in an inclusive and diverse environment: ECR nurturing, collaboration, Gender, Race and ethnicity
   3.B Reproducibility: Is this research reproducible: shared, availability of datasets, SW, methods and protocols, review citations
   3.C Sustainability of research practices: Carbon neutrality, team based effort
   3.D Interdisciplinarity: MI (Multidisciplinary index) II (Interdisciplinary Index)
   3.E Knowledge exchange: Research in collaboration with Industry, mobility to and from Industry, etc.

**Outcomes and Impact**
4. Knowledge created (Output)
   4.A Volume of publications as well as quality of publications
   4.B Traditional Research Output augmentation (local big data platform)
   4.C Other Traditional Research Output augmentation (preprint, datasets...)
   4.D Non Publication Research Output augmentation (creative work, events, live performances, etc.)
5. Outcomes and Impact
   5.C Impact on students, education system and priorities, alumni

Quantitative and Qualitative
A Global Platform for Societal Impact: United Nations Sustainable Development Goals (SDGs)

https://globalaffairs.ucdavis.edu/vur-sdgs
HBCU Research Overview, 2013-2022

Overall research performance

<table>
<thead>
<tr>
<th>Scholarly Output</th>
<th>Authors</th>
<th>Field-Weighted Citation Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>48,767 ▲</td>
<td>26,008 ▲</td>
<td>1.35 ▲</td>
</tr>
</tbody>
</table>

Subject areas:
- Computer Science (12.4%)
- Physics and Astronomy (13.8%)
- Engineering (19.2%)
- Chemistry (8.6%)
- Materials Science (10.3%)
- Environmental Science (7.0%)
- Earth and Planetary Sciences (5.0%)
- Agricultural and Biological Sciences (9.9%)
- Biochemistry, Genetics and Molecular Biology (11.5%)
- Arts and Humanities (3.9%)
- Business, Management and Accounting (4.0%)
- Medicine (20.5%)
- Social Sciences (16.0%)
- Mathematics (6.4%)
- Other

Source: SciVal
Relative Activity Index of HBCU SDG Contributions

Zero Hunger
Quality Education
Reduced Inequality

Data source: SciVal
CUNY Linkage of Patents to UN SDGs

Source: PatentSight
Examples of Policy Bodies Citing University of Glasgow Research

<table>
<thead>
<tr>
<th>Policy Bodies</th>
<th>Policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidelines in PubMed Central</td>
<td>1231</td>
</tr>
<tr>
<td>World Health Organization</td>
<td>833</td>
</tr>
<tr>
<td>Publications Office of the European Union</td>
<td>429</td>
</tr>
<tr>
<td>The UK Government</td>
<td>385</td>
</tr>
<tr>
<td>NICE</td>
<td>338</td>
</tr>
<tr>
<td>UK Parliament Select Committee Publications</td>
<td>253</td>
</tr>
<tr>
<td>Analysis &amp; Policy Observatory</td>
<td>214</td>
</tr>
<tr>
<td>OECD</td>
<td>186</td>
</tr>
<tr>
<td>IZA Institute of Labor Economics</td>
<td>179</td>
</tr>
<tr>
<td>Ifo Institute</td>
<td>166</td>
</tr>
</tbody>
</table>

Data source: SciVal
CHIPS and Science Act of 2022: 10 Key Technology Areas

- Artificial Intelligence
- High Performance Computing
- Quantum Technology
- Advanced Manufacturing
- Disaster Preventions
- Advanced Communications
- Cybersecurity
- Biotech
- Advanced Energy Efficiency
- Material Science

NSF: Technology, Innovation and Partnerships (TIP) Directorate
TIP’s New Signature Program: Regional Innovation Engines (“Engines”) to advance translational and use-inspired research

Titles, keywords, and brief Concept Outlines of publicly submitted project ideas were used to link 442 of 679 projects (about 2/3) to one or more SDGs.
Interactive Map of the Engines Development Awards Portfolio

The NSF Engines program supports projects across all key technology and challenge areas as outlined in the CHIPs and Science Act 2022, including artificial intelligence, high-performance computing or semiconductors, quantum information technology, robotics, technology for disaster prevention, communications technology, bioengineering, data storage, energy, and materials.

Hover over the name of a key technology area or a blue square to see more award details.

Source: https://new.nsf.gov/funding/initiatives/regional-innovation-engines
For Cornell University, what are the paths for research areas to commercialization success?

**Methods**

- Census research design: all grants, publications, and patents for Cornell University
- School-supplied lists*: Cornell licensed patents (patent number, license status, licensee small business status, licensee startup status)
- Research topic proxy: STM model for topic-modelling

- Data covers 11,812 grants, 62,674 publications, 1,693 patent families, and 1,185 licenses

* Ethics approval was obtained from the Cornell Institutional Review Board before proceeding with data collection
Methodological Value for Ex-ante Analysis

RESULTS

![Graph showing the relationship between the number of publications and average grant amount.](image)
Acknowledgments

- Ann Gabriel, Elsevier
- Jesse Mudrick, Elsevier
- Tina Zdawczyk, Elsevier
- Mark Hurwitz, Cornell University
- Alice Li, Cornell University

Questions and Additional Information

Arthur Ellis
A.Ellis@Elsevier.com