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| Description | 一般講演要旨 |

CHAMPION DATA COMPARISON IN NUCLEAR RESEARCH INSTITUTES IN EUROPE, THE U. S., AND JAPAN

○KAZUAKI YANAGISAWA^{†1}

†1 Japan Atomic Energy Agency; 1233 Watanuki, Takasaki, Gunma 370-1292-Japan

1. INTRODUCTION

Valuable and retention-worthy knowledge is born as a result of research activities in nuclear institutes. Such knowledge should be provided explicitly in the form of research papers to facilitate more usage for educational purposes and nuclear knowledge management. Using research papers provided by JAERI-Japan and 10 prestigious international nuclear research institutes (PNRI), an institutional comparison by bibliometric method was performed for this study from the view point of ex-post research evaluation. This comparison is aimed at learning the volume of intellectual assets produced by each institute and also looking from the view point of knowledge management for the benefit of taxpayers in order to explain an accountability or a transparency of national institutes funded mainly by the government [1].

2. ANALYTICAL METHOD

2.1 Prestigious institutes chosen

The following PNRI (JAERI plus 10 other international institutes) were chosen for the present study. They are all well-renowned national institutes (laboratories) with historical nuclear research programs.

JAPAN: Japan Atomic Energy Research Institute (JAERI)¹
 The U.S.: Oak Ridge National Laboratory (ORNL), Sandia National Laboratory (SNL), Argonne National Laboratory (ANL), Brookhaven National Laboratory (BNL) and Idaho National Laboratory (INL)
 EUROPE: Karlsruhe (FZK) and Juelich (FZJ) in Germany. CEA/Saclay, CEA/Grenoble, and CEA/Cadarache in France

2.2 Research tools

As the principal research tool, the International Nuclear Information System (INIS), owned and operated by International Atomic Energy Agency (IAEA) was used [2]. INIS has been in existence since the year 1970 and today 118 countries and 23 international organizations co-operate for managing nuclear information resources. Research outputs from JAERI and the other international research institutes chosen for the study are provided into the system regularly.

Additionally, the U.S. Department of Energy (DOE) Office of Scientific and Technical Information (OSTI) builds the Energy Citation Database (ECD), operating since 1948 [3]. Research outputs of JAERI and other renowned international research institutes are also included in this database. The subject scope includes all energy-related topics. ECD includes international information published through the mid-1970's. Since that period, ECD is populated primarily with U.S.-published research results due to dissemination limitations placed on internationally-exchanged information. ECD in the present study was used as a reference. Further, the Web of Science (WOS) from ISI-Thomson [4] was also used as a reference because managers interviewed indicated it to be a more familiar tool to many of the major nuclear research institutes located in Europe.

2.3 Time span

¹ JAERI was reorganized in 2005 and renamed as the Japan Atomic Energy Agency (JAEA). The present study addresses intellectual assets created by JAERI. Hence, JAERI is used in the text.

From CD-ROM or the Website, INIS provides published papers with a time span of 25 years (1978-2002) and for 5-year periods, that is, present (1998-2002), past 5 (1993-1997), past 10 (1988-1992), past 15 (1983-1987) and past 20 (1978-1982). In comparison, ECD can provide submitted papers with a time span of 50 years (1953-2002), 25 years (1978-2002) and 5-year periods. WOS has a similar functionality as that of ECD.

3. RESULTS

3.1 Institutional comparison by INIS

Figure 1 shows the total number of papers provided by JAERI and 9 other PNRIs over the 25 year period of the study.

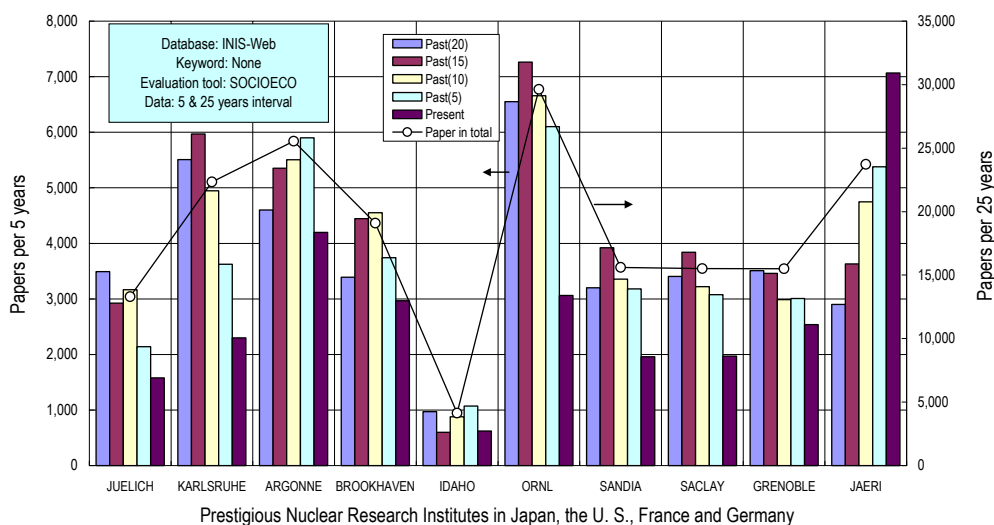


Fig. 1 All papers published in JAERI and 9 PNRIs during the period 1978-2002. Open circles show the total published papers during 25 years at each institute (scale is shown on the right-hand side) and the columns show the papers published during 5-year increments at each institute (scale is shown on the left-hand side). Database used was INIS.

After review of the data, the following conclusions can be reached:

- (1) Over the 25 years of research activities, the papers are of the order

ORNL>ANL>JAERI>FZK>BNL>SNL>Saclay>Grenoble>FZJ>Idaho /1/

JAERI is in the 3rd position, following ORNL and ANL. Through interviews with corresponding managers, it was understood that the change of nuclear policies (e.g., de-emphasis of reprocessing policies in the U. S.), the nuclear accidents (e.g., TMI (1979) and Chernobyl (1986)), and economical dynamics (e.g., the 2nd oil shock in Japan) and so on, are significant factors having much influence on research activities, including the number of research publications produced. Therefore, the capability of knowledge retention is affected by those external events.

(2) For each 5-year period of research activities, the number of papers in JAERI increased period to period. However, research papers in the other 9 PNRIs decreased from the past (20) to the present. A comparison between ORNL and JAERI at present (1998-2002) shows that ORNL is about 3,000 and JAERI is about 7,000. Just reviewing the numbers, it appears that readers would think that JAERI is alone in increasing its research activity in the world and the other 10 PNRIs are decreasing their research activities. This viewpoint is, on the surface, rather unlikely. To gain further insight as to its validity, the author carried out a similar bibliometric analysis using WOS.

3.2 Institutional comparison by WOS

WOS focuses mainly on the research papers submitted to journals in the field of natural sciences; WOS has the advantage of being able to show a citation index or an impact factor. Research papers presented at international conferences and published in the form of proceedings are usually omitted, however. Because WOS has a large volume of citations, though, WOS data may be a good representation of publishing patterns in advanced research fields.

A bibliometric study was done similar to that of the INIS database. Results obtained are shown in **Figure 2**. Note that in this case, the time span was extended an additional 5 years from 1978-2002 (present) to 1978-2007 (present-m) as denoted in the legend of the figure.

Conclusions reached from this analysis were interesting.

(1) It is evident that there is a significant difference between the totals for U.S. papers and those from the other international sources. It is surmised that WOS may draw its data primarily from U.S. data sources, especially for historical periods.

Among the U.S. papers, the ranking according to WOS is of the order

ORNL>ANL>BNL>SNL>Idaho /2/

(2) As was clear from equation /2/, ORNL here is the champion, too. One regrets to say that Japan, France and Germany totals are negligible, based on the data available within WOS.

(3) It is worth to mention that in the 5-year data increment comparisons within WOS, all research institutes had a tendency to increase from the past (20) to date. This observation is apparently the reverse to that shown using the INIS database. The authors attribute this reversal to the likelihood that journal publishing is less dependent on the factors influencing research report and conference paper generation noted as contributing factors to the INIS database results. A shortcoming of WOS, though, is that there is insufficient bibliometric data for Japan, Germany and France (only Cadarache even appears at all). Thus at the moment, it is not realistic to carry out meaningful international comparisons using WOS, although it was valuable for U.S. sources and to verify research trends.

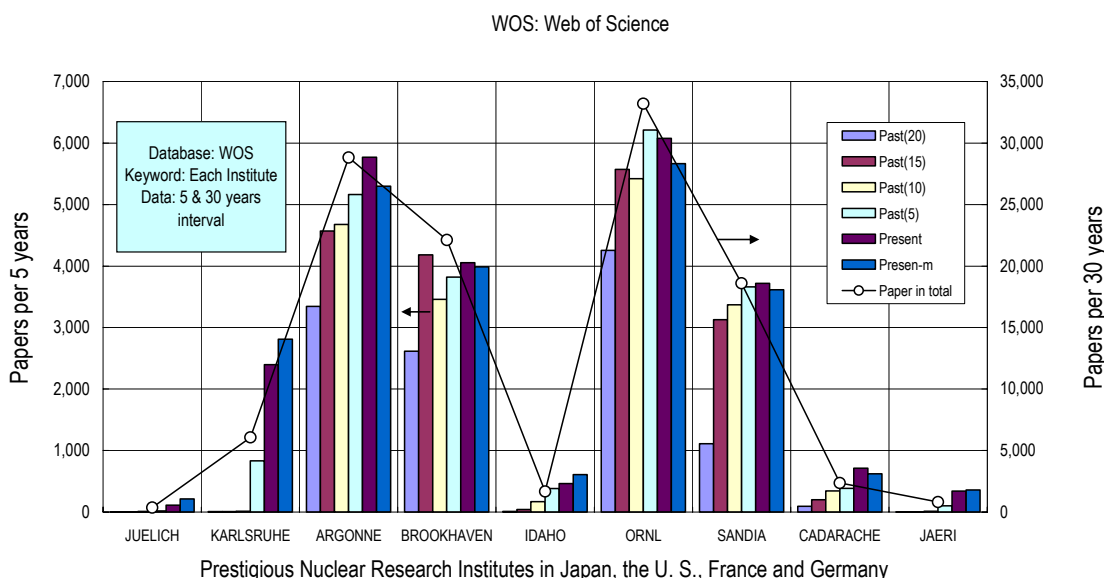


Fig. 2 All papers published in JAERI and 8 PNRIs during the period 1978-2007. Open circles show the published papers during 30 years at each institute (scale is shown on the right-hand side) and the column shows the papers published during every 5-year intervals at each institute (scale is shown on the left-hand side). Database used was WOS.

3.3 Institutional comparison by ECD

To gain a third perspective of the results available from these prestigious institutes, **Figure 3** illustrates the total number of papers using ECD as the basis.

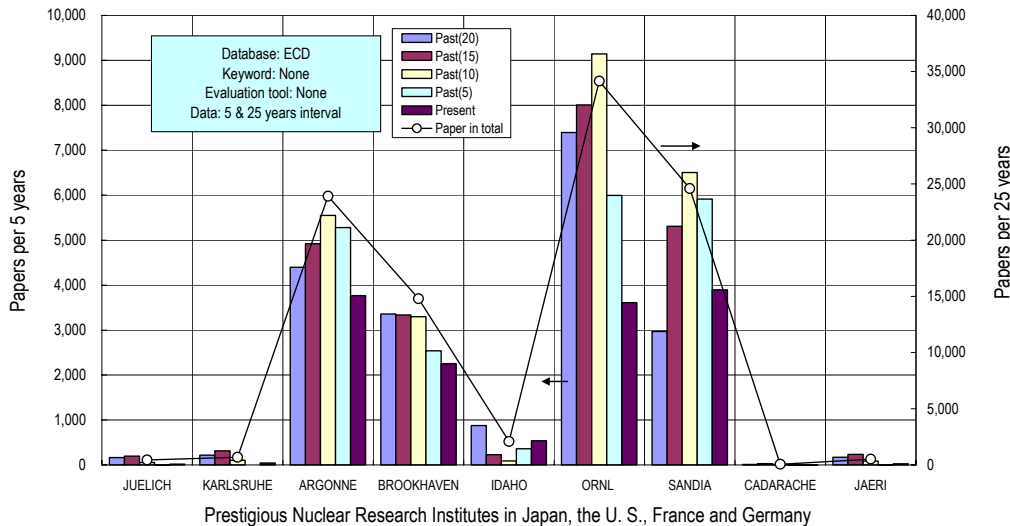


Fig. 3 All papers published in JAERI and 8 PNRIs during the period 1978-2002. Open circles show total published papers during 25 years at each institute (scale is shown on the right-hand side) and the columns show papers published during 5-year increments at each institute (scale is shown on the left-hand side). Database used was ECD.

The following observations can be made from these results.

(1) For the time span of 25 years (1978-2002), non-U.S institutes have a very poor number of papers reported (only 4 of the PNRIs selected for the study appear). This is a quite different point of view from the INIS analysis but quite similar to that of WOS. Likely, ECD and WOS are the distinguished databases targeted at reflecting U.S. research. For ECD, this has been verified to be the situation for the period evaluated. Out of the U.S. papers evaluated in ECD, they are ranked in the order of

ORNL (34,149 papers)>SNL>ANL>BNL>Idaho /3/

ORNL is here the champion, too. One regrets to say that JAERI is in the 7th position, almost negligible. However, this appears due to the strong U.S.-focus of the database, not necessarily reflective of JAERI's research efforts.

(2) For the time span of 50 years (1953-2002), the total number of papers are of the order of

ORNL (55,857 papers) >ANL (37,129 papers) >
 SNL (24,628 papers) >BNL(24,289 papers)>Idaho (2,398 papers) /4/

It should be noted that SNL may have additional papers that have a different subject scope, while SNL and Idaho did not publish papers before 1979 and 1975, respectively as the named institute.

(3) For the 5-year increments of research activities, papers vary from one to another time span. Around the past (10) timeframe (1988-1992), a significant reduction of papers occurred at most U.S. institutes. Possible factors contributing to this reduction learned during interviews could be changes to the nuclear mission by the U.S. government, reduction of human resources to create and process papers, and reduced reporting requirement policies being put into place.

4. CONCLUSIONS

- (1) The present bibliometric study shows that research knowledge from JAERI and 10 PNRIs is retained successfully and is available in the INIS database, as well as the more U.S.-focused WOS and ECD systems. The retained knowledge (some over 50 years old) could and should be utilized for educational and training purposes.
- (2) Well-retained and indexed knowledge can provide a sound basis for institutional comparison which is valid from the viewpoint of nuclear knowledge management. Within the present study's scope and period evaluated, the world champion among JAERI and the 10 other institutes is ORNL. This is supported by the volume of papers included in INIS, WOS and ECD, although international information in the latter two is limited.
- (3) INIS is an advanced, key tool for performing international comparisons among PNRIs. Over the 25-year time span of research paper publication, JAERI is the 3rd ranked institute following ORNL and ANL.
- (4) Different characteristics exhibited by individual databases can sometimes generate conflicting bibliometric results. This was true among INIS, WOS and ECD when looking at trends between 5-year periods. It implies that results from analytical tools used in bibliometric studies should be viewed with careful consideration to learn of any influencing factors.
- (5) Based on interviews, use of WOS has tended to grow for U.S. and Europeans, while use of INIS has predominance in Japan, and ECD in the U.S. However, users looking for research results from JAERI and other non-U.S. institutes would be better served using INIS. ECD and WOS are both valuable for U.S. research results, with the latter system potentially growing in international content.

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