RIGHT NOW, WHAT IS HAPPENING IN THE WORLD OF LEARNING?

- Commercialization of Knowledge :
  Infiltration of the business ethic into the sphere of academic knowledge
  ⇔ A postmodern moment for knowledge
- Globalization of Knowledge : Prevalence of American systems
  ⇔ A post-colonial moment for knowledge
- Digitalization of Knowledge :
  Destruction of the class of readers of books about the humanities or refined books
  ⇔ A post-Gutenberg moment for knowledge

Dynamic shift in the production/distribution platform of knowledge :

- Digitalization of knowledge throughout the world due to Google (a mammoth electronic library)
- Development of digital archives and knowledge databases in various locations throughout the world.
- Development of search systems on the Internet such as Wikipedia

➢ The subdivision and closed nature of knowledge, and corresponding loss of an ability to see the whole.
⇒How can we revive a love of learning and active interest in society and the future?

RIGHT NOW, WHAT IS HAPPENING IN THE UNIVERSITIES?

- Structural shift at Japanese universities since the 1990s

1. Structural reform

①Deregulation of University Act= dismantling of Liberal Arts Program
②Greater focus on graduate schools
③Change of status for national universities to university public corporations

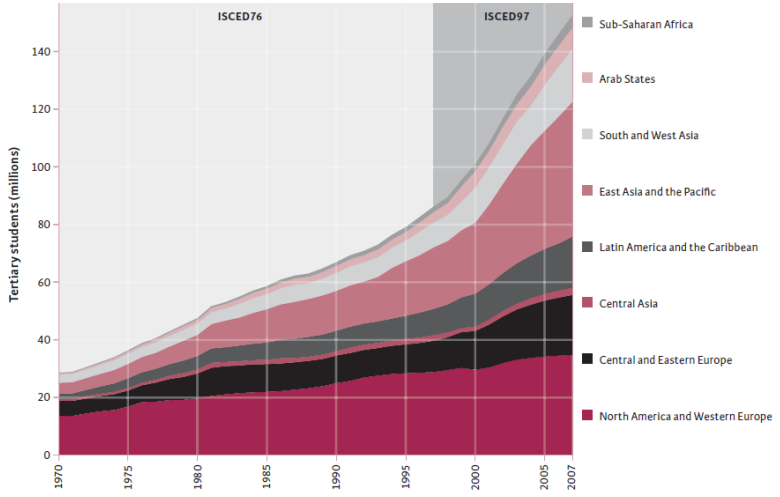
2. Decrease in the number of 18 year olds ⇔ Increase in the number of universities

: Decline in quality (marketing to applicants Destruction of the "career path")

- Intensification of competition among universities around the world (explosive development of universities)

⇒ Restructuring of "learning"? Redefinition of the "university"?

Number of students entering institutions of higher learning by region (1970-2007)



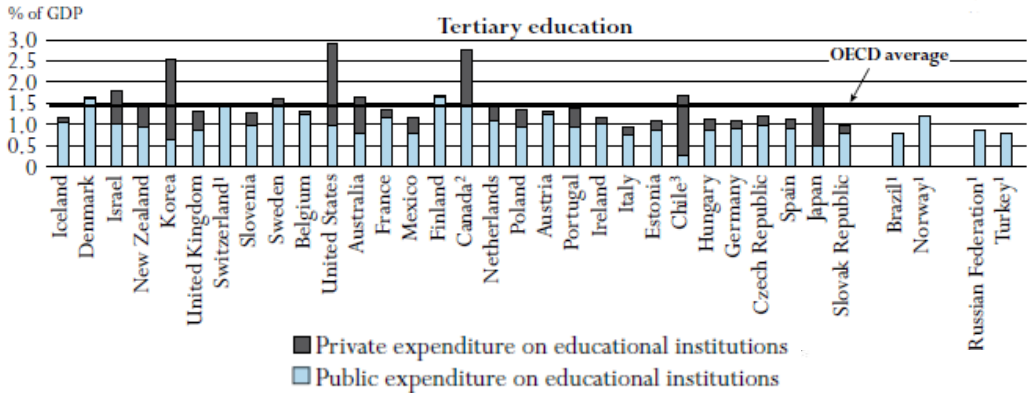
Note: Data before 1998 are classified according to ISCED76. Some programmes classified as post-secondary non-tertiary education with ISCED97 were included in tertiary education using ISCED76. To provide consistent time series, tertiary enrolment data after 1998 include post-secondary non-tertiary education. This accounts for more than 100,000 students in Australia, Canada, Kazakhstan, Morocco and the United States. Therefore, enrolment presented here exceeds regional figures based on ISCED97 by approximately 1 percentage point.

Source: UNESCO Institute for Statistics, Time Series Data, Table 1.

Source: UNESCO「Global Education Digest 2009」p.1, FIGURE1
ユネスコ「Global Education Digest 2009」をもとに作成
(used by permission of UNESCO)

Insufficient public financing for universities

Public expenditures on educational institutions as a percentage of GDP (Higher Education) (2006)



Source: OECD「Education at a Glance 2009」p.211、Chart B2.2.

TOWARDS A REDEFINITION OF THE UNIVERSITY

The university has already suffered one death.

→Are they heading toward a second death and then to a third birth?

- Birth of the university during the Middle Ages
  - ⇔ The rise of networks among cities (people as the medium)
- Death of the university in the early modern period
  - ⇔ Printing technology, vocational schools, academies, the Encyclopedists
- Rebirth of the university in the 19th century
  - ⇔ the State/imperialism

WHAT IS KNOWLEDGE?

- Students are preparing reports by copying information from the Internet.
- Using information from the Internet without sufficient background investigation/confirmation has caused journalists to make errors.

  ⇒Hardliners: Shouldn't we completely outlaw the use of information recovered from the Internet for academic reports and newspaper articles?

  ⇔Accommodators: Are there really essential differences between what is found on the Internet and extracts from books and dictionaries?

→ Can information from the Internet serve as a basis for knowledge?

What is the difference between information on the Internet and knowledge found in library books?

- Who creates knowledge? : Someone's knowledge versus everyone's knowledge
  - Books: Writers, who have reputations in various sectors, take the bet of having their work published in order to win a reputation in society. ⇒Responsibility remains with the individual.
  - Internet: The concept of something that has been written and put out before the pubic belonging to a certain individual is weak, and the concept that knowledge belongs to "everyone" is strong. ⇒ Responsibility is shared collectively.

WHAT IS KNOWLEDGE?

- **What about its structure?** : Knowledge has a structure which connects mutually related elements.
- Knowledge: This is not the haphazard collection of information and data, but rather the mutual tying together (synthesizing) of the contents of various concepts and expressions of phenomena, so as to create conditions under which all has become a system. (The tree of knowledge).
- Difficulties of editing a dictionary = comparing the importance of different items, and finding relationships between items.
- Most of the books that people borrow from libraries, when studied are not used to learn the meaning of individual words, but rather to grasp the structure used to spread the various concepts included.

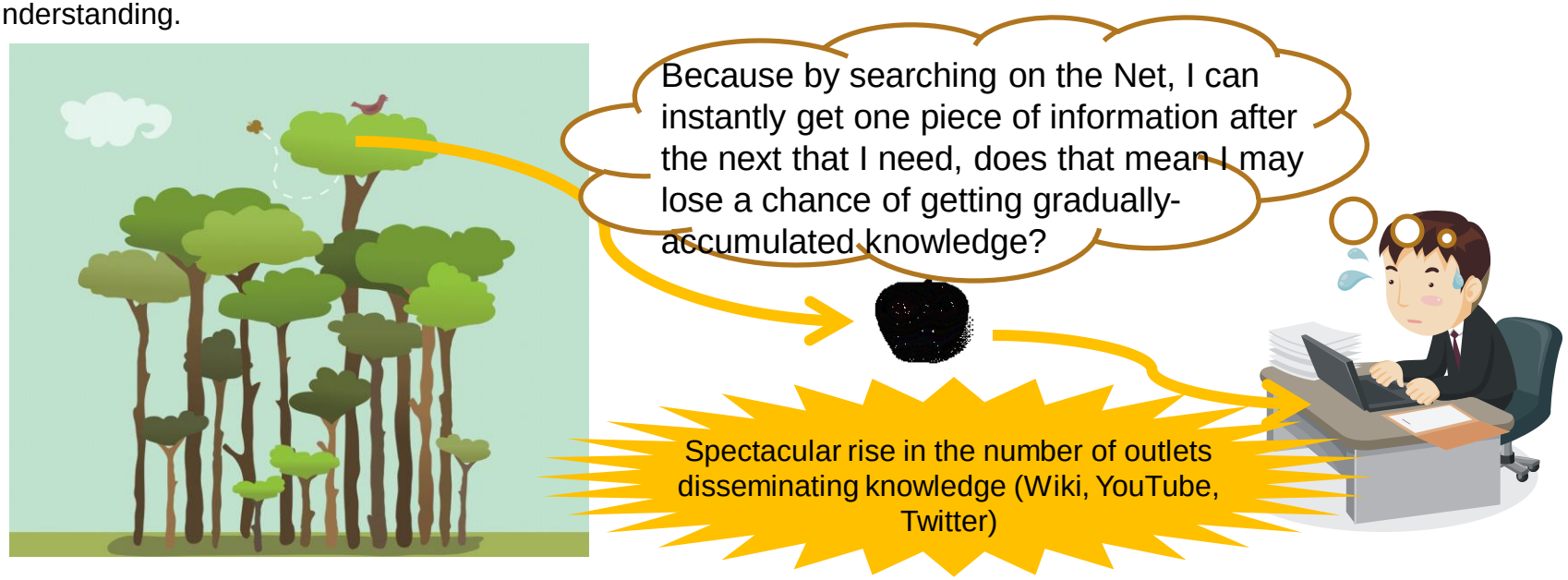
INTERNET SEARCHES LEAD TO A DIALOGUE WITH THE PAST.

Net Searches ⇒ Even if you know absolutely nothing about the relationship between the roots and branches of knowledge, etc., you can get detailed information on things you want to know about.

＝ Even if you do not know what kind of tree is an apple tree or on which branches its fruit grows on, you have the magic to have an apple appear in your hand in an instant. Even though till the end you still don't know what kind of grove you are walking through.

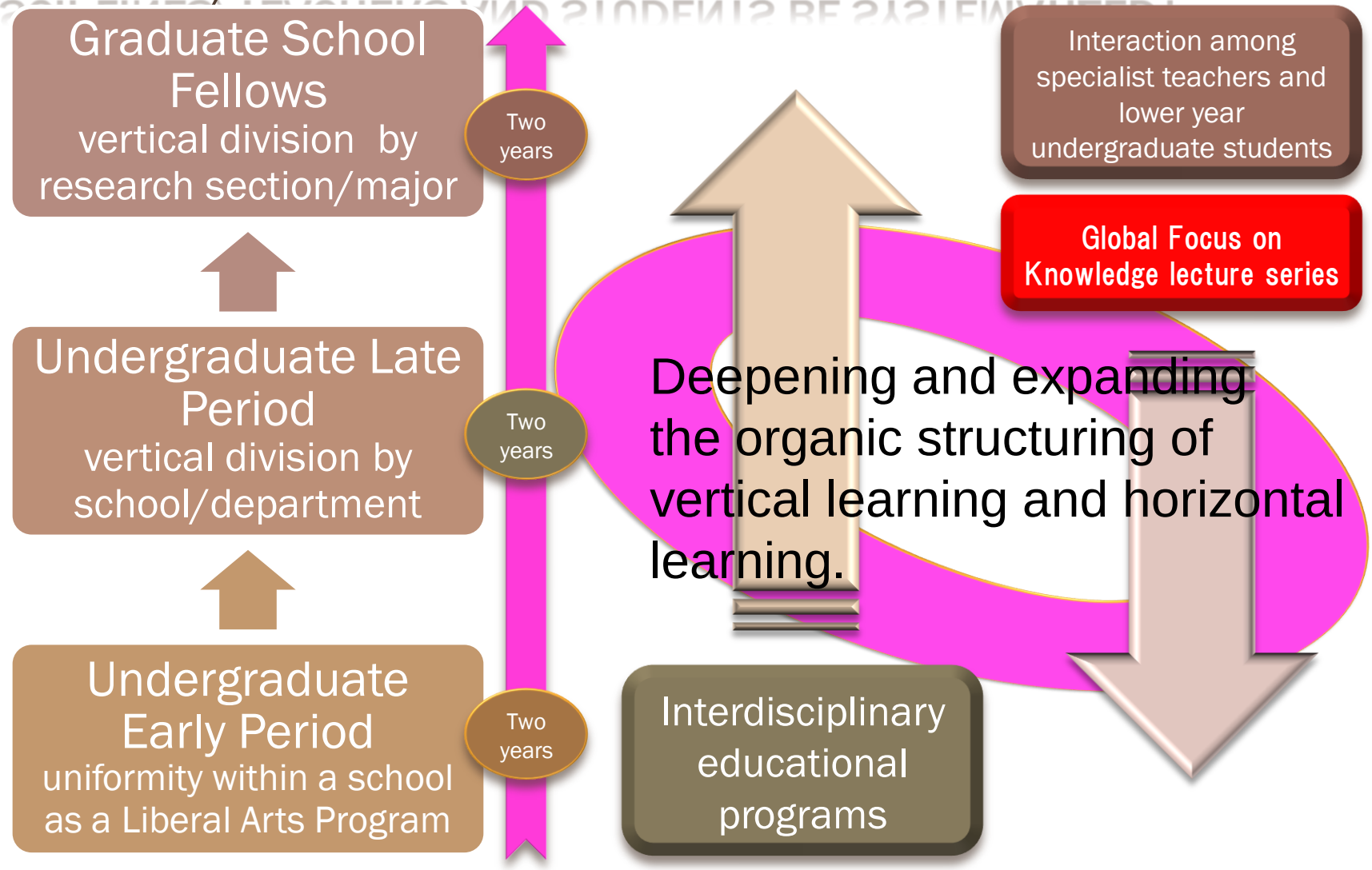
What is a Copernican shift in knowledge?

Seeing as how this is an age in which amateurs throughout the world have access to information that would put an expert to shame, the important thing is not the elements of the information being consumed themselves, but rather systematically understanding how they are mutually tied together. New knowledge is born from conflict with knowledge from the past, and changes through the daily accumulation of thinking. Regarding the Internet of the future, we will have to see whether it can become a medium for a dialogue with the knowledge of the past, and capable of establishing a new framework for understanding.



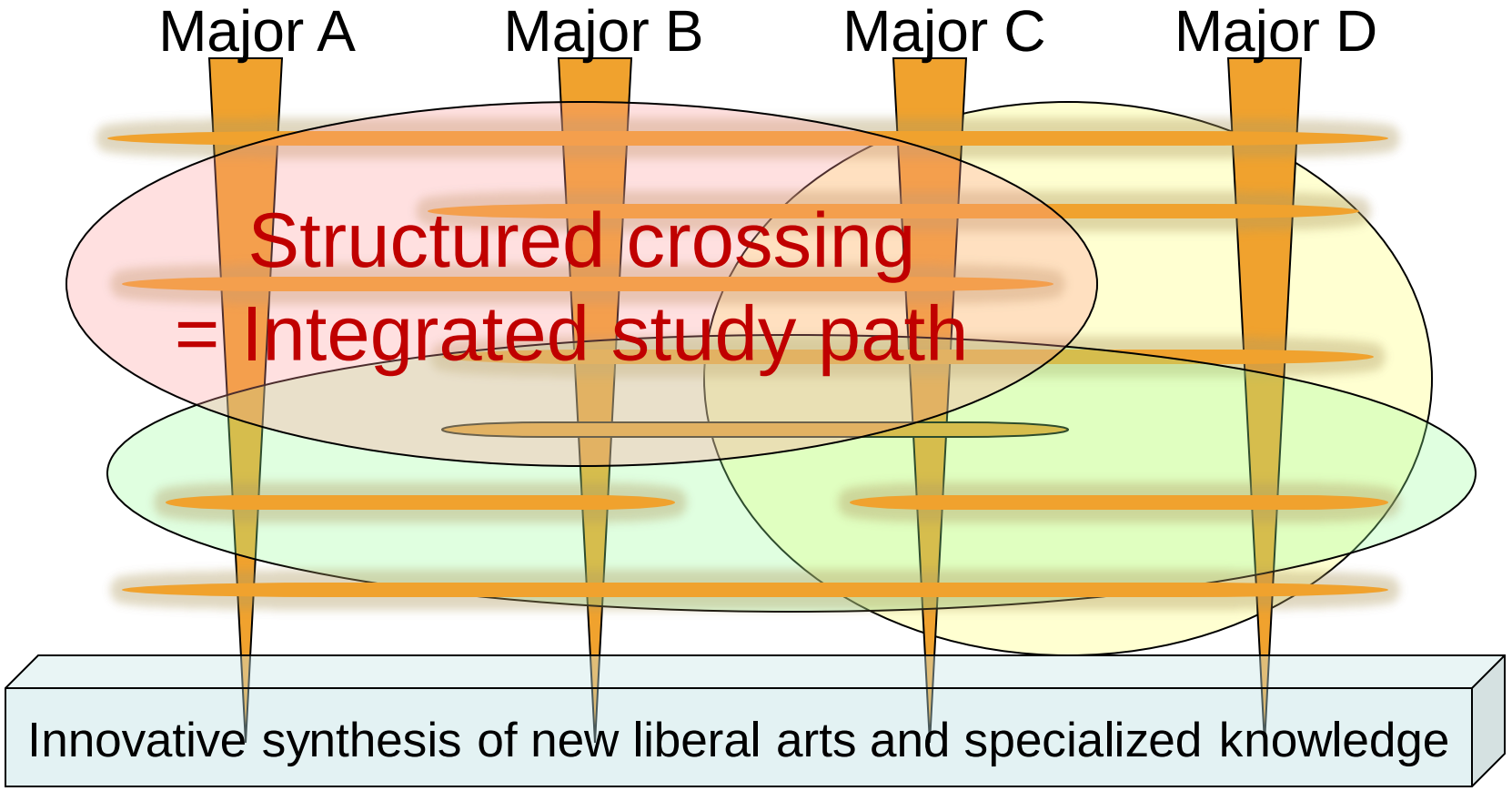
LATE SPECIALIZATION, EARLY EXPOSURE :

HOW SHOULD INTERACTIONS BETWEEN SPECIALIZED DISCIPLINES/TEACHERS AND STUDENTS BE SYSTEMATIZED?



THE GLOBAL FOCUS ON KNOWLEDGE LECTURE SERIES AND STUDY LINKING THE VERTICAL AND HORIZONTAL

- Global Focus on Knowledge lectures as an experiment in early exposure
- Structuring of knowledge (→study) attuned to individual interests and talents
- Strategic employment of websites as support systems



The University of Tokyo
Global Focus on Knowledge Lecture Series

THE UNIVERSITY OF TOKYO ON THE INTERNET

Hideki Mima (School of Engineering)
Shunya Yoshimi(Information Environment, Interfaculty Initiative in Information Studies)

Outline

Ⅰ：Structuring of knowledge and technologies for organizing

Ⅱ：The Internet (ICT) and education, research

Ⅲ：The University of Tokyo on the Internet

Ⅳ：Discussion

EXPLOSIVE GROWTH

- around 19 million/60,000 per month

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  - The number of documents registered on the medical journal articles database (MEDLINE)/number increasing per month

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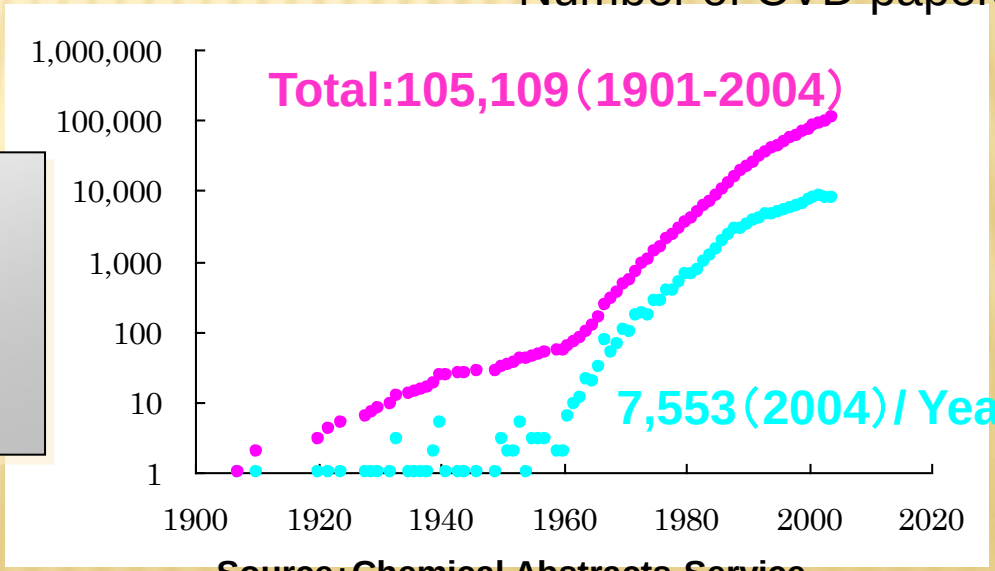
Number of CVD papers



Source：Chemical Abstracts Service

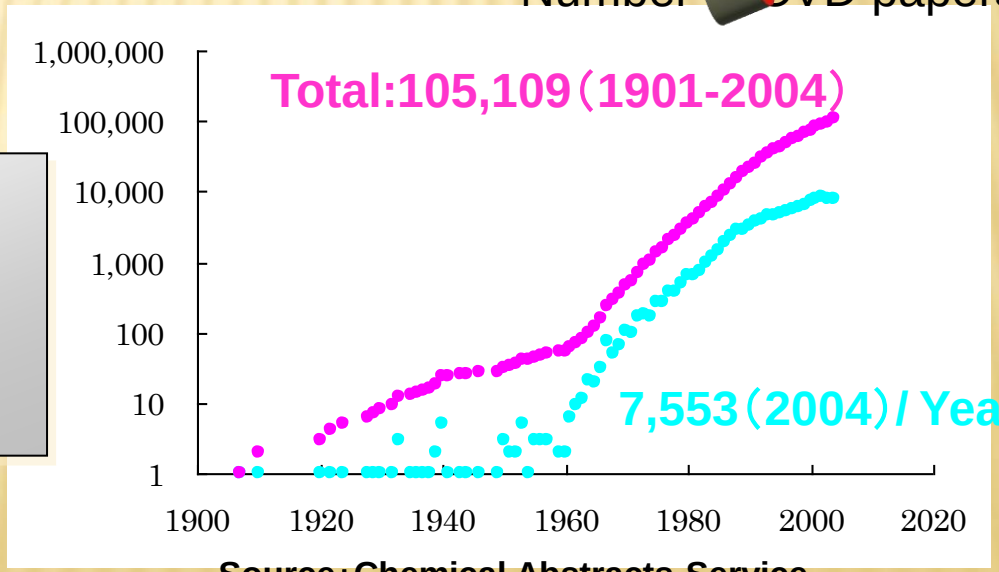
Exponential increase
in the amount of scholarly knowledge/information available
— A question of quantity —

EXPLOSIVE GROWTH

- Around 19 million/60,000 per month
  - the number of documents registered
    on chemistry articles
    increasing per month

A Super-Abundance of Knowledge

Number of CVD papers



Source：Chemical Abstracts Service

Exponential increase
in the amount of scholarly
knowledge/information available
— A question of quantity —

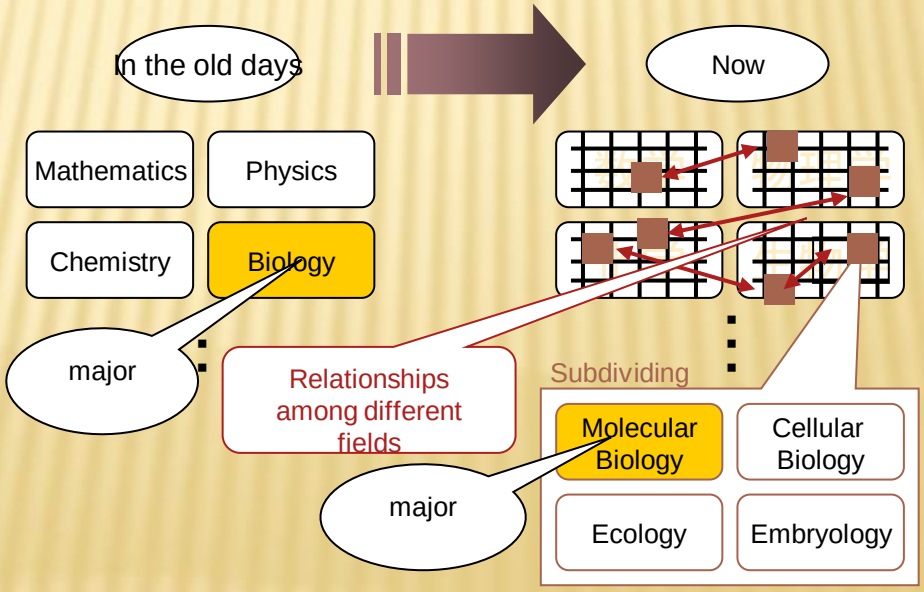
SUBDIVIDING OF KNOWLEDGE

- Around 900

SUBDIVIDING OF KNOWLEDGE

- Around 900
- Number of lectures in the School of Engineering, the University of Tokyo

Subdividing of academic disciplines, inadequate preparation in terms of terminology, appearance of knotty issues that cannot be responded to by existing academic systems
—A question of quality—



SUBDIVIDING OF KNOWLEDGE

- Around 900

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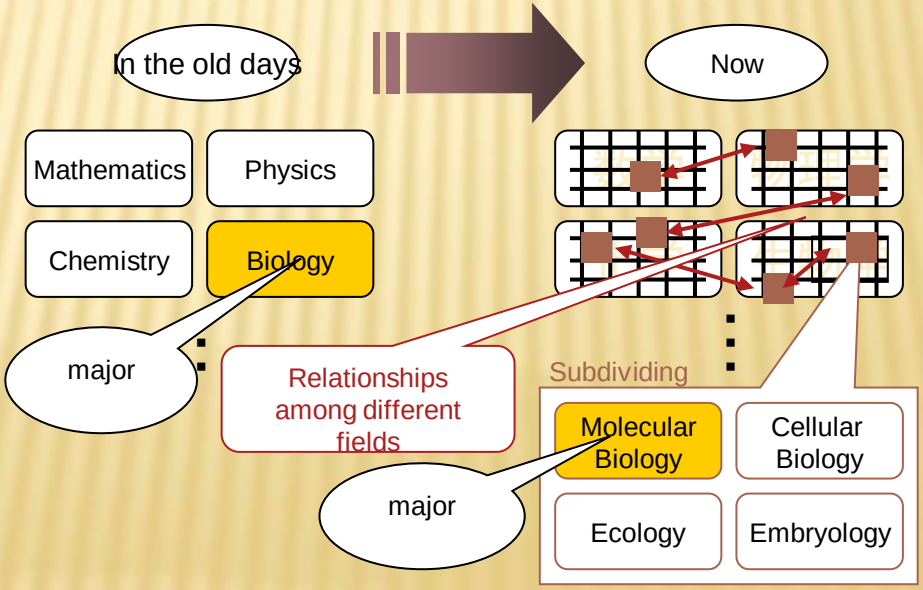
Unorganized Diversity

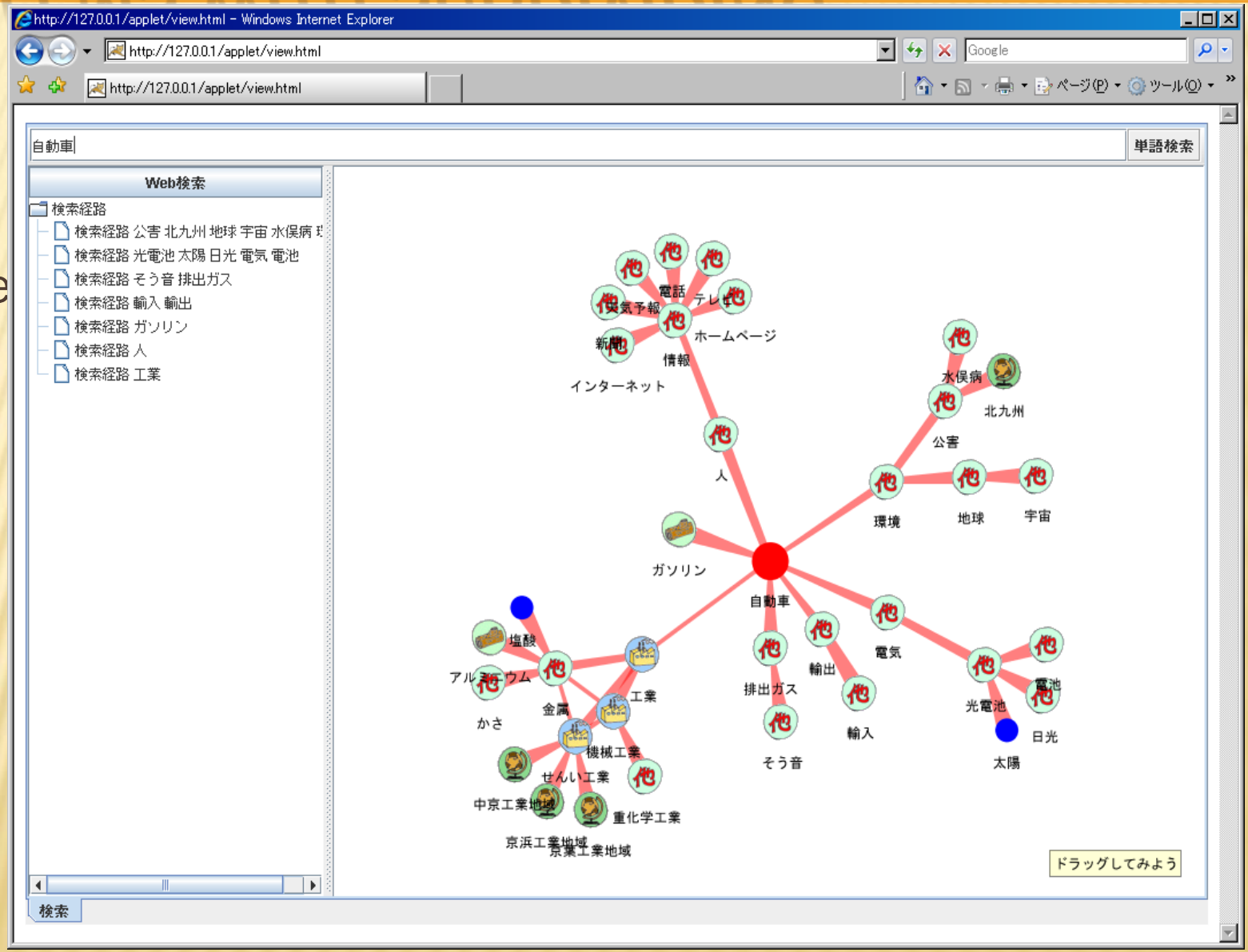
ded to by existing academic sy

—A question of quality—



PROBLEMS WITH SUBDIVIDING

- Paths a search for “automobile can lead to



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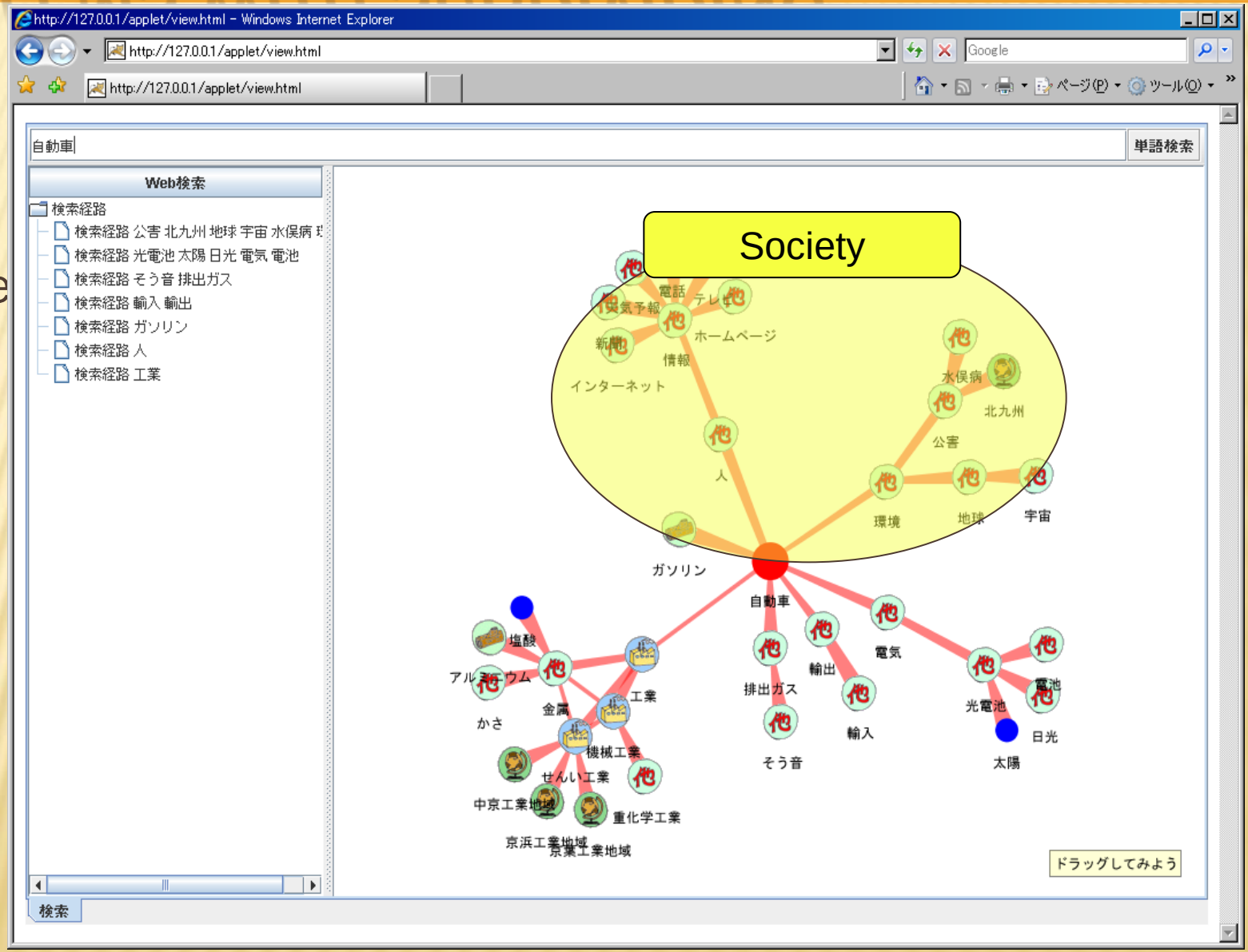

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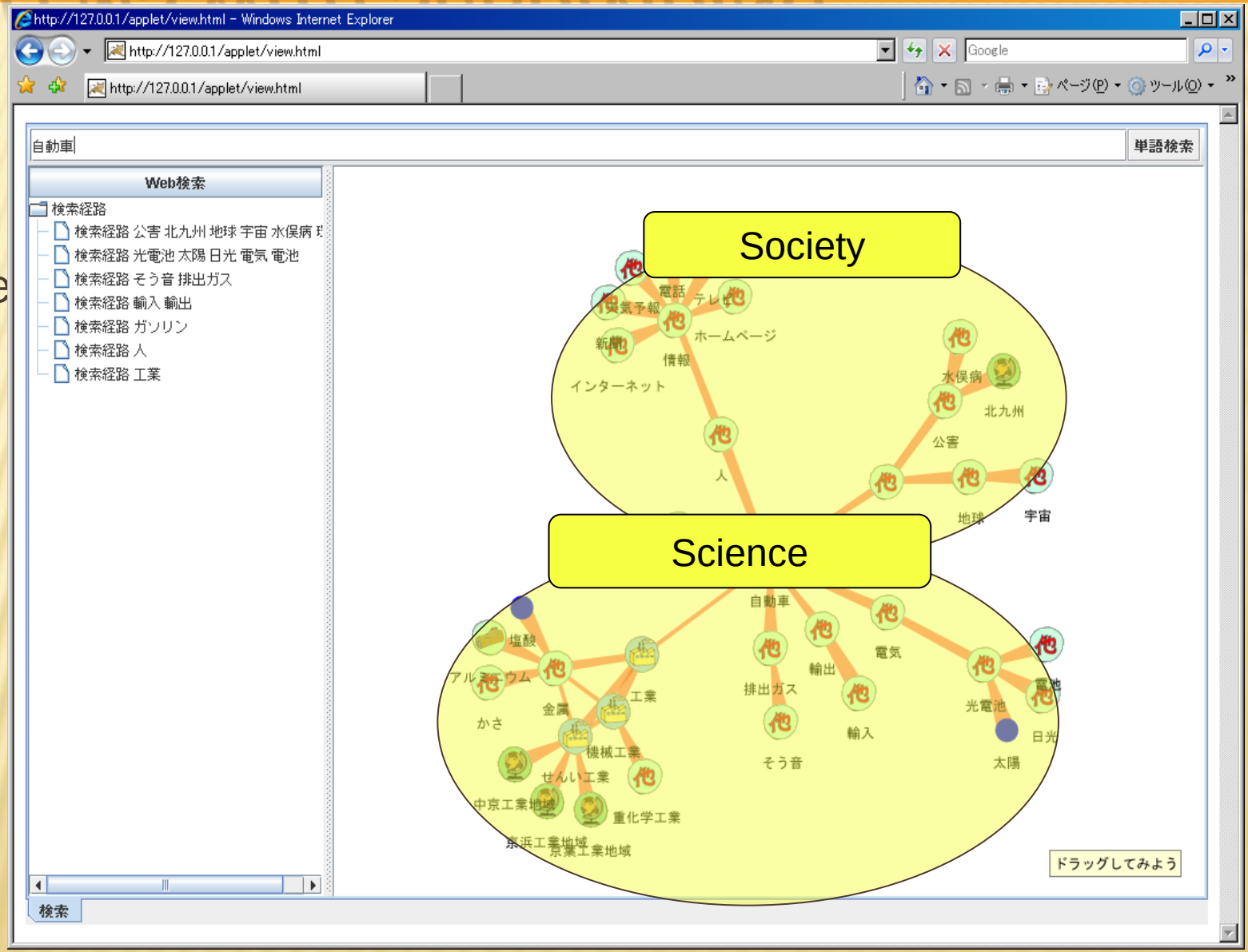
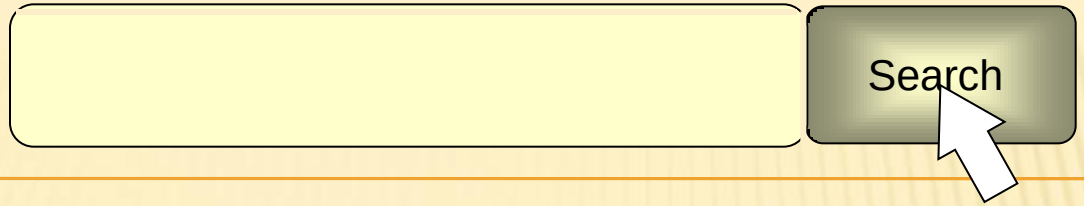
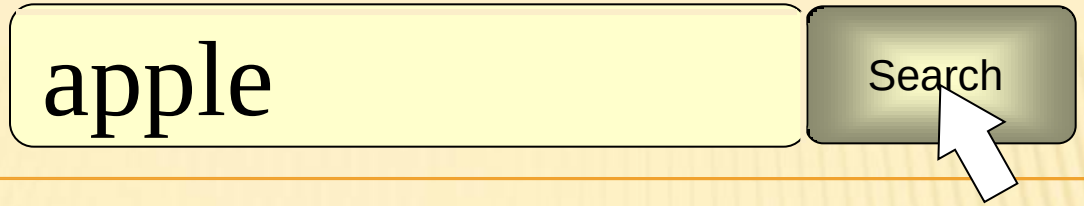
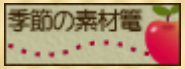



Search


apple
Search

apple

Search



apple

Search

fruit

IT

STRUCTURING OF KNOWLEDGE

WE NEED "STRUCTURING OF KNOWLEDGE" IN ORDER TO MAKE ACTIVE USE OF INFORMATION WHICH HAS BECOME CHAOTIC.

"Being able to arrange knowledge in such a way that its use can transcend fields, organizations and prevailing conditions."

TECHNOLOGIES FOR STRUCTURING KNOWLEDGE

- Taking the enormous amount of information available and putting it into “categories” and making it “abstract.”

“Connection” recognition

- —Identifying special characteristics.
- —Gauging the degree to which items are similar.

EXAMPLES OF PUTTING INFORMATION TO WORK BY MAKING IT "ABSTRACT":

- Transport Safety
  - Video filming of driving conditions for trains/taxis

- Medical Safety
  - Video filming of conditions during operations

EXAMPLES OF PUTTING INFORMATION TO WORK BY MAKING IT "ABSTRACT":

- Transport Safety
  - + Video filming of driving conditions for trains/taxis
- Medical Safety
  - + Video filming of conditions during operations

Monitoring

Safety
Peace of Mind

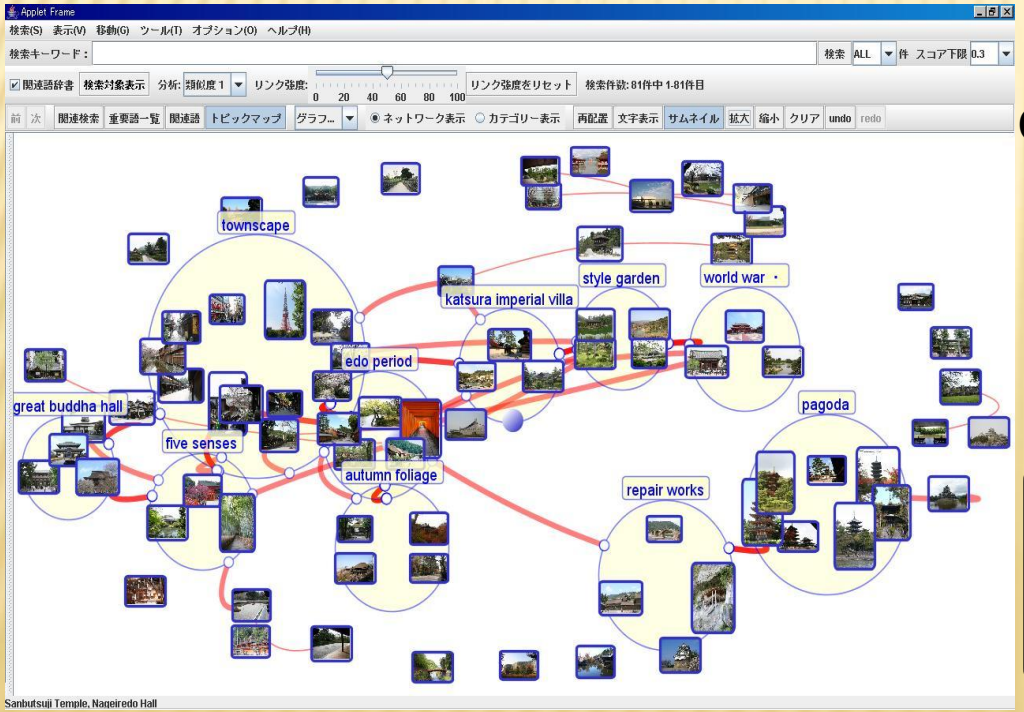
FROM “ABLE TO SEARCH” TO “ABLE TO UNDERSTAND”

MIMA RESEARCH DEMONSTRATION

TECHNOLOGIES FOR STRUCTURING OF KNOWLEDGE

HIDEKI MIMA THE UNIVERSITY OF TOKYO

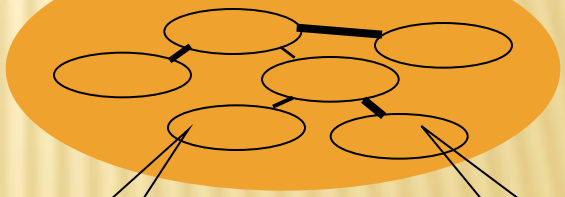
1. Accumulation of knowledge
2. Analysis/categorization of knowledge
3. Visualization of knowledge



Analysis of the text

to extract key concepts

Carrying out recognition of relevancy



Document 1
Nano-particles
titanium dioxide
Supercritical
Size・・・・

Inferring relevance from overlapping key concepts

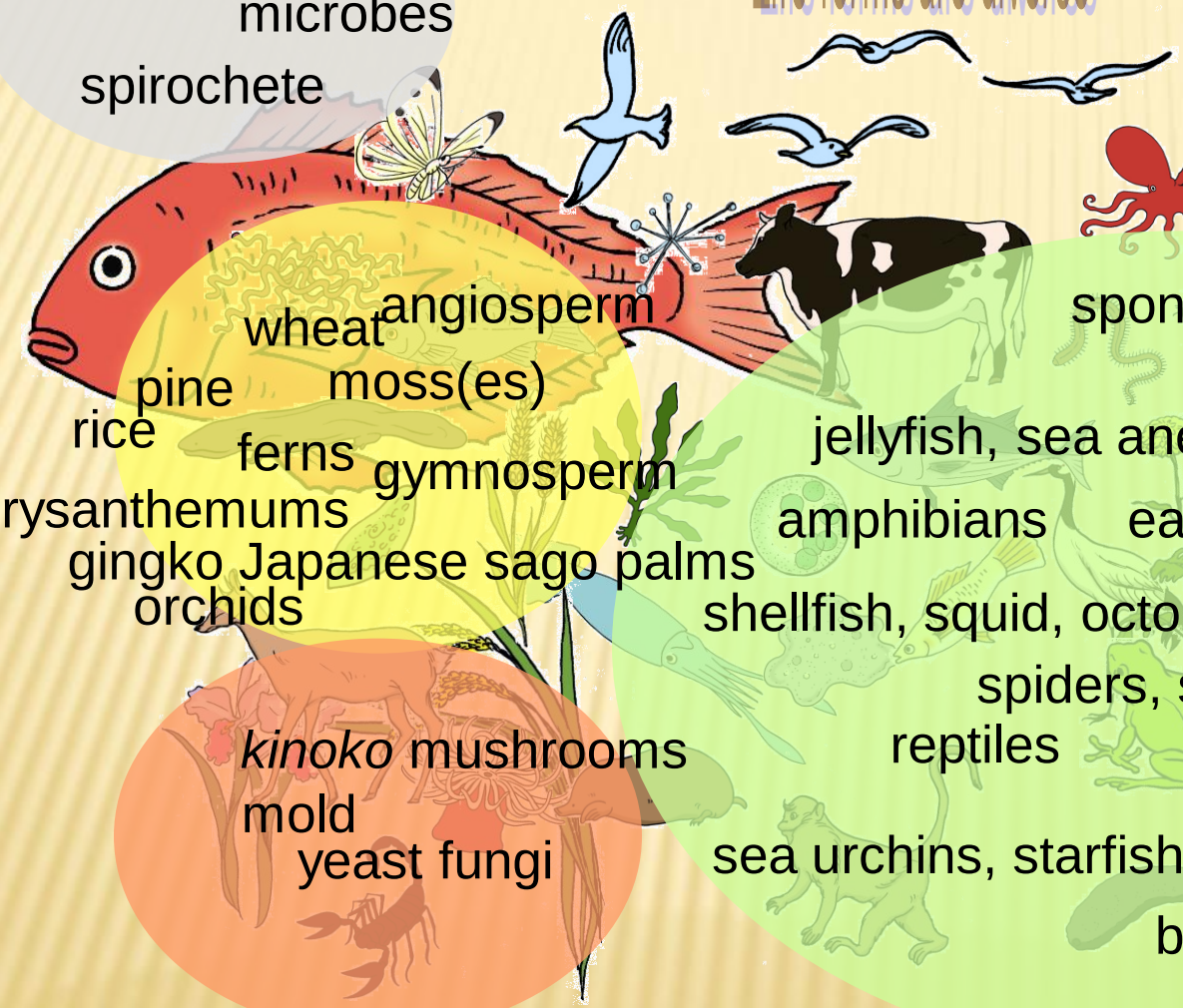
Document 2
Nano-particles
Supercritical
Luminescence
The University of Tohoku
・・・・

Unstructured Knowledge

-Life forms are diverse-

Unstructured Knowledge

-Life forms are diverse-



bacteria

microbes

spirochete

algae

amoeba

flagellates

angiosperm

wheat

pine

moss(es)

rice

ferns

gymnosperm

chrysanthemums

gingko Japanese sago palms

orchids

kinoko mushrooms

mold

yeast fungi

sponges

jellyfish, sea anemone, corals

amphibians

earthworms, lugworms

shellfish, squid, octopi

crustaceans

spiders, scorpions

insects

reptiles

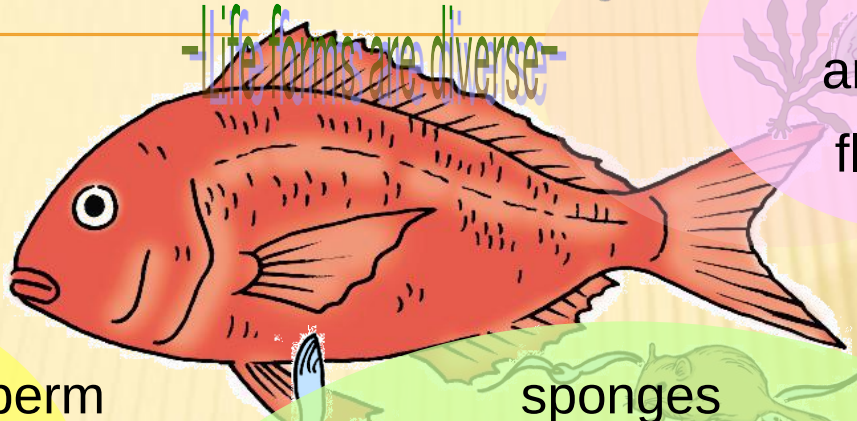
mammals

sea urchins, starfish, sea cucumbers

birds

Unstructured Knowledge

-Life forms are diverse-



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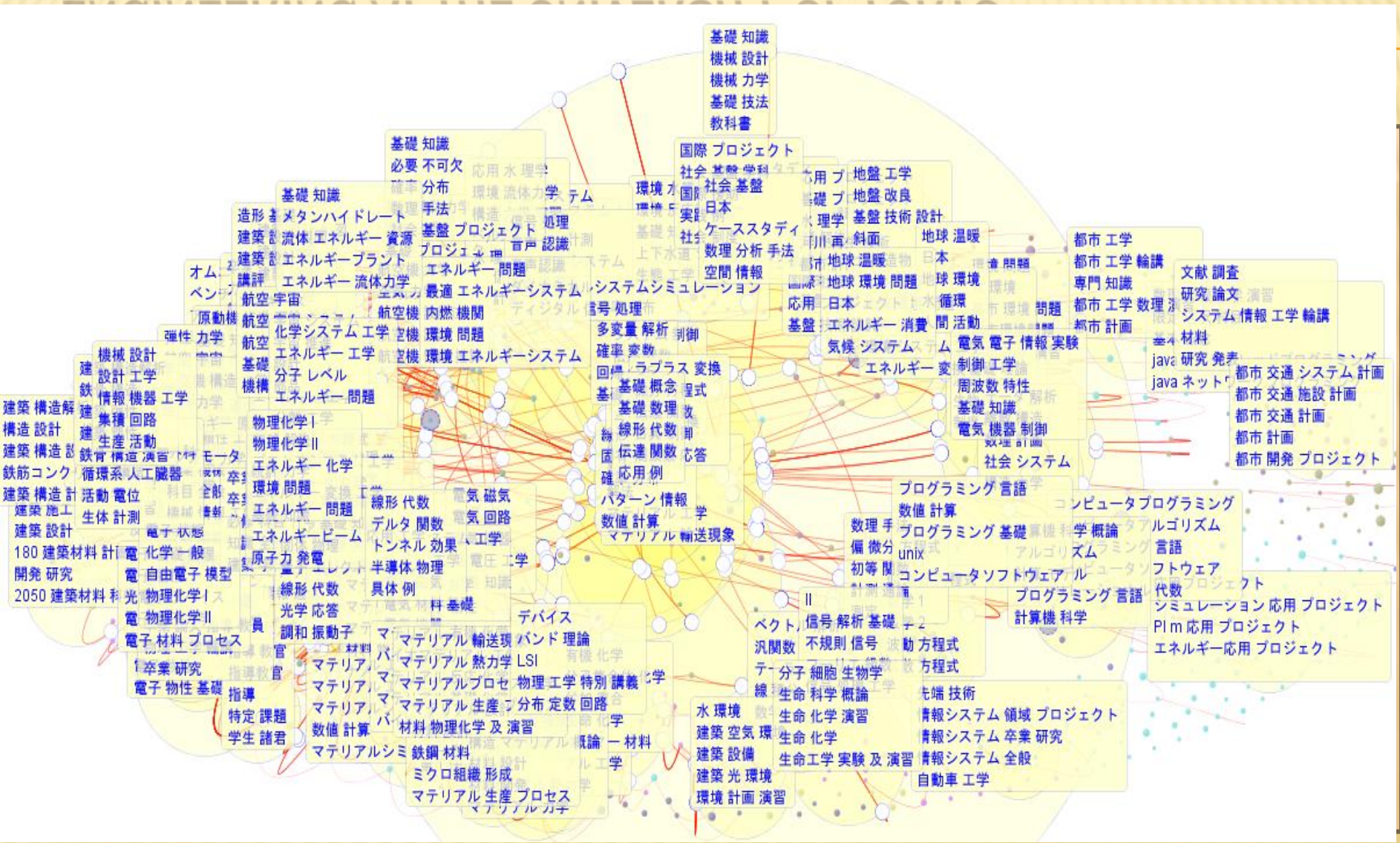
birds

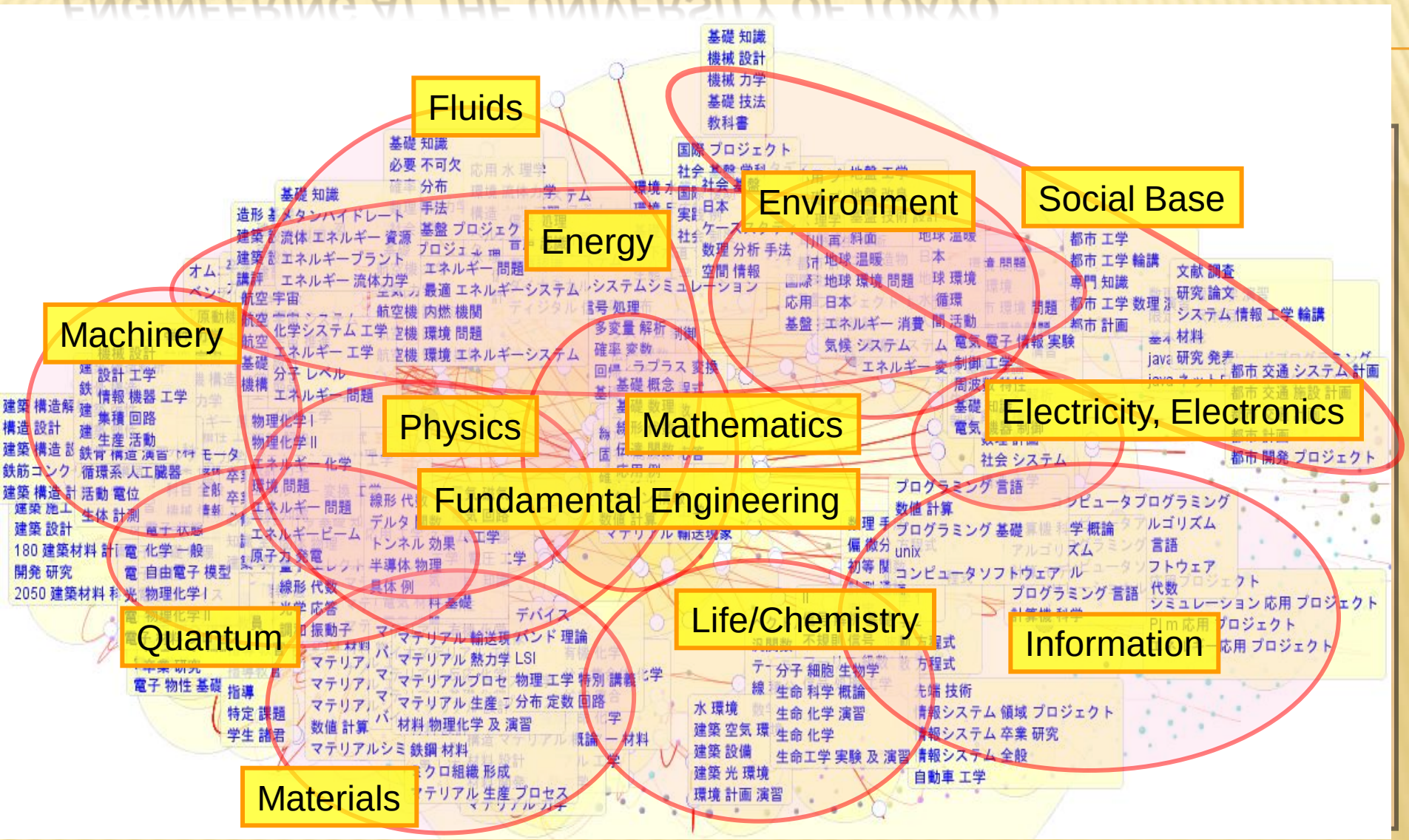
CONCENTRATION AND OMISSION OF KNOWLEDGE

STRUCTURING OF LECTURES IN THE SCHOOL OF ENGINEERING AT THE UNIVERSITY OF TOKYO



Source: MIMA Search（the School of Engineering at the University of Tokyo, Center for Innovation in Engineering Education）

STRUCTURING OF LECTURES IN THE SCHOOL OF ENGINEERING AT THE UNIVERSITY OF TOKYO



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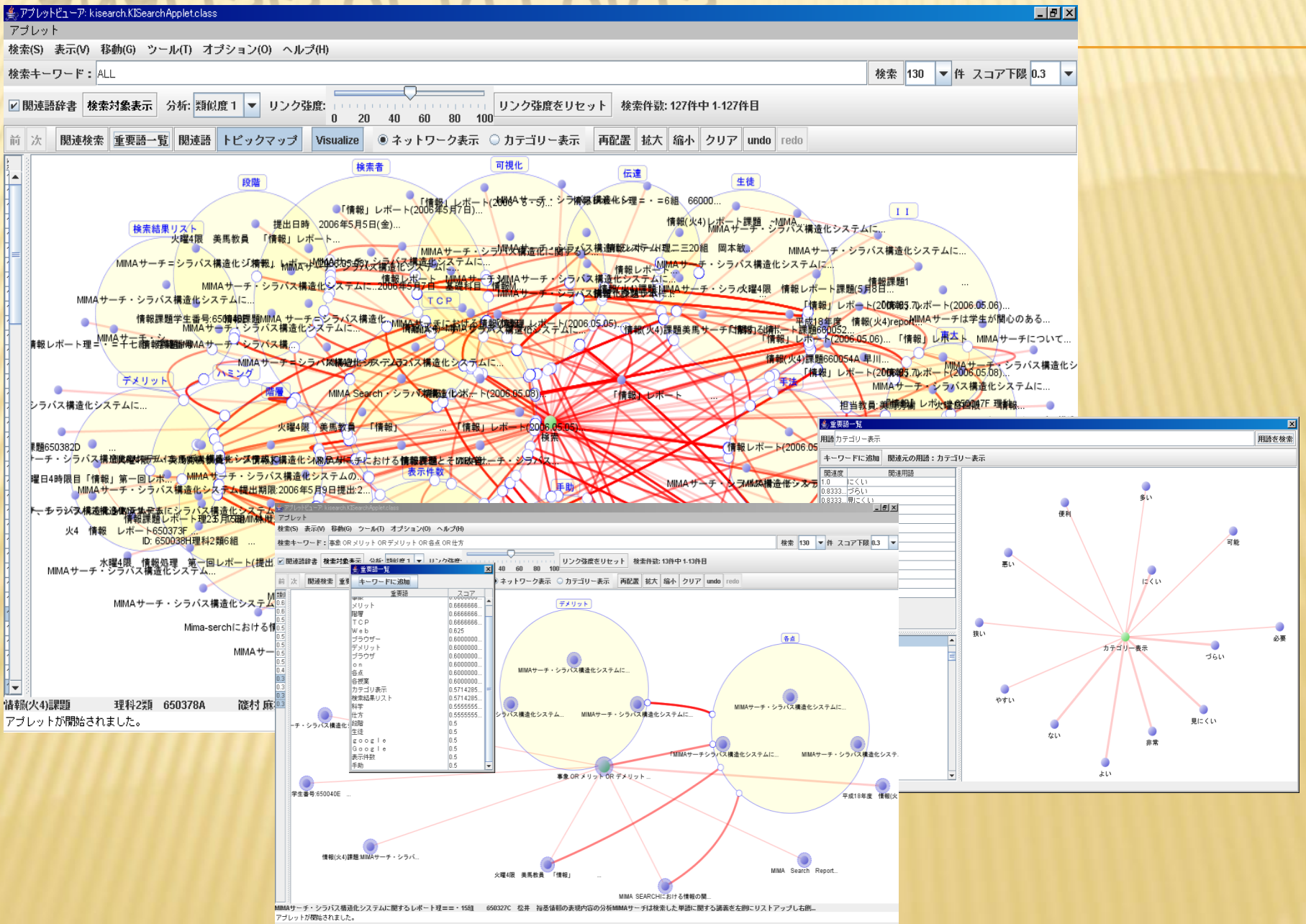
ANALYSIS OF REPORTS



THE INTERNET (ICT = INFORMATION & COMMUNICATIONS TECHNOLOGIES) AND EDUCATION/RESEARCH

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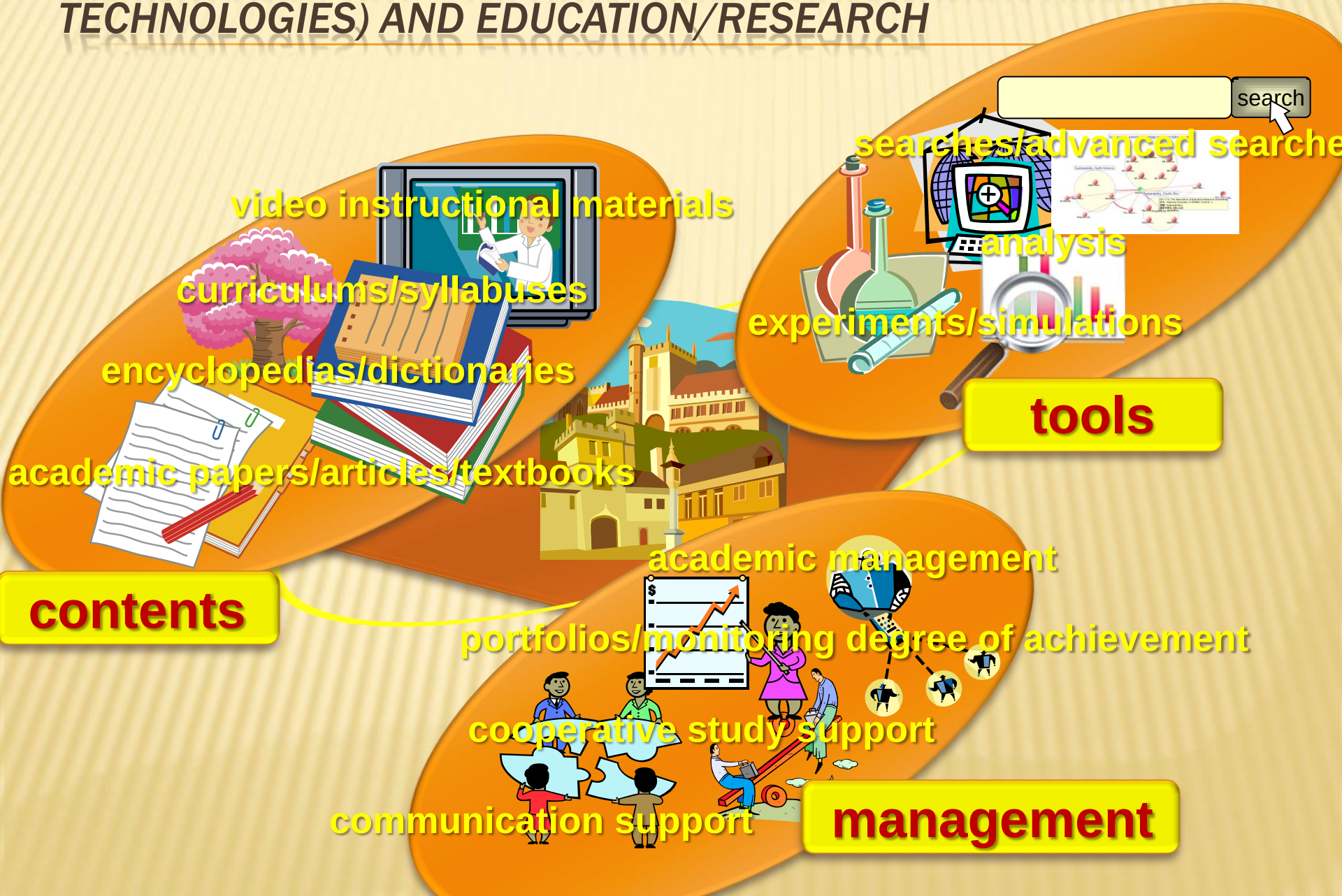


THE UNIVERSITY OF TOKYO ON THE INTERNET

THE UNIVERSITY OF TOKYO ON THE INTERNET

- Educational Content
  - Curriculums/Syllabuses
    - The University of Tokyo Course Catalog （http://catalog.he.u-tokyo.ac.jp/）
    - OCW(Open Course Ware)（http://ocw.u-tokyo.ac.jp/）
    - Engineering Education Promotion Syllabus NAVI （http://ciee.t.u-tokyo.ac.jp/snavi/）
  - Textbooks
    - Progressive Textbooks （http://utht.t.u-tokyo.ac.jp/）
    - Ideal Textbooks
- Research-use Content
  - Databases for Various Kinds of Research Materials and Academic Papers
    - GACoS（http://www.dl.itc.u-tokyo.ac.jp/gacos/）
    - Digital Library Division, Information Technology Center （http://www.dl.itc.u-tokyo.ac.jp/）
    - Affiliated Libraries （http://www.lib.u-tokyo.ac.jp/）
- e-Learning Study Materials
  - Lecture/Seminar Archives
    - Center for Innovation in Engineering Education Archives
    - TODAI.TV（http://todai.tv/）
    - etc.
  - WBT(Web Based Training)
    - HWB（http://hwb.ecc.u-tokyo.ac.jp/current/）
    - Snowballs (Self Navigation Web-Based Literacy Learning System) —Cooperative-type Literacy Study Assistance System
      - From distinct learning by field to virtual communication
- Support for Student Living
  - Todai Navi（http://utnav.jp/）、UT-Life（http://www.ut-life.net/）
  - …

IDEAL TEXTBOOKS

- UT-eTEXT

SNOWBALLS

- Self Navigation Web-Based Literacy Learning System

Self-Learning Web-based literacy-educational IT system

SCREEN IMAGES FOR STUDY SECTIONS

Individual “avatars” always are shown

If you give many correct answers, you can get a snowball.

Section from textbook

Collection of questions

New Web Textbooks UT— e TEXT

PROGRESSIVE TEXTBOOKS

BACKGROUND

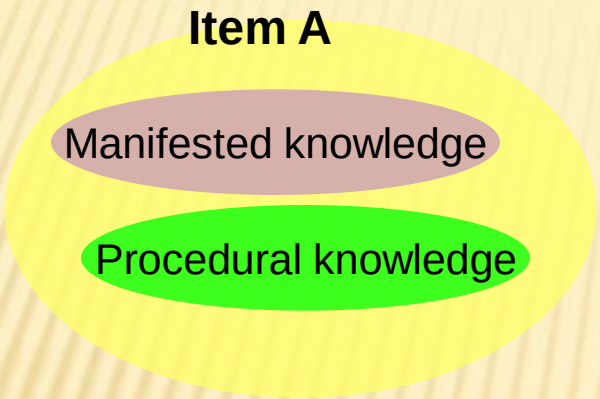
- Explosive growth in knowledge
  - Engineering Department/Number of lectures in School of Engineering 900/700
- Dilution of knowledge ties
  - Deleterious impact of sub-dividing of academic fields
  - From primary schools, secondary schools to universities and society
- Real time nature
  - Frontline research, social conditions reflected in education

Quantity, Quality, Speed

STRUCTURING OF KNOWLEDGE AND EDUCATION

- “Broad, Deep “
  - Broad knowledge and deep understanding
  - Theme-oriented model, Problem-solving model
- Knowledge Management (including time series)
  - Shifts in knowledge and needs
- Knowledge Circulation
  - Greater efficiency, enhancement of education
- Knowledge Ties
  - Ties with other databases and educational materials
  - Providing more knowledge and assessing the degree of achievement

“CIRCULATION” AND “REUSING” OF KNOWLEDGE – CONTINUITY AND SYNTHESIS



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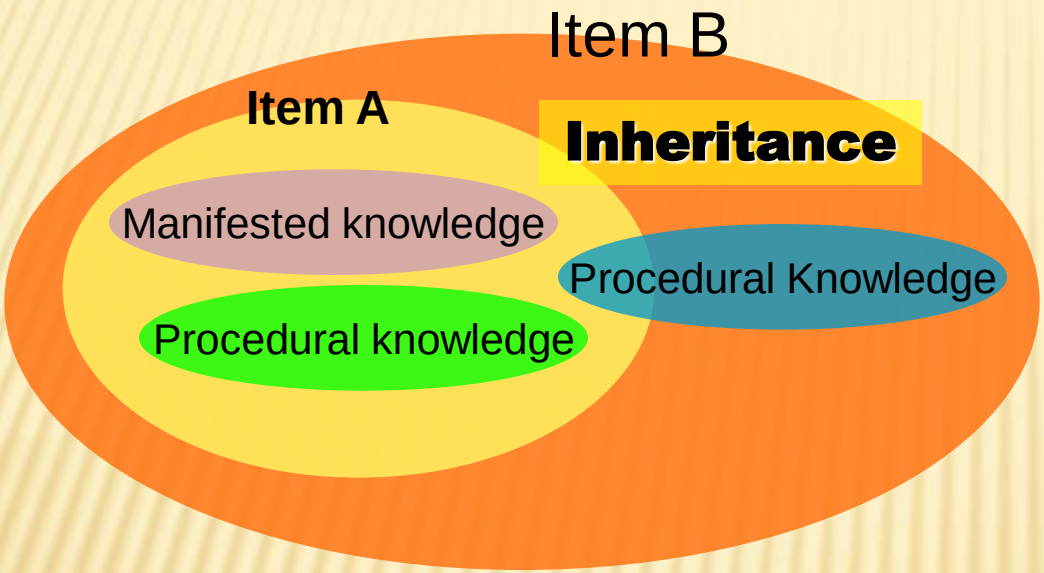

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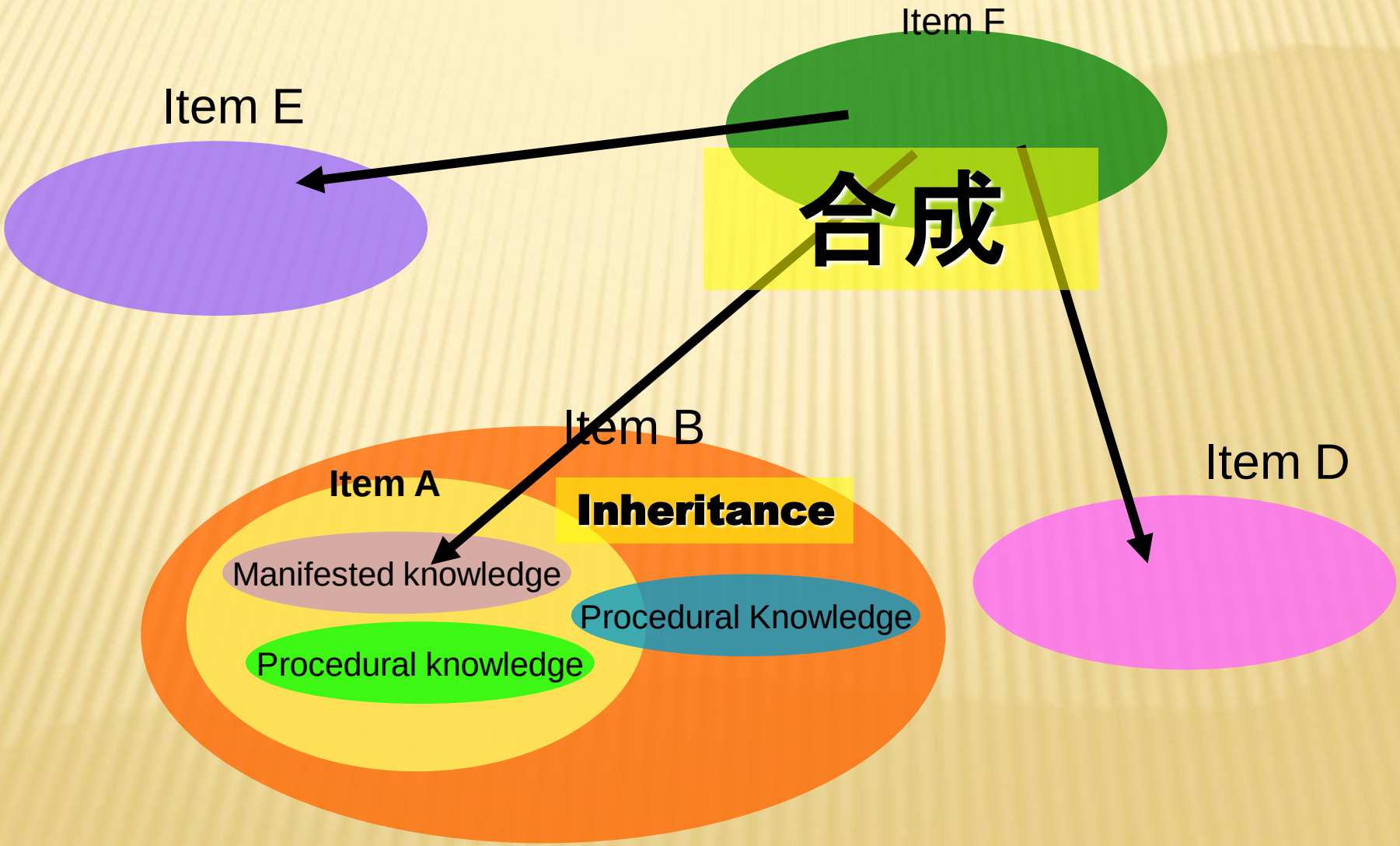
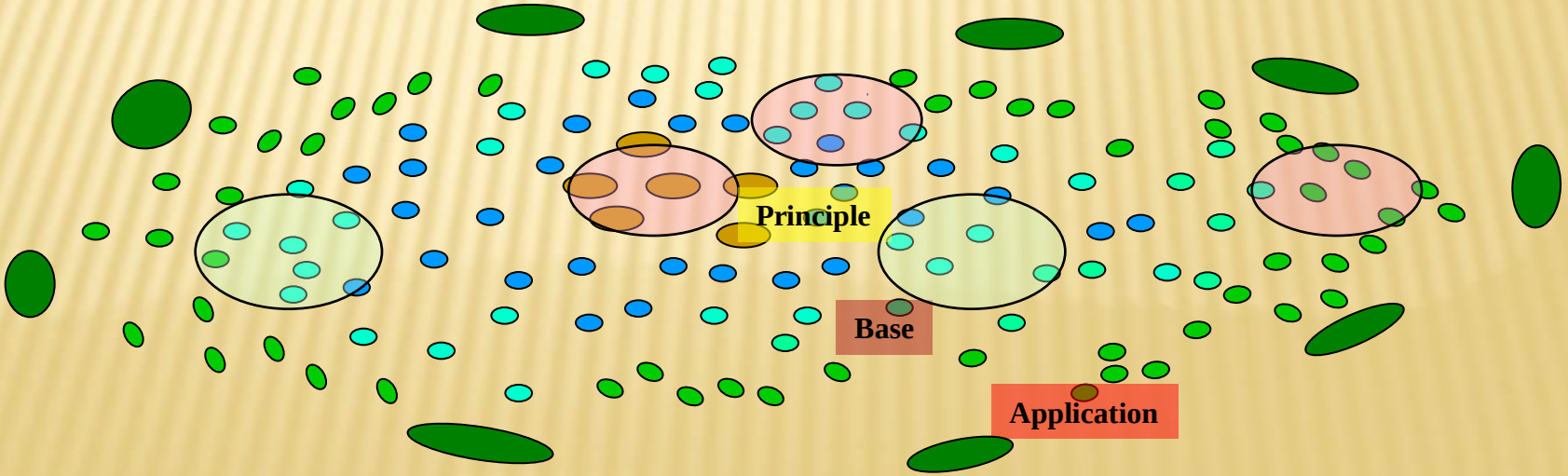


PROCESS OF PROGRESSION

Synthesis leading to synthesis leading to inheritance leading to synthesis leading to. . .



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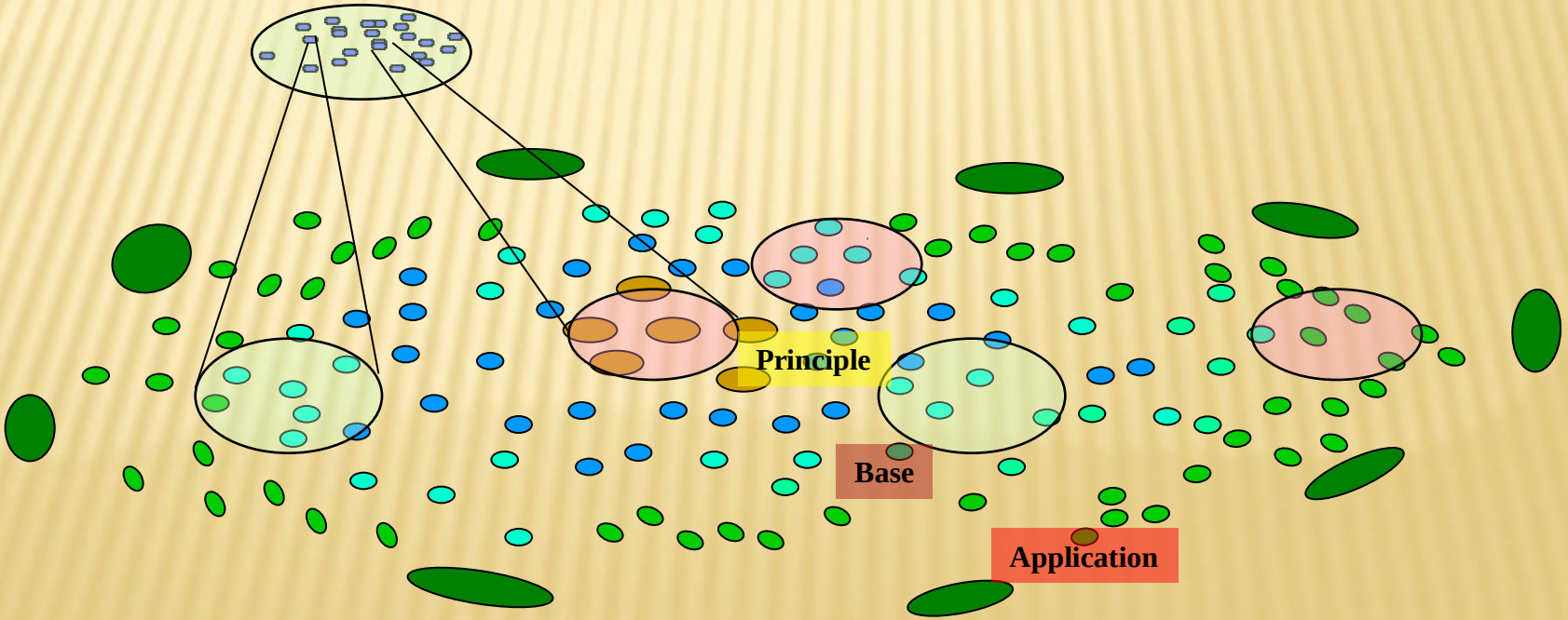

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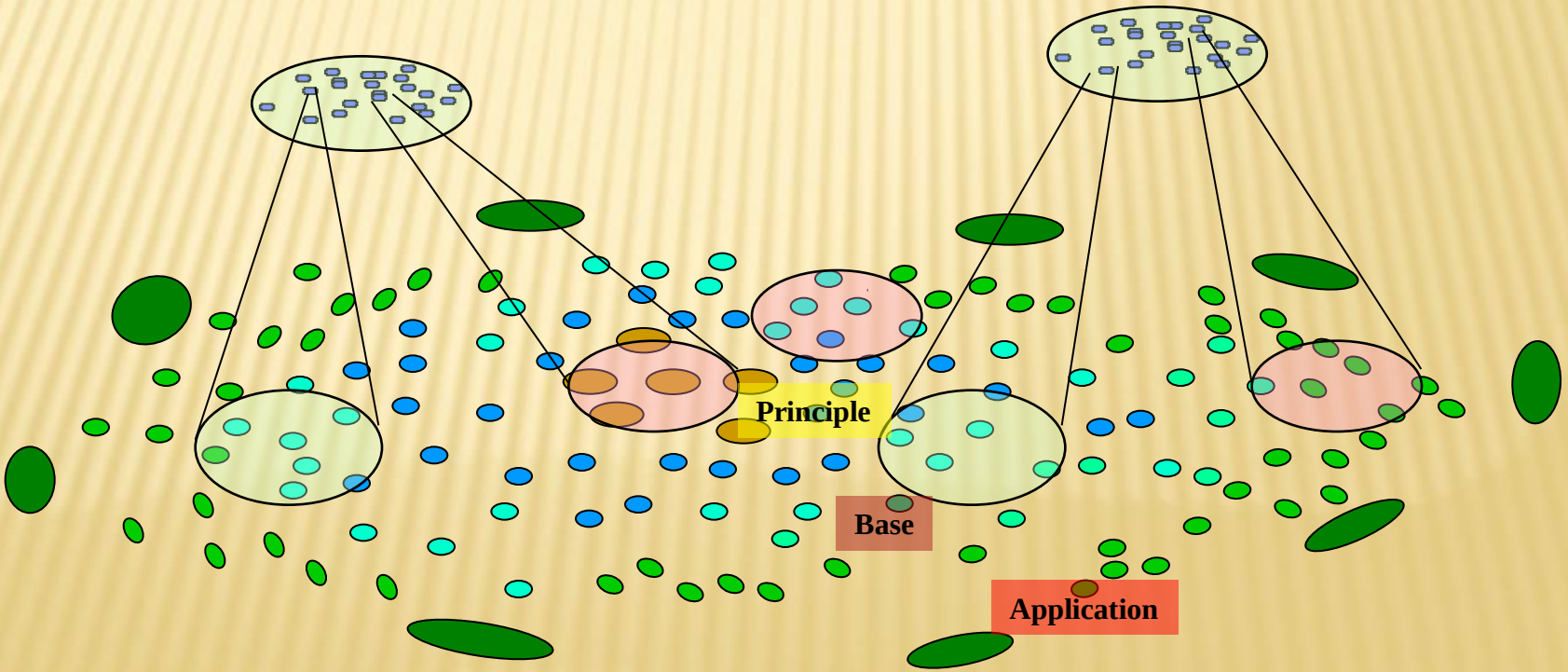

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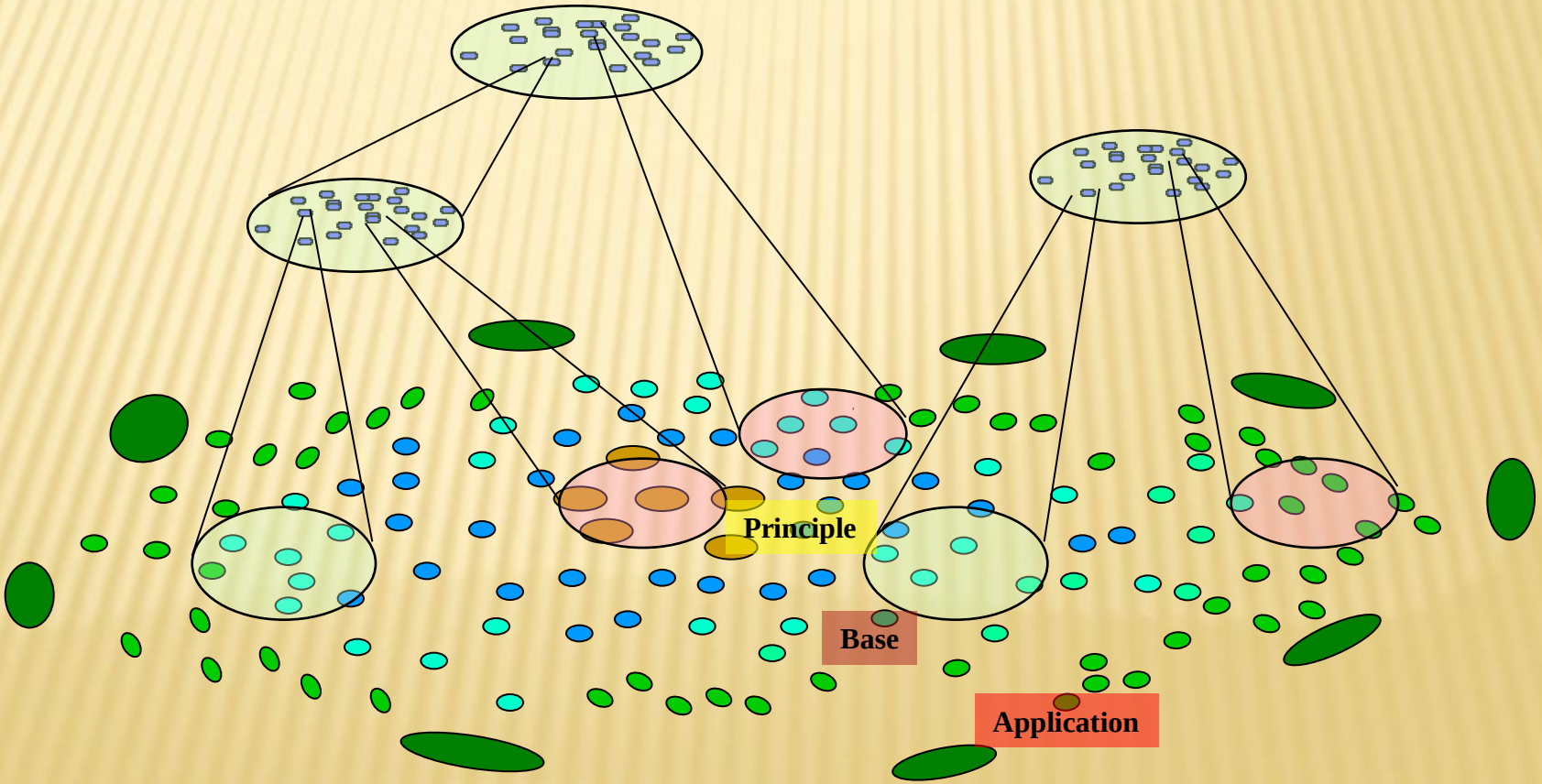
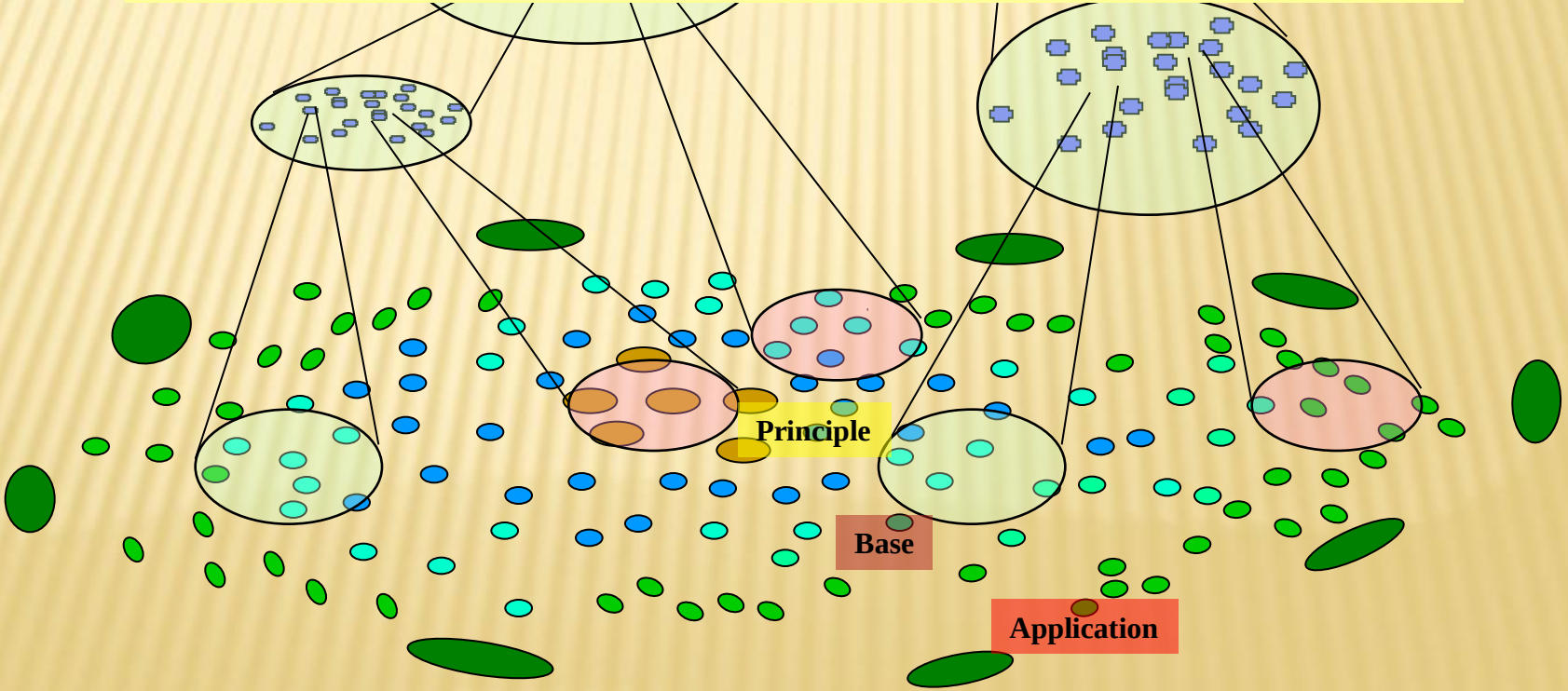


PROCESS OF PROGRESSION

Synthesis leading to synthesis leading to inheritance leading to synthesis leading to. . .

Vertical axis and horizontal axis by the field

Elimination of minor items which are rarely consulted about



SUPPORT FOR KNOWLEDGE CIRCULATION

東京大学 THE UNIVERSITY OF TOKYO

Knowledge which Can Be

Creativity

Creation of Individual Items with Wiki

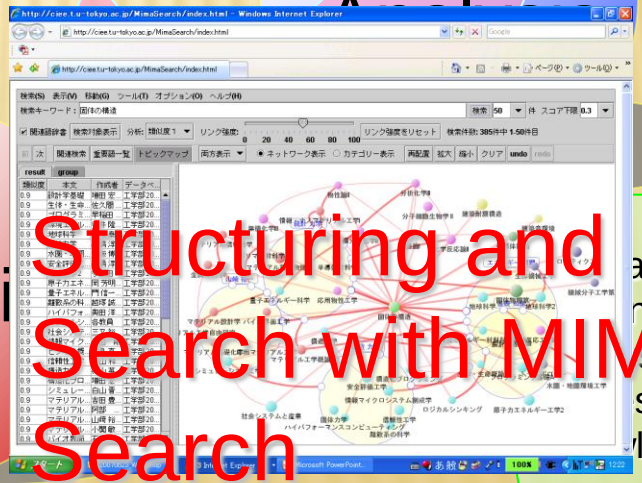
Creation of new indexed items

Selection Synthesis

Search

Visualizi

Structuring and Search with MIMA Search



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Clarification of related items

SUPPORT FOR KNOWLEDGE CIRCULATION

東京大学 THE UNIVERSITY OF TOKYO

Creation of new indexed items

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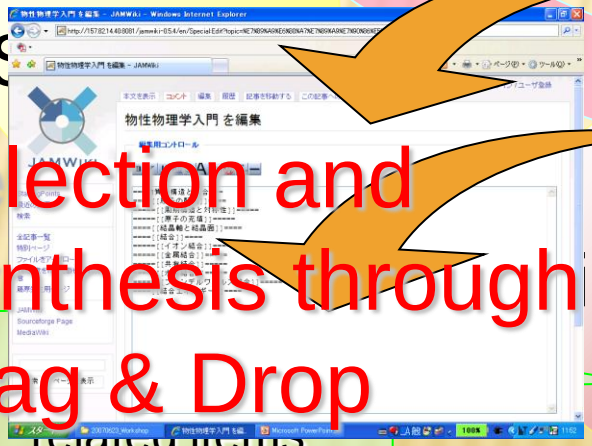
Knowledge which Can Be

Creation of Individual Items with Wiki

Creativity

Search

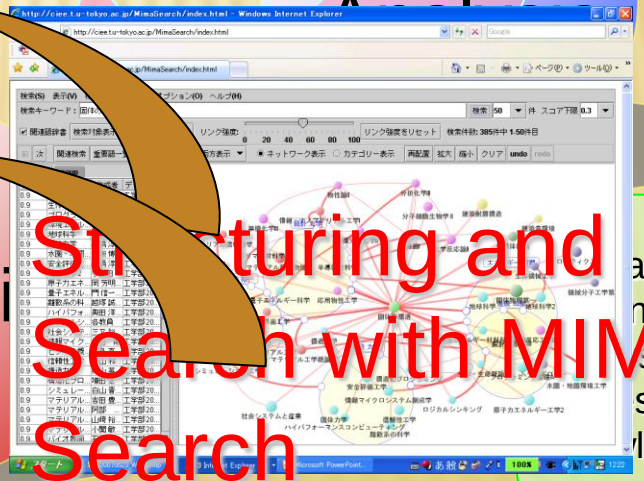
Selection



Selection and Synthesis through Drag & Drop

related items

Visualizi



Structuring and Search with MIMA Search

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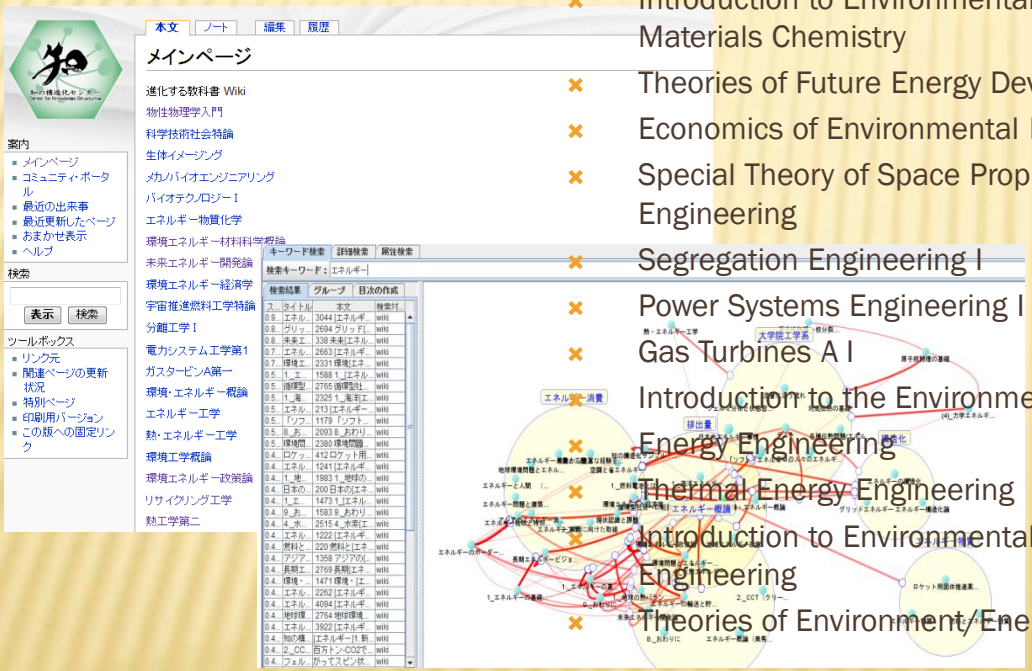
PROGRESSIVE TEXTBOOKS

29 Lectures
Roughly 240 Items

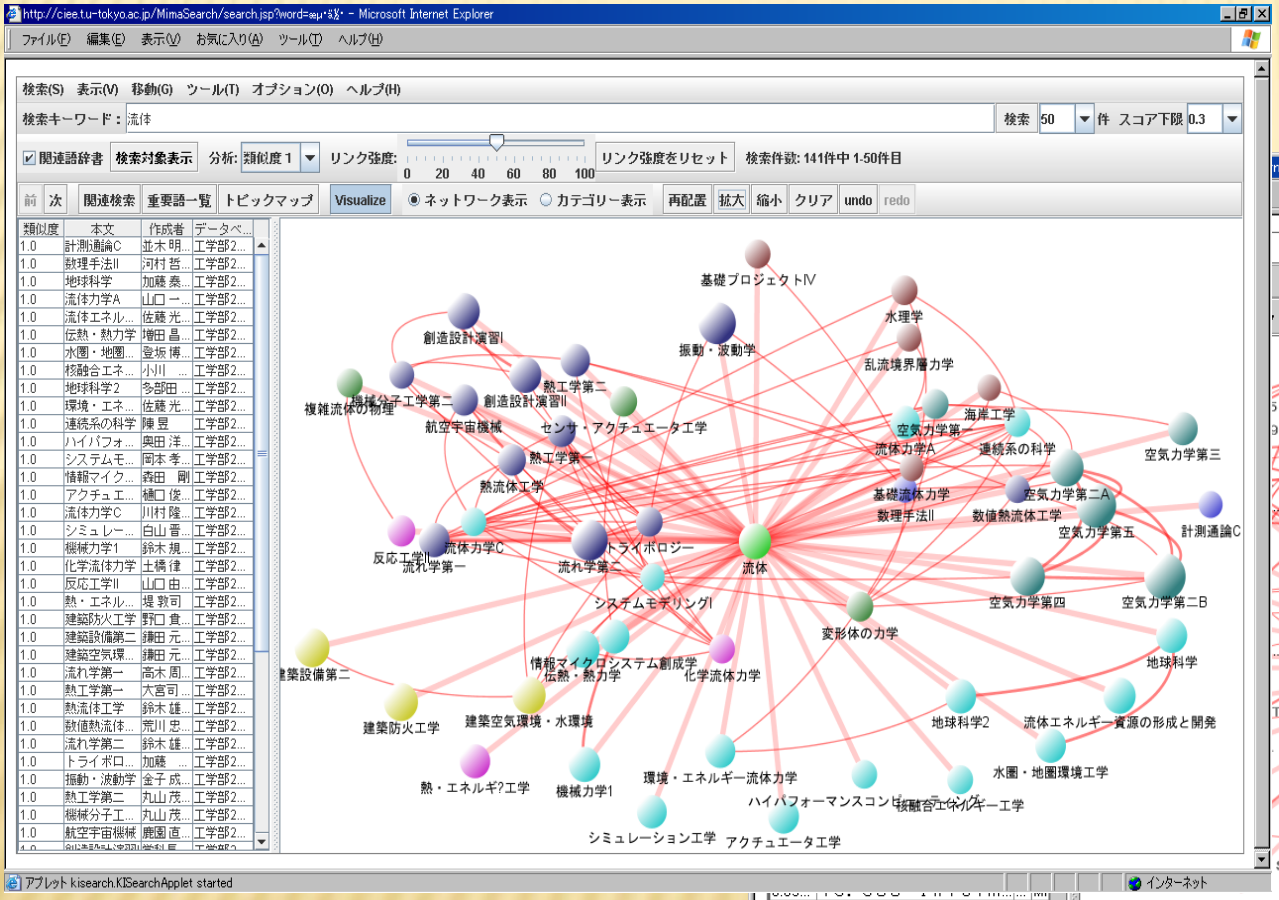


- Introduction to Condensed-Matter Physics
- Special Theory of Science & Technology in Society
- Bio-Imaging
- Biotechnology I
- Energy & Hydrocarbon Chemistry
- Introduction to Environmental Energy & Materials Chemistry
- Theories of Future Energy Development
- Economics of Environmental Energy
- Special Theory of Space Propulsion Fuel Engineering
- Segregation Engineering I
- Power Systems Engineering I
- Gas Turbines A I
- Introduction to the Environment/Energy
- Energy Engineering
- Thermal Energy Engineering
- Introduction to Environmental Engineering
- Theories of Environment/Energy Policies
- Nano-Bioengineering
- Recycling Engineering
- Thermal Engineering II
- Reaction Engineering II
- Ethics for Technicians
- Theories of Environment/Energy Policies
- Nuclear Energy Engineering
- Global Environment Engineering
- Study of Environmental Health Risks
- Nano-/Micro-Fabrication
- Energy Engineering
- Mechano-Bioengineering
- Bio-Interfacing Engineering
- Thermal/Energy Engineering
- Flow Studies I

KNOWLEDGE TIES WHICH TRANSCEND THE UNIVERSITY LEVEL

OCW: LINKING UP UNIVERSITY OF TOKYO LECTURES AND MIT LECTURES
KNOWLEDGE TIES WHICH TRANSCEND THE UNIVERSITY LEVEL

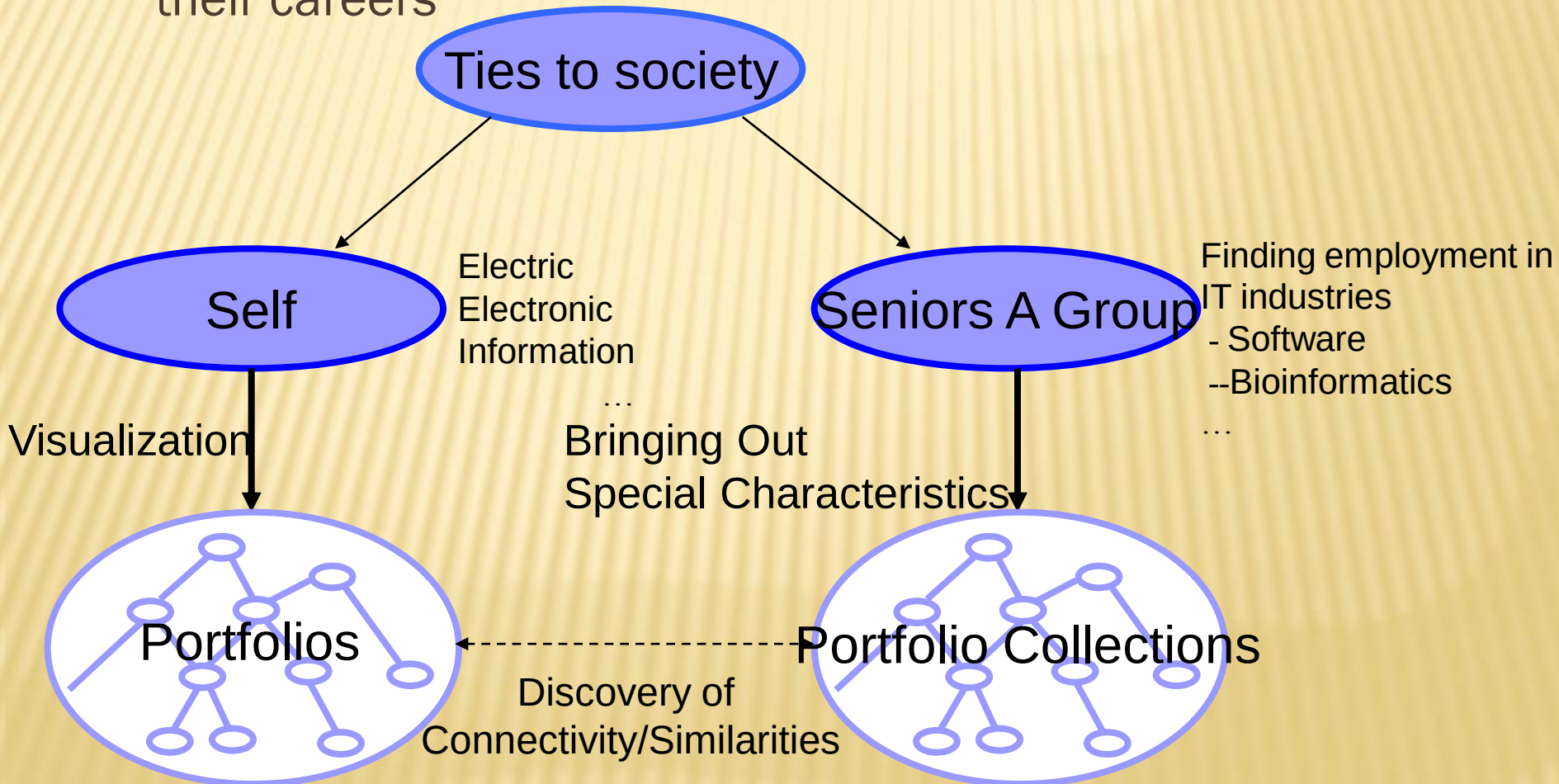
http://ciee.t.u-tokyo.ac.jp/



http://ocw.u-tokyo.ac.jp/

PORTFOLIOS AND PATH SIMULATIONS

- Visualization of own degree of learning attainment
- Studying academic records of one's seniors and relationship to their careers



SUMMARY

EDUCATION, RESEARCH & UNIVERSITIES ON THE INTERNET

"Global Focus on Knowledge" and "Interfacing"

NEED FOR STRUCTURING OF KNOWLEDGE

"Know Others"