Mapping of Scientific Patenting

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Japan Science and Technology Agency
J-GLOBAL foresight

- combining analytical findings from multiple databases
- to gain multiple perspectives on science, technology and innovation activities

Databases

- J-DreamII
- Dictionary for Science and technology
- J-Global
- ReaD
- Name Identification system
- Thomson Reuters Web of Science
- Essential Science Indicators
- Derwent Innovation Index
- Elsevier Scopus Custom Data
- EPO PATSTAT

Bibliometric analysis

- 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

Visualization
Paradigm Disruptive Innovation
based on Innovation Diagram (ID)
by Dr. Eiichi Yamaguchi (Professor., Doshisha University, JAPAN)

Knowledge embodiment (Development)

A (Existing Technology) → A (Paradigm Sustaining Innovation)

Knowledge creation (Research)

S (Existing Knowledge) → P (Created Knowledge)

Abduction

Field of Resonance

A* (Paradigm Disruptive Innovation)

A (Existing Technology) → A (Paradigm Sustaining Innovation)

Breakthrough

Innovation Diagram

Deduction

Induction
Paradigm Disruptive Innovation
based on Innovation Diagram (ID)
by Dr. Eiichi Yamaguchi (Professor., Doshisha University, JAPAN)

Knowledge embodiment (Development)

A’ (Paradigm Sustaining Innovation)

A (Existing Technology)

A* (Paradigm Disruptive Innovation)

S (Existing Knowledge)

P (Created Knowledge)

Funding

Citation analysis

Mapping: keywords

Science Linkage

Technology Linkage: linkage between articles and patents

Historical development for a specific technology

LINKAGE: linkage between articles and patents

Network Analysis

Foresight

Induction

Deduction

Abduction

Innovation Diagram (ID)

Field of Resonance

Knowledge creation (Research)

Historical development for a specific field

Patent

Paper

Funding

Outputs (articles/patents)

Linking databases

Foresight
## JST Indicators

<table>
<thead>
<tr>
<th>Papers</th>
<th>Linkage between papers and patents</th>
<th>Patents</th>
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<tbody>
<tr>
<td>Science Front</td>
<td>Innovation Front</td>
<td>Technology Front</td>
</tr>
<tr>
<td>Essential Science Indicators (ESI)+Web of Science (WoS)</td>
<td>Essential Science Indicators +Derwent Innovation Index</td>
<td>Derwent Innovation Index (DII)</td>
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</tbody>
</table>

### Diagram:

- **ESI**
  - Paper A
  - Paper B
  - Paper X
  - Paper Y
  - Paper Z

- **WoS**
  - Paper A
  - Paper B
  - Paper X
  - Paper Y
  - Paper Z

- **DII**
  - Patent A
  - Patent B
  - Patent a
  - Patent b
  - Patent c

### Picture of science, innovation, and technology
Innovation Front Methodology

1) Based on identifying the most-cited papers across multiple disciplines over a five year period.
2) Determining how often these papers have been jointly cited.
3) Identifying innovation fronts involves manipulating the co-cited papers in order to group together those that are strongly related.

- Innovation Front can assist in identifying scientific areas where the technological community is focusing its attention.

Highly Cited Papers: TOP1% (Essential Science Indicators) 2006-2010: 500,000

Threshold:
the integer threshold was set to accept co-citation frequencies of 2 or greater, and the normalized threshold was set at 0.1.

Cluster:
Starting with co-cited pair that meets the thresholds, this grouping procedure then finds other pairs that share common papers. The gathering process continues until no other pairs can be added to the rest. The resulting clusters vary in size from a minimum of two papers to some maximum size.

Derwent Innovation Index

1) Based on identifying the most-cited papers across multiple disciplines over a five year period.
2) Determining how often these papers have been jointly cited.
3) Identifying innovation fronts involves manipulating the co-cited papers in order to group together those that are strongly related.

Highly Cited Papers: TOP1% (Essential Science Indicators) 2006-2010: 500,000

Innovation Front: 18 Papers
Papers: 86

Threshold:
the integer threshold was set to accept co-citation frequencies of 2 or greater, and the normalized threshold was set at 0.1.

Cluster:
Starting with co-cited pair that meets the thresholds, this grouping procedure then finds other pairs that share common papers. The gathering process continues until no other pairs can be added to the rest. The resulting clusters vary in size from a minimum of two papers to some maximum size.
Innovation Front

Node size is proportional to the number of times papers cited
Node title is subject description
position of node and distance between nodes have no meaning

Click a specific node, you can see title, fields, journal, author keywords, author, affiliation on the below panel

Sources: Calculated by JST J-GLOBAL foresight based on data from Thomson Reuters’s Web of Science and Derwent Innovation Index
Anderson, et al. (1996) pointed out that the strongest linkage between patented technology and science is found in the biotechnology field.

Most papers are being in “Life Science”, especially clinical medicine.

Sources: Calculated by JST J-GLOBAL foresight based on data from Thomson Reuters’s Web of Science and Derwent Innovation Index
## Cluster 1: MicroRNA (miRNAs)

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## Cluster 2: induced pluripotent stem cells (iPS)

### Database:
- Thomson Reuters “Essential Science Indicators (2000-2010)"
- Thomson Reuters “Derwent Innovation Index”

### Technology:
- Cytoscape

Sources: Calculated by JST J-GLOBAL foresight based on data from Thomson Reuters’s Web of Science and Derwent Innovation Index
Clusters: 23

- **Cluster 2**
  - **induced pluripotent stem cells (iPS)**
  - S Yamanaka, Kyoto University

- **Cluster 5**
  - Over expression of monocyte chemoattractant protein-1 in adipose tissues causes macrophage recruitment and insulin resistance
    - Very basic
    - T Kadowaki, Tokyo University

- **Cluster 7**
  - **induced pluripotent stem cells (iPS)**
  - S Yamanaka, Kyoto University

- **Cluster 13**
  - Over expression of monocyte chemoattractant protein-1 in adipose tissues causes macrophage recruitment and insulin resistance
    - Drug etc.
    - T Kadowaki, Tokyo University
Technology Front Methodology

1) Based on identifying the most-cited patents across biotechnology fields over a five year period
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Derwent Innovation Index

Papers f

Innovation Front: 18
Papers: 86
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**Cluster 1**
New substituted heterocyclic compounds are non-structural 3 protease inhibitors useful to treat e.g. liver fibrosis and hepatitis C infection, and to increase liver function.

**Cluster 2**
Peptidomimetic compounds useful for inducing apoptosis in a cell, stimulating apoptosis in a cell, and for treating cancer.

**Cluster 161**
New composition comprising peptide-dicer substrate RNA, useful for ameliorating inflammation, e.g. arthritis or psoriasis, or infection associated with influenza virus.

B2: Medical, dental, veterinary, cosmetic
D16: Natural products and polymers. Including testing of body fluids (other than blood typing or cell counting), pharmaceuticals or veterinary compounds of unknown structure, testing of microorganisms for pathogenicity, testing of chemicals for mutagenicity or human toxicity and fermentative production of DNA or RNA. General compositions.

Sources: Calculated by JST J-GLOBAL foresight based on data from Thomson Reuters’s Web of Science and Derwent Innovation Index.
induced pluripotent stem cells (iPS) S Yamanaka, Kyoto University

Address=“JAPAN” \cap Innovation Front

Cluster 2

Cluster 5

Cluster 7

Cluster 13

Innovation Front

Cluster 30

Technology Front

induced pluripotent stem cells (iPS) S Yamanaka, Kyoto University
**name:** Demo: The number of papers on the globe  
**description:** This demo shows a map of the number of the papers in the world. Clicking a book shows more detailed information and a link to a graphical representation of the time-series of papers.  
**creator(s):** Mari Jibu, Yusuke Mukai, Hideki Omi  
**created:** 2011/08/08