EPO Patent Statistics for Decision Makers

November 17—18, 2010

Wien Austria

PATLISYS-J
An analysis of the Achievements of JST Operations through Linkage between Patents and Papers

November 17-18, 2010

Department of Databases for Information and Knowledge Infrastructure
Innovation Headquarter
Japan Science and Technology Agency (JST)

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Collaborated with
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Political Leadership
Two Prescriptions for boosting effectiveness of the growth strategy
1. Thoroughly analyze goals and policies, adding new measures as needed
2. Craft and ensure the roll-out of the “Growth Strategy Implementation Plan”
   ● Determine a timetable for the “Growth Strategy Implementation Plan”
   ● Institute a system for examining and evaluating the progress of each measure

Background
日本の状況

Funding for resolving social Challenges
Evidence-based Policy
Upgrading of government-wide R&D data base for efficient and appropriate budget allocation
The 2009 Plan for the Promotion of Intellectual Property (June 24, 2009)

With regard to patents and academic papers of universities, studies will be made in the fiscal year 2009 to draw some conclusions on the establishment of a method to count the number of times they are cited in the applications or notifications of reasons for refusal of other patents. These need to be counted per patent, academic paper, inventor, and author. The data will be utilized to evaluate the quality of patents and academic papers as well as to assess researchers.

The Japanese Government Revitalization Unit (GRR) reviewed the Science and Technology Budget Requests (November 11-27, 2009)

- review selected projects/programs in the budget request for the next fiscal year (JFY2010: April 2010 – March 2-11) with the goal of securing sufficient funds in the next year’s fiscal year’s budget, to enable implementation of policies the Democratic Party of Japan Pledged in its campaign platform last August.
- tagged 447 out of 3,000 projects/programs for review.

Japan Science and Technology Agency (JST)’s Mission:

- promote science and technology in Japan by conducting a broad range of activities, including the following:
  * Promotion of consistent research and development from basic research to commercialization with particular emphasis on the creation of new technological seeds
  * Upgrading the infrastructure for the promotion of science and technology, including dissemination of scientific and technological information
- developed evaluation system to analyze the linkage between scientific papers and patents for the purpose of assessing the investment effects of its operations.
SUPER-PATLISYS-J:

- **Papers:**
  - Highly cited articles
  - Co-Citation Analysis
  - Bibliographic coupling analysis

- **Patents:**
  - Citation analysis
  - Linkage between papers and patents
  - Time line of the author’s publications
  - Important co-author relationship
  - View historiography showing the key papers and timeline of a research field
  - Earlier publications and documents important to the development of the author’s work

**Construct database**

**Bibliometric analysis**

**Visualization**

JST,研究者プロジェクト, 論文(A), 特許(B), 論文(D), 特許(C)

Elsevier Scopus Custom Data

EPO PATSTAT

Thomson Web of Science Derwent Innovation Index Patent Citation Index

Papers DB 15,000,000

Patents DB 8,700,000

After cleansing Papers DB

After data cleansing Patents DB

Linkage DB 660万件

Japan Science & Technology Agency
ANALYSIS METHOD

Database:
Papers: Web of Science, Thomson Reuters
Patents: Derwent Innovation Index (DII), Thomson Reuters
FY1981-FY2008
Total papers: 26,110 (1981-2008)

- exceeded 1,000 in 1999 during the period of the First Science and Technology Basic Plan (FY1996-FY2000)
- surpassed 2,000 papers in 2002 during the Second Science and Technology Basic Plan period (FY2001-FY2005)
- the number peaked in 2007, at 2,915 during the Third Science and Technology Basic Plan (FY2006-FY2010)
- decreased somewhat to 2,765 in 2008

The Second Plan, which advocated the “strategic prioritization of science and technology”, resulted in increased science and technology investments in the field of life sciences, and also led to the greater number of academic papers by JST-funded researchers in life sciences such as molecular biology, genetics, and immunology.
Together with molecular biology and genetics, the JST papers in these fields accounted for about 30% of the total number of times the JST papers were cited.

The number of times cited per academic paper is by far the highest in immunology, accounting to about four times that of molecular biology and genetics.

Sources: Calculated by JST based on data from Thomson Reuters’s Web of Science
596 papers are ranked in the top 1%
90 papers are ranked in the top 0.1%

The number of papers in physics is the highest at 29%, followed by those in molecular biology and genetics, and chemistry.
The number of papers in immunology, the highest at 24%, followed by those in physics

Sources: Calculated by JST based on data from Thomson Reuters’s Web of Science
How much contribution academic papers of JST-funded researchers have made to technology, patent citing such papers were extracted from the Derwent Innovation Index:

1789 papers: about 6.9% of all papers by JST-funded researchers were cited by patent examiners.

The timing when these papers were cited by patent examiners most frequently was 3 years after their publication, with an average period of 5.28 years.

Sources: Calculated by JST based on data from Thomson Reuters’s Web of Science and Derwent Innovation Index
On a percentile basis, the number of JST-funded academic papers cited by patent examiners. The most frequently cited papers are those ranked in the Top 1%. There are 190 such papers, accounting for 31.88%.

A discipline-based analysis of the academic papers cited by patent examiners shows that the number of academic papers in molecular biology and genetics is the highest, followed by those in physics and then chemistry. In terms of the percentage of total academic papers, those in immunology had the largest share at 22.91%.

Sources: Calculated by JST based on data from Thomson Reuters’s Web of Science and Derwent Innovation Index
When looking at countries in which patent applications citing the academic papers of JST-funded researchers were filed, the number of hose filed to the U.S. Patent and Trademark Office is the highest, followed by the World Intellectual Property Organization, Australia, and Europe.

Sources: Calculated by JST based on data from Thomson Reuters’s Web of Science and Derwent Innovation Index.
IPC codes of patents in which patent examiners cited the academic papers of JST-funded researchers

<table>
<thead>
<tr>
<th>Rank</th>
<th>IPC Codes</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>C12</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>2</td>
<td>C07</td>
<td>Organic Chemistry</td>
</tr>
<tr>
<td>3</td>
<td>A61</td>
<td>Medical or Veterinary Science</td>
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C12Q-001/68
Measuring or testing processes involving enzymes or microorganisms; compositions or test papers therefor; processes or preparing such compositions; condition-responsive control in microbiological or enzymological processes; measuring or testing apparatus with condition measuring or sensing means; compositions therefore; processes of preparing such compositions, involving nucleic acid)

A61K-039/395
Medical preparations containing antigens or antibodies

Anderson, et al. (1996) pointed out that the strongest linkage between patented technology and science is found in the biotechnology field, and at the JST, too, academic papers related to biotechnology were most frequently cited in patents.

Sources: Calculated by JST based on data from Thomson Reuters’s Web of Science and Derwent Innovation Index
COMPARISON WITH THE WORLD OUTPUTS

Database:
Papers: Scopus Custom Data, Elsevier
Patents: PATSTAT(Worldwide Patent Statistical Database), European Patent Office(EPO)
FY1996-FY2007
Country shares of the number of academic papers and those of times academic papers were cited

<table>
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<tr>
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<th>JAPAN</th>
<th>US</th>
<th>JST</th>
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<tbody>
<tr>
<td>FY1996</td>
<td>8.03</td>
<td>5.44</td>
<td>0.04</td>
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<tr>
<td>FY2007</td>
<td>29.4</td>
<td>21.65</td>
<td>0.22</td>
</tr>
<tr>
<td>Country shares of the number of academic papers</td>
<td>Rank 2</td>
<td>Rank 5</td>
<td>Rank 1</td>
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<tr>
<td>Country shares of the times academic papers were cited</td>
<td>Rank 4</td>
<td>Rank 5</td>
<td>Rank 1</td>
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Country shares of the number of academic papers and those of times academic paper were cited by patent examiners

Sources: Calculated by JST based on data from Elsevier Scopus Custom Data and PATSTAT

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<td>Rank 2</td>
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<tr>
<td>Country Shares of the times academic paper were cited by patent examiners</td>
<td>8.57</td>
<td>9.91</td>
<td>45.18</td>
<td>34.4</td>
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POLICY MAP

Database:
Papers: Scopus Custom Data, Elsevier
Patents: PATSTAT(Worldwide Patent Statistical Database), European Patent Office(EPO)
FY1996-FY2007
SUPER-PATLISYS-J:

Papers:
Highly cited articles
Co-Citation Analysis
Bibliographic coupling analysis
Patents:
Citation analysis
Linkage between papers and patents
Time line of the author’s publications
Important co-author relationship
View historiography showing the key papers and timeline of a research field
Earlier publications and documents important to the development of the author’s work

Construct database
Bibliometric analysis
visualization

Elsevier
Scopus
Custom Data

EPO
PATSTAT

Thomson
Web of Science
Derwent
Innovation Index
Patent Citation Index

Cytoscape: open source
View historiography showing the key papers and timeline of a research field

- Extract papers with keywords “Stem Cells” from Scopus Custom Data
- View historiography showing the key papers and timeline of a research field

- Yamanaka Shinya’s paper: ‘Induction of Pluripotent Stem Cells from Mouse Embryonic and Adult Fibroblast Cultures by Defined Factors’ Published in the “Cell” in 2006. You can trace who and when cites Yamanaka’s paper.

How to see the map

- Node size is proportional to the number of times papers cited
- Node title is the main fields
- ◇nodes with papers written by researchers funded by JST
- Position and distance between nodes have no meaning

- Click a specific node, you can see title, fields, journal, author keywords, author, affiliation, whether or not cited by patent examiner on the below panel

Sources: Calculated by JST based on data from Elsevier Scopus Custom Data and PATSTAT
Important Co-author relationship

How to see the map

• Node title is the main fields
• Position of node and distance between nodes have no meaning

✓ see the stem-cell researchers all over the world.

✓ see the Yamanaka’s co-author relationship

Sources: Calculated by JST based on data from Elsevier Scopus Custom Data and PATSTAT
About map

How to make a map

Extract papers published from 1996 to 2008

Extract highly cited papers: TOP 1%

make clusters of the strongest co-citation links for each paper (that is, indicating that the papers are frequently cited together): N>0.3

make nodes of highly cited papers: N>0.02

The solid lines between nodes represent the strongest co-citation links for each paper

\[
N_{\text{AB}}^{\text{norm}} = \frac{n_{\text{AB}}}{\sqrt{n_A n_B}}
\]

- \( n_{\text{AB}} \): number of times paper (A) and paper (B) are cited together
- \( n_A \): number of times paper (A) is cited
- \( n_B \): number of times paper (B) is cited

Cytoscape: open source

- why choose cytoscape
  - Most of the plugins are freely available
  - Additional features are available as plugins.
  - Plugins are available for network, new layouts, additional file format support, scripting and connection with database
Policy map

First Science and Technology Basic Plan

Second Science and Technology Basic Plan

Third Science and Technology Basic Plan

Sources: Calculated by JST based on data from Elsevier Scopus Custom Data and PATSTAT
Thank you!