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Feature

Roads to Open Access

Considering Future Systems
for Distributing Academic Information

Can Open Access Solve the E-Journal Problem?

Takashi Hikihara [Director-General of Kyoto University
Library Network / Director of Main Library, Kyoto University]

Tomorrow's Scholarly Information Systems

Jun Adachi [Deputy Director General, NII]

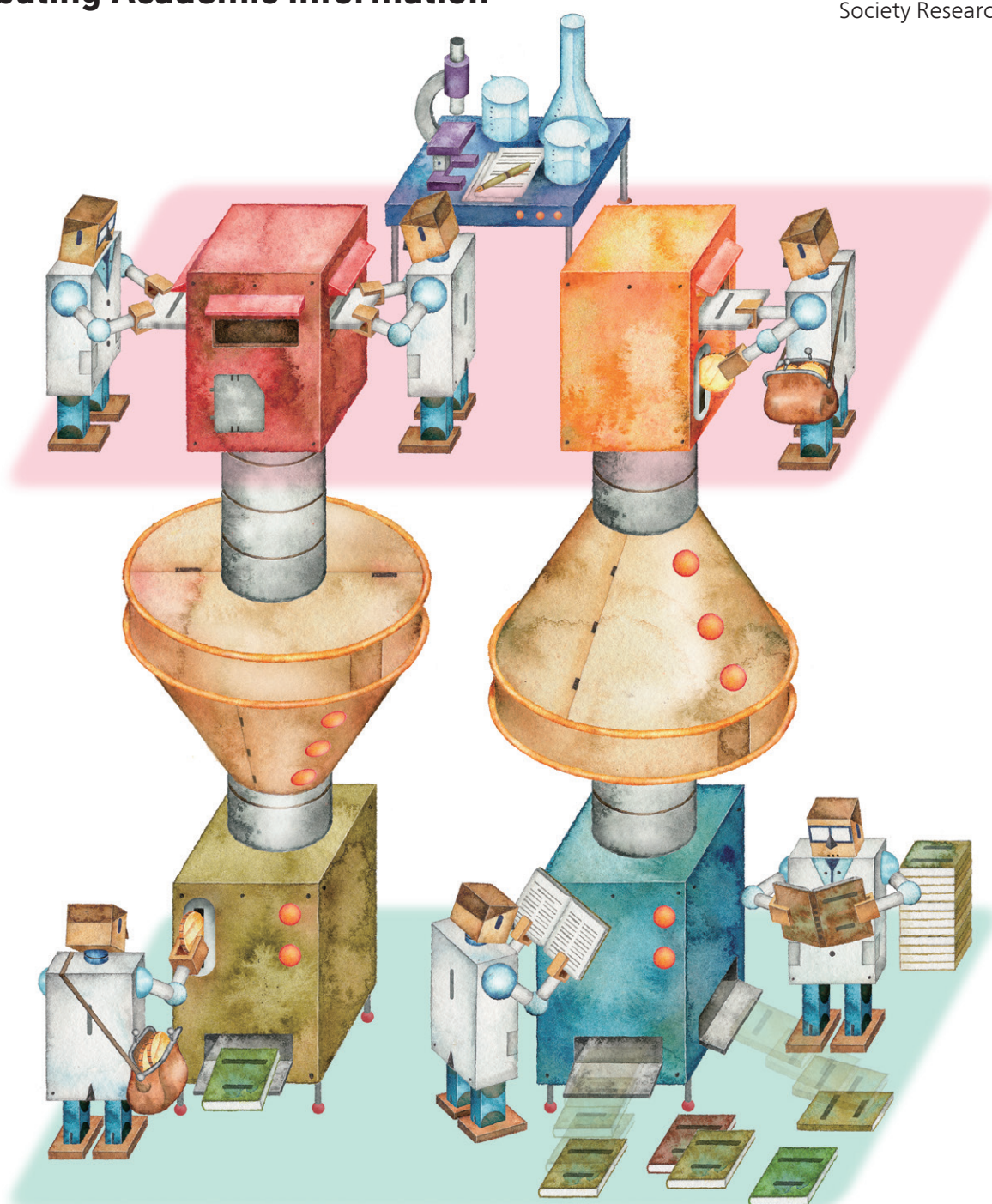
Dialog Key Initiatives for Promoting Open Access

Midori Ichiko [Administrative Director, Keio University Mita
Media Center / Chair of JUSTICE Steering Committee]

Koichi Ojio [Project Researcher, Research Center
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Commentary Putting Journals Back into the Hands of Academia

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Can Open Access Solve the E-Journal Problem?

Kyoto University's efforts to improve the research environment

Takashi Hikihara Professor, Graduate School of Engineering / Director-General of Kyoto University Library Network and Director of Main Library, Kyoto University

Interviewer: Jun-ichi Taki Senior Staff Writer, Editorial Bureau, Nikkei Inc.

Publishing and reading research results in academic journals are essential for researchers. Concern about researchers losing access to journals is becoming a reality due to steep price rises for electronic journals offered by major international publishers, in addition to cuts in university operating subsidies. Will moves to collect articles and make them freely available in the electronic archives of institutions such as universities (institutional repositories) change the situation? I asked Professor Takashi Hikihara, Director-General of the Kyoto University Library Network.

Taki What do you think about the impact of soaring prices of e-journals on research at universities?

Hikihara Due to regular price hikes by the oligopoly of publishers, currency fluctuations, and so on, prices are constantly increasing. Meanwhile, subsidies for university operating expenses are

decreasing every year, and the increase in journal subscription fees is putting pressure on university finances. The Japan Alliance of University Library Consortia for E-Resources (JUSTICE) is having some success in negotiations with international publishers, but has not yet managed to put a stop to the price increases.

Subscriptions to e-journal package deals start at the same price as when the journals were purchased in print form. Consequently, they have the benefit of allowing access to more journals than before digitization. It is possible to change the contract dynamically when the package price increases and subscribe to many inexpensive journals. There are universities that actually do this, but it has a downside in that they lose access to journals that were once available to them thanks to digitization.

Also, with the privatization of national universities, independent responses by each university have become the norm, and the details of their respective contracts cannot be disclosed. This has fragmented the response from national universities. Furthermore, the switch to HTTPS has made information on who has downloaded which articles confidential, and it is becoming impossible to acquire this information even within a university. When transparency about the use of articles is lost, it makes negotiations with publishers difficult, and it also makes it difficult to determine how to divide subscription costs between departments within universities.

Taki As interdisciplinary research increases, new journals will be required in addition to existing subscriptions. Questions will be raised about which journals are really necessary and who should pay for them.

Hikihara Publishers say that they will make an article open access so that anyone can read it, if the author pays an article processing charge (APC). If researchers are told that making their article open access is good for increasing citations, then they will probably pay the APC from their own research fund. From the universities point of view, this means that they are paying twice. Universities and researchers have to change their perspectives and financial operations regarding journals, but the system that divides universities and researchers is invisible so that no one knows what is fair and what isn't. They can't keep up with the



Takashi Hikihara

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changes.

Taki Is open access (OA) the answer to this problem?

Hikihara OA has advanced by way of making articles that have already been published but are only accessible to subscribers openly available. More broadly speaking, by making academic journals available to people who could not access them in order to share and disseminate scientific results, OA is consistent with the essence of science, which is to promote the spread of knowledge. One method of OA is to register the author's edition of an article after peer review but before publication in a journal, as well as articles that have the consent of the publisher, into an institutional repository belonging to a university or other institution. Another method is to make articles prior to peer review (preprints)^[1] accessible on a server.

Institutional repositories and preprint servers may not be very attractive to researchers who want the added value of a journal's name or indicators such as citations and impact factor (IF)^[2], but open access in the broad sense is desirable when one considers the scientific community as a whole.

Kyoto University adopted its open access policy in April 2015. It stipulates that open science will be developed to protect researchers and research, and proactively secure sources of new knowledge. Young researchers have a positive understanding of this policy. The electronic publication of academic dissertations was made compulsory in 2013, and this was important because it gives people a sense that open access is a matter of course. As a result, more than 10,000 articles are deposited into the repository every year.

Taki What triggered the creation of the policy?

Hikihara In the Research University 11 (RU11) consortium, formed of eleven Japanese universities, there were calls to take another look at the situation regarding foreign e-journal contracts, and I traveled to the USA in 2014. On that trip, something someone involved with American libraries said about OA made an impression on me. They said that "access to articles is not being opened up because journals are expensive, it is being opened up in order to rebuild the research community." OA connects people who weren't connected before. It allows young people to access the research of more experienced researchers, not just within a university, but from anywhere in the world. If I think about it, when I was young, I learned by reading preprints handed out by older researchers at seminars and the like. That practice is dying out now. I realized that OA is an opportunity to reevaluate the community.

At Kyoto University, our policy is to put as much as we possibly can into the repository. The contents have already reached between 150,000 and 160,000 articles, and we are aiming for 210,000 articles over the next six years. The repository is number one in terms of abundance and diversity among all Asian universities, and it has grown into one of the foremost institutional repositories in the world.

Next, there is no doubt that publishing companies will move on to open data as a way of controlling the source of research and making a profit, so discussions are underway about what preparations should be made for progressing to open data, assuming that articles have first been made open access.

Taki Could repositories be used to evaluate researchers too?

Hikihara The function of libraries and institutional repositories is to support researchers, not to evaluate them. Our policy is to put

what we can into the repository, but if researchers don't want to put their research in, they don't have to and we allow them to opt out. This is because it would become an evaluation if they had to put their research into the repository. At Kyoto University, there are many faculty members in the humanities, and they cannot gain an equal footing with the sciences. Open access allows people to view each other's research, regardless of whether it is in the humanities or the sciences, and a major aim is to expand interdisciplinary research.

Taki Traditionally, journals have taken on the job of assuring the quality of articles and distributing them, but that way of doing things has changed.

Hikihara At the stage when journals were simply converted into electronic form, the journal's name was still attached and the publisher held the information. Publishers who owned many journals were strengthened by a belief in the numbers. Citations and impact factors took on a life of their own, and while there is no doubt that excellent articles appear in prestigious journals, the upside-down logic that if an article appears in a prestigious journal, then it is a good article started to become accepted. The question of how best to assure the quality of academic information and distribute it should, under normal circumstances, be considered by universities.

Looking at the USA, the Gates Foundation has started publishing the equivalent of academic papers on the Internet and having experts review them. Google is participating in preprint servers for artificial intelligence (AI) research. People are increasingly deciding to judge for themselves, without relying on journal evaluations. The paradigm is changing.

(Photography by Mito Takahashi)

Note

[1] A manuscript, written with the aim of being published as an academic paper in a journal, that is uploaded to an Internet server when it is complete, prior to peer review. Well-known servers include arXiv.org, established in 1991.

[2] A measure of the influence of an academic journal. Reflects how often, on average, articles published in a certain journal were cited in a given year.

A Word from the Interviewer

Professor Hikihara says that he was told not to read academic papers when he was a student. What this advice was warning against was "popular papers." It was implying that papers should be read not in order to follow the fashion of the day but to understand what thoughts researchers that have come before you have had on your subject and what kind of data they have collected. The weakening of the foundation of this community is an issue.

After academic papers, the problem becomes research data. Who should collect, manage, and publish the data that academic papers are based on? This discussion will apparently lead there.

Jun-ichi Taki

Senior Staff Writer, Editorial Bureau, Nikkei Inc.

Born in 1956. Joined Nikkei Inc. after graduating from the School of Political Science and Economics at Waseda University. At Nikkei, worked in regional bureaus and as a business news reporter before becoming responsible for science, technology, and environmental news in the mid-1980s. Author of *Eco uma ni nore!* (Ride that Eco Horse!) (Shogakukan Inc.) and co-author of *Kansen-sho retto* (The Archipelago of Infectious Disease) (Nikkei Inc.), among other works.



Tomorrow's Scholarly Information Systems

Open access as a key to sustainability

Jun Adachi Deputy Director General / Project Professor, NII

Interviewer: Atsuko Tsuji Designated Professor, Institute of International Education & Exchange, Nagoya University

Recent years have witnessed great changes and much progress in open access (OA) initiatives. The conversion of all the existing journals into OA was once regarded as totally unrealistic, but as it advances, European countries are stepping up their efforts as national strategies. What is going to change and how? How must Japan prepare for these changes? Professor Jun Adachi has long been involved with OA, and he considers it essential for dealing with the soaring number of scholarly articles. I asked him about the significance of OA and future issues.

Who will pay?

Tsuji There appear to be various movements centering on OA. How should we view these movements?

Adachi Scholarly journals have traditionally been accessed by paying a subscription fee. However, against a backdrop of steep increases in the price of journals, OA initiatives have been launched and have yielded OA journals which allow free access to articles by charging authors an article processing charge (APC) of about 2,000 euros (approximately 260,000 Japanese yen) on average at the time of publishing. This gave rise to questions such as "Who should bear the cost and how?" and "What is an appropriate price?" These questions have been raised along with the advent of new initiatives and confrontations with publishers on a national level in Europe and other regions. The problem with OA is basically the issue of money, and therefore, really tough negotiations are going on. The landscape has changed

dramatically over the past few years, and it will be exciting to see what happens next.

Tsuji This is a different side to the concept of making articles openly accessible, isn't it?

Adachi Yes. The following estimation was done in Germany where efforts to promote OA are being made nationally. Two million articles are published worldwide every year, and calculating the cost per article from subscription fees gives 502 thousand yen. However, with the OA model, the price per article is only 284 thousand yen. In other words, it is 45% cheaper. Japan publishes 50,000 articles, and so the price falls from 25.1 billion yen to 14.2 billion yen, which means that approximately 10 billion yen is being overpaid.

Meanwhile, scholarly publishing is a trillion-yen business worldwide, with three major companies, Elsevier, Springer Nature, and Wiley, accounting for 50 to 60%. In terms of numbers of articles, they account for 40%. These statistics say that their prices are relatively high. To that extent, their profit margins are also high. For example, Elsevier's profit margin is 40%. Over the past few years, countries such as Germany and the UK have participated in negotiations with a strong commitment to make prices more reasonable, because if prices drop, the money can be used for other things.

Tsuji Which is why there is a desire to promote OA?

Adachi It's not just about reducing the cost, but also that without OA it will be impossible to deal with the ever-increasing number of articles. Moreover, I think the way of doing things needs to be changed completely, so that each country pays appropriately according to the number of articles they write. Current scheme is that countries with few researchers are paying more money every year just to read more articles produced in other countries, and stakeholders in developed countries recognize that this cannot be sustainable. The same is all true within Japan: while there are research-oriented universities like



Jun Adachi

the University of Tokyo that produce many articles, small colleges are paying solely to read articles. Taking the journal *Nature* as an example, small colleges that have probably never published an article in that journal also pay a subscription fee for it.

High-energy physics is leading the switch to OA

Tsuji Are attempts at conversion to OA progressing?

Adachi Most of the current OA journals are newly created, but SCOAP3 (Sponsoring Consortium for Open Access Publishing in Particle Physics) pioneered the moves to convert the major existing journals into OA. SCOAP3 was started in response to a call from the European Organization for Nuclear Research (CERN) for the conversion of journals in the field of high-energy physics. Initially, it met with difficulties, as few countries supported it, but it gained momentum from around 2011 after countries such as the USA and Japan agreed to participate. The prices of articles in each journal were determined by a bidding process, and each country pays a share of the total amount commensurate to the proportion of authors from that country, and in turn, publishers reduce the subscription fees for each institution. The key feature is that this reduced amount is collected by CERN and paid collectively to the publisher, so each country does not need to make new payment arrangements.

However, it is up to each university to decide whether they will support the principle of SCOAP3 and pay the contribution, and compared to the USA where there is enough support, the situation in Japan is, to my sorrow, extremely bad, with many universities taking a free ride.

With regard to Japanese journals, *Progress of Theoretical and Experimental Physics (PTEP)* published by the Physical Society of Japan is included in SCOAP3 journals, and the number of downloads of articles has increased several times over, as well as the number of citations.

SCOAP³ is now trying to expand the number of journals it covers.

Tsuji Preprint servers (PPS) also originated in the field of high-energy physics. The field continues to embark on forward-looking initiatives in relation to scholarly information, doesn't it?

Adachi I think that the field has a strong desire to build scholarly infrastructure making full use of IT in order to carry out large-scale experiments in which huge sums of money are invested. As a researcher in informatics, it pains me in some ways to know that the World Wide Web (WWW) also originated at CERN, but I see them as a potential rival who makes us stronger.

PPS, which host articles prior to peer review, originated at the Los Alamos National Laboratory in the US in 1991 and were the forerunners of OA. The first PPS now exists as arXiv.org (pronounced "archive") hosted by Cornell University and has expanded to include from the whole of physics to the fields of computer science, mathematics, and economics. Recently, arXiv.org is receiving attention from IT researchers because Google submits its latest AI research results in this site. There are similar trends in fields such as biology and chemistry.

Tsuji If these initiatives grow, then the situation surrounding scholarly articles will change dramatically.

Adachi What we need to be careful about is that articles are supported and tied to evaluation by peer review. We must proceed cautiously to ensure that the present methods of peer review are not negatively impacted. I am paying attention to the

effects that the tension between PPS and peer-reviewed journals will have on the evaluation of researchers and peer review.

In physics, different ways are used according to the purposes—for example, doctoral qualification requires peer-reviewed journal articles, and on the other hand, PPS is used for the rapid exchange of the latest research works—but I don't know whether things will continue on unchanged. Researchers are rather conservative, and I think that ways of checking inside specialized research communities will remain.

A change in mentality is required in Japan

Tsuji What is the response to these trends in Japan?

Adachi Researchers are not necessarily interested. In Japan, university libraries have pushed to continue to buy journals, so accessing articles is as easy as breathing as long as one is on a university campus. Some people say, "OA has effectively been achieved," without thinking about who is paying. Or, "Once journals are converted into electronic form, the costs are next to nothing," but operating a peer review system costs money.

Another concern is the possibility of a sudden progression to OA. If that happens, it will apply to Japanese universities as well, whether they are willing or not. In other words, APC will suddenly be required at submission. Unless funding agencies and universities put payment systems in place, young researchers will be in trouble. Incentives to write papers could diminish and researchers from overseas might stop coming to Japan. In countries such as Germany, proper frameworks for support to cover the payment have been built.

What is important is the availability of a scholarly information system that serves as research infrastructure, to allow researchers to freely devote themselves to their research without worrying about the payment of APC. This system also helps collect and utilize ever-increasing articles. It is by no means the case that once we have converted journals to OA, that will be the end.

(Photography by Yusuke Sato)

A Word from the Interviewer

I found myself fascinated by the dynamic global movements centering on scholarly information. My understanding of this often puzzling situation was helped by Professor Adachi's line, "OA is about money," which is so typical of senior figures in this field. In other words, this is a world where high-minded ideas and pragmatic calculations intersect. Japan faces many challenges prior to switching to open access, including digitization and conversion to English. How will we build better scholarly information infrastructure to support tomorrow's research? This is an urgent issue.

Atsuko Tsuji

Designated Professor, Institute of International Education & Exchange, Nagoya University. Graduated from the Department of History and Philosophy of Science, College of Arts and Sciences, the University of Tokyo in 1976. Joined the Asahi Shimbun in 1979 and was primarily responsible for writing on science, technology, and medicine in various posts including in the Science Department, the American General Bureau, and as an editorial writer. Took up her present post in October 2016. Writes a column entitled "Meidai Watch" on the Nagoya University website.



Key Initiatives for Promoting Open Access

Will Green OA or Gold OA save academic journals?

Midori Ichiko

Administrative Director,
Keio University Mita Media Center /
Chair of JUSTICE Steering Committee



Koichi Ojiro

Project Researcher, Research Center
for Open Science and Data Platform (RCOS)
National Institute of Informatics

Rising prices for academic journals from the 1980s onward resulted in decreases in the number of academic journals that university libraries could subscribe to. The existence of electronic journals, which became widespread from the 2000s, changed this situation. Package deals covering multiple journals and the formation of consortia by university libraries to begin collective bargaining with publishers led to substantial increases in the number of journals accessible at universities. However, the price of e-journals continues to increase. Midori Ichiko and Koichi Ojiro discussed initiatives that have emerged to overcome this situation, such as Gold OA and Green OA via institutional repositories, as well as the future outlook.

Moves towards open access

— Why are prices continuing to rise?

Ojiro One reason that the publishers give for the price rises is that the number of articles published is increasing annually by 3 to 4%. The number of articles, especially from China and India, is growing considerably. The fact that the market is dominated by a few commercial publishers has been identified as another reason.

— How are universities in Japan and overseas responding to this crisis?

Ichiko The model for e-journal contracts has begun to change dramatically worldwide. In the new model, rather than paying for subscriptions, money is paid for editing and publishing, and articles are distributed in an open access (OA) form that allows anyone to read them. Articles can also be reused without restrictions as long as authors and sources are indicated appropriately. Led by

the Max Planck Digital Library in Germany, with the aim of transforming all of the leading journals to OA by 2020, this model is spreading throughout the world.

Currently, an author is required to pay an article processing charge (APC) to the journal publisher in order to make their article OA. Libraries are paying subscription fees and authors are paying APCs, so publishers are suspected of double-dipping. The number of Gold OA journals, in which all articles are OA, is increasing. When the Japan Alliance of University Library Consortia for E-Resources (JUSTICE) looked at publishing data for 2016, it estimated the total APCs paid by researchers to be several billion yen. Most of this cost is covered by research funds or university grants. I think that clarification of the current situation and replacement of subscription fees with APCs will lead to prices becoming fair and acceptable to both researchers and publishers.

— Another movement towards OA involves preprint servers, such as arXiv.org (pronounced “archive”), operated by Cornell University.

Ichiko Information in fields such as physics, math, computer science, and deep learning is actively exchanged on arXiv.org, and it is already essential in those fields.

Ojiro The use of preprints is also increasing in biology, and bioRxiv (pronounced “bioarchive”) is growing rapidly.

However, publishers have been making moves to purchase preprint servers. SSRN, the best-known preprint server for the social sciences, was bought by Elsevier in 2016, and there are concerns that arXiv will be purchased.

What are Green OA and Gold OA?

— Institutional repositories that collect academic papers at universities or research institutes also play an important role.

Ojiro Chiba University’s Repository for Access to Outcomes from Research is said to be the first institutional repository in Japan. It was officially launched in 2005, and I was actually involved in setting it up at Chiba University’s library.



Midori Ichiko

Served as head administrator at Keio University’s Shinanomachi Media Center (medicine), Media Center for Science and Technology, and Hiyoshi Media Center, before assuming her current position. Chair of the JUSTICE Steering Committee since April 2017. Member of the Steering Committee of the International Scholarly Communication Initiative (SPARC Japan).

Worldwide campaigns for OA began just prior to that. In 2002, a declaration for promotion of OA was adopted in Budapest, and two OA methods, Green OA and Gold OA, were proposed there. In Green OA, OA is implemented through self-archiving, where researchers themselves post their articles to a personal website or to an electronic archive on the Internet, known as a repository. Institutional repositories are one type of receptacle used for Green OA. Meanwhile, the Gold OA method involves academic journals making articles accessible to everyone free of charge via the Internet.

Green OA can be promoted independently by university libraries. The library sets up an institutional repository server and asks researchers affiliated with the university to register OA versions of their articles. If this activity spreads, eventually everyone will be able to read articles without subscribing to expensive e-journals. It was with a desire to make this a reality that the institutional repository at Chiba University was launched.

Subsequently, NII provided its support, and around 800 institutional repositories were launched in Japan, probably the largest number in the world. However, the number of articles registered in the institutional repositories is still small. In that regard, things are not progressing as expected.

— Why are few articles registered?

Ojiro There are two reasons. One is restrictions imposed by the publisher that holds the copyright to the article. Many publishers do not allow the official version available on the publisher's website to be registered in an institutional repository. What can be registered is the author's final draft after peer review. Publishers also impose restrictions on when articles can be registered, such as only allowing registration six months or one year after publication.

Another reason is that there are few incentives for researchers to register their articles in an institutional repository. Researchers are satisfied if their article is accepted and published by a prestigious journal, and they don't feel that there is any benefit in then taking the trouble to find their final draft and register it in an institutional repository.

A new role for institutional repositories

— Are there strategies for overcoming this and really popularizing Green OA?

Ojiro There are said to be more than 3,000 institutional repositories worldwide. The idea of connecting these repositories via a network and using them as a kind of infrastructure has been raised.

Up until now, institutional repositories have typically contained peer-reviewed articles, but by having them instead carry preprints prior to peer review and incorporating a mechanism within the repository network for ensuring quality such as peer review and editing, we could attempt to build a system capable of taking over the functions that have so far been performed by commercial journals.

Peer review is also diversifying. There are now initiatives such as "post-publication peer review," where an article is peer reviewed once it has been published, and "open peer review," where multiple researchers openly review an article. What is important

is that the academic community has an alternative means of publishing, distributing, and assuring the quality of articles, without relying on commercial journals. This could also be used as a negotiating card with publishers. Moves are underway to put together standard functional and technical requirements for implementing this idea.

— How will NII contribute to this?

Ojiro The Research Center for Open Science and Data Platform (RCOS), with which I am affiliated, is developing new repository software called WEKO3. This will be equipped with functions and technology for implementing a new academic publishing system.

— So this system will replace the functions of the publishing company using IT?

Ojiro That's right. However, the major issue is how to build a mechanism for assuring the quality of articles. The greatest contribution publishing companies have made to academia is in training competent editors and maintaining lists of talented reviewers, and we must commend them for that. The question is whether the academic community can create a quality assurance system without relying on publishing companies.

Another issue is that an SNS-like communication function is likely to be important. Researchers will not be enthusiastic about using a server that they simply deposit their articles in.

Ichiko In terms of motivating researchers, the social networking service for researchers called ResearchGate is very successful. Researchers know immediately if someone cites their article, and that's very gratifying.

It really is necessary to think carefully about researcher incentives. What we need is a platform that provides motivation and gratification, as well as being hassle free.

(Interview/report by Naoki Asakawa
[Deputy Editor, Nikkei xTECH/Nikkei Computer] /
Photography by Yusuke Sato)

Koichi Ojiro



Putting Journals Back into the Hands of Academia

Recent trends in open access and Japan at a crossroads

"I couldn't read an online article, because it was price tagged." "Even though it is my article, I can't access it." "I was told that the journal subscription is too high for the institution to afford it."

Every researcher must have had these kinds of experiences more than once. We have to accept that publishing involves certain costs. However, in this era of the Internet where contents are shared openly and instantly, it is no surprise that many researchers would like to share and get access to academic information more freely. Open access is being promoted to solve this issue. Here, the OA movements and recent trends in OA are presented.

The paywall blocking access to articles

The subscription cost of academic journals has increased continually over the past several decades; they are now over six times higher than thirty years ago. The price increase per year is 7 to 8%. Even the wealthiest institutions, such as Harvard University, cannot afford all of the journals that they need. Also, with the shift toward electronic journals, package deals with each publisher known as "big deals" have become the norm, and the damage when these deals are canceled is enormous (Figure 1). Taking the major publisher Elsevier as an example, it allows institutions to subscribe to more than 2,000 journals in a package deal, but if an institution cancels this kind of deal and switches over to journal subscriptions equivalent to the same amount of money, they will only be able to access a few hundred journals. Furthermore, because the prices of individual journals increase annually, if an institution's budget remains the same, then the number of journals that it can subscribe to will decrease every year.

The growing number of articles worldwide is said to be behind the continual increase in journal prices, but the business model of the commercial publishers responsible for journal publication is considered to be a far more

serious problem. Because an academic journal cannot be replaced with an alternative if it is too expensive, market forces do not apply to journals, and commercial publishers are free to set the prices. Meanwhile, the profit margins of the world's big three publishers⁽¹⁾ are currently between 30 and 40%.

In academic publishing, researchers write articles for free and also perform editing and peer reviewing without compensation. Additionally, digitization has been progressing in the last decades, and journals can be set up and distributed at much less cost than in the print age. In circumstances where academic institutions have trouble affording subscription fees, the imbalance between the academia and commercial publishers is questionable.

Solving the problem by making articles open access

Since the 1990s, there have been many protest movements against commercial publishers, aimed at putting academic articles back into the hands of academia (Figure 2). In 1994, during the early days of the Internet, Stevan Harnad proposed overturning the existing academic publishing system by making articles openly available on the Internet. In 2001, 34,000 people signed an open letter to academic publishers. Recently, Professor Timothy Gowers, a mathematician at the University of Cambridge, called for a boycott



Miho Funamori

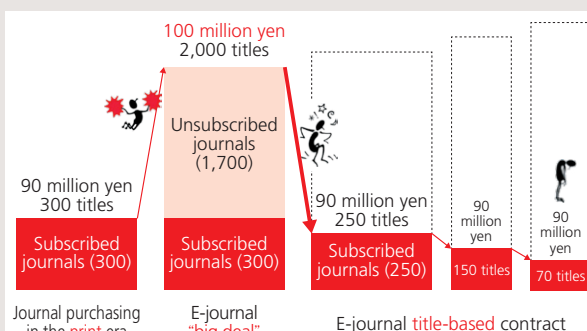
Associate Professor, Information and Society Research Division
National Institute of Informatics

Figure 2 Events in the conversion of e-journals to OA

1991	Preprint server "arXiv" is launched. Platforms for instantly sharing draft papers via the Internet originate in the field of high energy physics.
1994	Stevan Harnad puts forward "A Subversive Proposal."
1998	SPARC starts its initiative to put research back into the hands of researchers.
2000	First subject repository, PubMed Central, goes live.
2001	34,000 people sign an open letter to academic publishers.
2002	The Budapest OA Initiative (BOAI) identifies a path to solving the problem of soaring journal prices through OA.
2003	First OA journal "PLOS" is launched.
2006	An international framework for institutional subsidization of APCs and conversion of articles to OA is launched in high-energy physics (SCOAP ³).
2008	NIH Public Access Policy comes into effect. The OA mandate for results of research funded by NIH leads to a rapid increase in the number of articles registered in PubMed Central.
2009	- Harvard University's Faculty of Arts and Sciences adopts the first university OA policy. - The Compact for Open-Access Publishing Equity (COPE), which confirms institutional subsidization of APCs, is launched.
2011	SciHub, a website offering pirated versions of academic papers, is launched.
2012	A website entitled "The Cost of Knowledge," which calls for a boycott on submission/peer reviewing/editing of articles in Elsevier's journals, is established.
2013	- The UK research funding body RCUK begins subsidizing APCs. - The academic publishing platform F1000Research, offering OA and open peer review, goes live.
2015	The Max Planck Society calls for flipping to full OA by 2020 (OA2020).
2017 January	- The Gates Foundation OA policy demanding OA and reuse of research results immediately upon publication (CC 4.0) comes into effect. - The German Rectors' Conference's negotiations with Elsevier seeking a "publish-and-read" agreement run into difficulties, and about 70 universities defer renewing their contracts (Project DEAL).
2018 April July September	- France cancels contract with Springer Nature. - Sweden cancels contract with Elsevier. - Eleven European research funders announce "Plan S," requiring full OA from 2020 onward. Hybrid journals are expressly forbidden.
December	China expresses interest in immediate OA for academic articles.

Figure 1 Impact on the number of subscribed journals when a "big deal" is canceled

Unsubscribed journals are journals that an institution did not subscribe to in the past but became accessible with the shift to e-journals and package deals. When an institution cancels its package deal and transfers to a subscription agreement for each journal, the damage is great because unsubscribed journals become inaccessible.



on the submission, peer review, and editing of articles in journals published by Elsevier through a website entitled “The Cost of Knowledge,” which gathered 17,000 signatures.

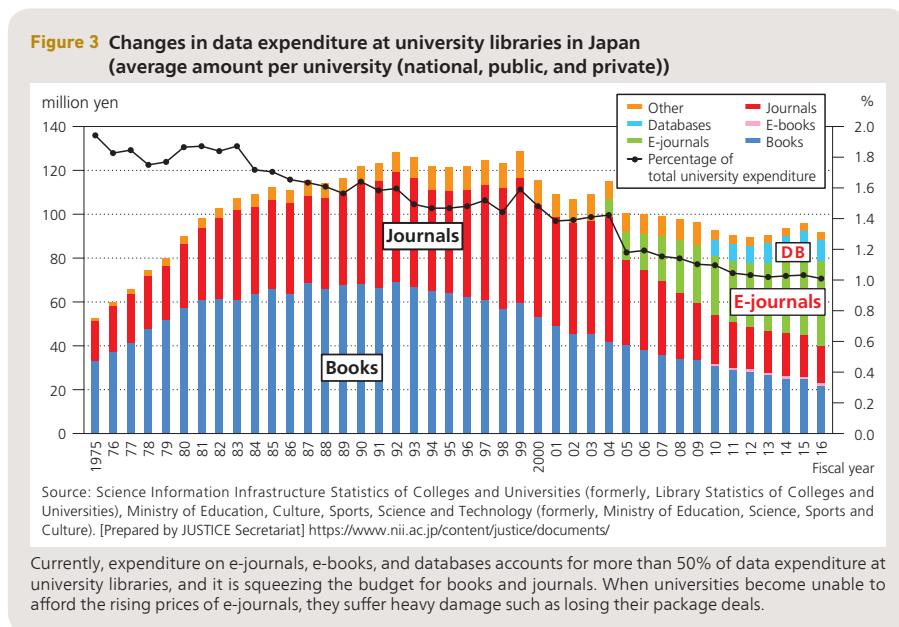
In 2002 in Budapest, an effort to resolve the problem of soaring subscription cost of academic journals by publishing articles open access on the Internet was confirmed (Budapest OA Initiative). Two open access methods—green OA and gold OA—were defined. In green OA, the author’s final manuscript is made openly available in an online database, such as an institutional repository. The print version cannot be distributed because the copyright is held by the publisher. In gold OA, “OA journals” are newly established which offer open access to articles simultaneously with publication. As OA journals cannot collect subscription fees, the publication costs are covered by article processing charges (APCs) paid by the article author.

As a result of such efforts, approximately half of all articles are currently available in OA format. Green OA makes up less than 10% of all articles, as it is very troublesome to upload the author’s final manuscript on an OA repository after article publication. Also, most of the OA journals established by gold OA have not succeeded in displacing the existing prestigious journals. Instead, they have led to the appearance of hybrid journals that make articles OA upon payment of APCs by the author who wishes to publish open access. The commercial publishers started offering the option of making these journals OA on an article basis, seeing researchers’ need to publish in existing prestigious journals.

Dealing with double-dipping charges of subscription fees and APCs

Hybrid journals bring in double benefits for commercial publishers, with APCs from authors and subscription fees from university libraries and other institutions. Because only some of the articles are OA in hybrid journals, institutions cannot cancel their subscriptions. Furthermore, as subscriptions and APCs are covered by university libraries and researchers, respectively, it is difficult to grasp the whole picture and control the costs even within a single institution. To make matters worse, the APCs for hybrid journals are typically twice that of full OA journals, and this is putting pressure on university finances.

If hybrid journals became fully open access, subscription fees would be unnecessary. To this end, a method of shifting the majority of the leading academic journals OA through “publish-and-read” (PAR) agreements has been proposed. In PAR agreements, institutions pay the APCs for articles written by their researchers and a subscription fee for non-OA articles in journals. The subscription fee that the institution used to pay is diverted to the APCs. It is hoped that if the world’s



leading academic institutions enter into PAR agreements, then non-OA articles will disappear almost entirely, and therefore, subscription fees will become unnecessary. This conversion from subscription-based academic publishing of the print era to OA publishing of the digital age based on APCs is known as “flipping.”

The Max Planck Society has called to flip leading academic journals to OA by 2020 (OA2020), and more than 100 institutions worldwide have declared their interest. Germany and Sweden sought PAR agreements with Elsevier, but the negotiations have failed, leaving many institutions blocked from accessing Elsevier’s journals. In September 2018, eleven research funding agencies in European countries, including the UK and France, announced “Plan S,” an initiative that requires all academic articles produced as a result of publicly funded research to be fully OA from 2020 onward. Plan S states that OA publication in hybrid journals is not acceptable.

These movements demonstrate an increasingly confrontational attitude toward commercial publishers worldwide.

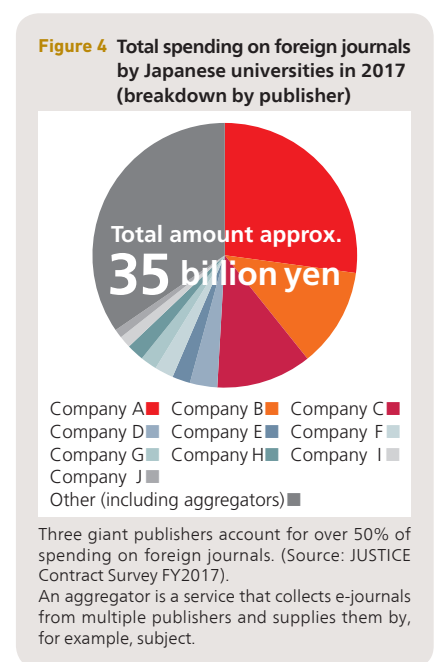
Challenges and responses to OA in Japan

Awareness of researchers and university leadership in Japan regarding the need for journals to convert to OA is not high. Reasons for this lack of awareness include the fact that the soaring price of journals worldwide was offset by the appreciation of the yen following the Plaza Accord of 1985, and subsequently, the fact that the number of journals that can be accessed has increased dramatically due to the appearance of e-journals. The recent economic slump and depreciation of the yen have led some universities to cancel subscriptions to journals, but there is not widespread awareness about resolving the issue of journal prices using OA. Also, OA2020 and PAR agreements are

perceived by many to be unrealistic methods.

However, at the end of the day, academic articles are written and disseminated by researchers in order to share their research with the research community. The situation in which researchers cannot share articles with each other must be changed.

Currently, the total amount spent by Japanese universities and institutions on subscriptions to foreign journals is approximately 35 billion yen (Figure 4). A model in which all of this money is diverted to article processing charges and all articles are converted to OA is being discussed throughout the world. The question of how to establish an academic publishing system fit to the digital age is in the hands of academia.



Note

[1] Elsevier, Springer Nature, and Wiley.

NEWS
1

“Research that makes a difference in the world”

Special lecture by Professor Takeo Kanade, Carnegie Mellon University



On November 30, NII hosted a special lecture entitled “Toward Impactful Research: Illustrated by My Experiences and Sayings” by Takeo Kanade, who is U.A. and Helen Whitaker Professor at Carnegie Mellon University and one of the world’s leading authorities on computer vision and robotics (see photograph).

Professor Kanade has carried out pioneering work in these fields, and after stating that “impactful research is research that makes a difference in the world,” he introduced examples of his own impactful research. These

included Navlab, the first self-driving car to cross the American continent in 1995; EyeVision, a system used at the 2001 NFL Super Bowl to record footage with a 270-degree view; and the Lucas-Kanade method, the most fundamental algorithm in video processing.

He then stressed the importance of “focused problem setup in which you create a scenario that will make a difference starting from a specific problem, and then convince people with the results.” Also, declaring that “articles are useless unless they are read,” he

humorously presented the characteristics of articles that are not read.

Finally, he delivered a rousing message to the researchers and students gathered at the venue, saying, “Problems are waiting for you to solve.”

This was a precious opportunity to hear Professor Kanade speak, and more than 300 people listened with rapt attention.

NEWS
2

Presentation of unique grazing management system using IoT

Professor Takafumi Gotoh of Kagoshima University in Special SINET Session



On November 30, NII hosted the first “Public Lecture: Special SINET Session.” These sessions present cutting-edge research using “wide-area data collection infrastructure,” a new service that directly connects the Science Information Network (SINET5) with mobile communications.

In this first session, Professor Takafumi Gotoh from the Research Field in Agriculture, Agriculture, Fisheries and Veterinary

Medicine Area, Department of Agricultural Sciences and Natural Resources, Faculty of Agriculture, Kagoshima University gave a lecture entitled “Beef Production Using IoT Grazing Management System: Raising Cattle Using a Smartphone?!” (see photograph).

In Japan, cows are generally raised solely inside cattle sheds and are fed huge quantities of grain. This presents numerous problems, such as the fact that Japan is dependent on imports for more than 90% of its grain feed, and the fact that cattle manure contaminates soil and groundwater. Therefore, Professor Gotoh’s research group aims to build a system that utilizes unused land, hilly and mountainous areas, etc., as pasture for cows, which are naturally grazing animals, and produces beef from these plant resources.

Because the cows will wander around freely, they will need to be controlled over large areas. To save labor and enhance the efficiency of this, the group is researching remote feeding systems and positioning systems using smartphones, and movement sensing. It is also looking into determining the health status of cattle, the timing of giving birth, and so on, using implantable sensors.

Professor Gotoh said that “using SINET’s wide-area data collection infrastructure makes it possible to regularly collect sensor data via a mobile network, rather than actually going to where the cows are,” and he wants to try to resolve various problems in Japan’s livestock industry by creating a livestock business system based on grazing using IoT.

NEWS
3

Associate Professor Yamagishi presented with Excellence Award in Advanced Technology

17th Docomo Mobile Science Award

The 17th Docomo Mobile Science Awards ceremony was held on October 19, and Associate Professor Junichi Yamagishi of the Digital Content and Media Sciences Research Division was presented with an Excellence Award in Advanced Technology for his achievements in “multifaceted research on voice identity.”

Associate Professor Yamagishi developed a “speaker adaptation” technique that creates an “average voice” from the recorded speech of multiple people, and then produces speech that sounds like a particular person by combining the average voice with the person’s own voice. Existing methods required dozens of hours of recorded speech for each person, but using his new technique, Associate Professor Yamagishi established

the world’s first “digital voice cloning technology” capable of reproducing not only gender and age but also the speaker’s distinctive voice quality from just a few minutes of voice data.

He also successfully applied the technology to reproduce the speech of people who were losing their voices due to illness and made it possible for them to speak with their own voice via a computer. Further, he built a large-scale corpus that can be used for machine learning to detect voice impersonation attacks and developed “liveness detection” technology that distinguishes between natural and artificial voices. He has also made new scientific discoveries by conducting speech perception experiments related to voice identity. This award recognizes the extremely high scientific



value of these achievements and their social application in various areas, including welfare and healthcare.

At the awards ceremony, Associate Professor Yamagishi and other prizewinners were presented with certificates, following comments from the Chair of the Selection Committee, Mitsutoshi Hatori, Professor Emeritus at the University of Tokyo (see photograph).

Fall busy season for exhibitions, spreading NII's research and services to wider society

Inter-University Research Institute Corporation Symposium 2018 Cheers at SINET5 VR experience, and Associate Professor Yoshida in Researchers' Talks

The "Inter-University Research Institute Corporation Symposium 2018—Cutting-Edge Research Show" was held at Nagoya City Science Museum on October 14. This event is an opportunity for NII and other inter-university research institutes nationwide to jointly present their research to the general public.

The NII booth featured a VR activity that allowed visitors to experience the 100 Gbps bandwidth of the Science Information Network (SINET5), built and operated by NII. Gasps of astonishment were heard from visitors who experienced the powerful VR images (see photograph). The amount of data flowing was likened to water, with a 100 Mbps residential high-speed network resembling a narrow water pipe, and SINET5, which possesses 1000 times the bandwidth, resembling an immense underground space.

In the Researchers' Talks, where researchers from each institute introduce the appeal of their research and the latest topics, Associate Professor Yuichi Yoshida (Principles of Informatics Research Division) spoke as NII's representative. He explained his research on constant-time algorithms in a talk entitled "Ultimate High-Speed Algorithms."



CEATEC JAPAN 2018 IoT-based infrastructure maintenance, SIP research results exhibited

The combined CPS/IoT exhibition "CEATEC JAPAN 2018" was held at Makuhari Messe from October 16 to 19, and NII exhibited on the theme of "Protecting Infrastructure Using IoT."



NII's exhibit consisted of the results of an R&D theme of the Cross-Ministerial Strategic Innovation Promotion Program (SIP), "An Integrated Data Management Platform for Civil Infrastructure Sensing." As infrastructure built during the period of rapid economic growth deteriorates, there are concerns that a major accident could occur due to the collapse of a bridge, road, or tunnel, as well as concerns about the spiraling costs of maintenance and repair. Under these circumstances, the aim of this research project is to construct a new infrastructure management system using monitoring and prediction technologies based on advanced ICT, and as a result, to prevent major accidents and minimize infrastructure lifecycle costs.

This year, NII exhibited and demonstrated technology for centralized control of a wide variety of infrastructure management data, technology for road surface/bridge screening through integration of large-scale sensor information, and analytical technology for applying accumulated data to infrastructure management tasks in the field (see photograph).

20th Library Fair & Forum Introducing three research data platforms for "management," "publication," and "retrieval"

The 20th Library Fair & Forum was held from October 30 to November 1 at Pacifico Yokohama. NII exhibited and presented new academic information infrastructure being developed to support open science: a data management platform (GakuNin RDM), a data publishing platform (WEKO3), and a data retrieval platform (CiNii Research) (see photograph).

Open science, which makes not only research papers but also research data and

software widely available to society at large via the Internet, has attracted attention in recent years as a new procedure for research. The sharing of research data between different organizations requires data management geared toward open science, such as the storing and publishing of research data using common names and formats. Therefore, at the Research Center for Open Science and Data Platform (RCOS), NII is constructing infrastructure to fulfill the three roles of

"management," "publication," and "retrieval" of research data.

RCOS staff manned the booth for the duration of the event and answered questions from university library staff and researchers.



"Hey, this is great!" Hottest articles on Facebook and Twitter (September 2018-November 2018)



**National Institute of Informatics,
NII (official)**
www.facebook.com/jouhouken/

Facebook

NII is exhibiting on the theme of "Protecting Infrastructure Using IoT" alongside other organizations at CEATEC JAPAN 2018, a combined CPS/IoT exhibition held at Makuhari Messe. NII is exhibiting and demonstrating an ICT-based infrastructure maintenance system, including technology for centralized control of a wide variety of infrastructure management data, technology for road surface/bridge screening through integration of large-scale sensor information, and analytical technology for applying accumulated data to

infrastructure management tasks in the field.
(10/15/2018)



**National Institute of Informatics,
NII (official)**
[@jouhouken](https://twitter.com/jouhouken)

Twitter

"One Research Paper Will Change the World: Tackling Problems Through Domestic and International Collaboration—Fulfilling Our Responsibility for Quality as Researchers Involved in Methodology"

Masashi Sugiyama [Director, RIKEN Center for Advanced Intelligence Project (AIP) / Professor, Graduate School, University of Tokyo]

Interviewer: Nobuyuki Yajima [Senior

Researcher, Nikkei BP Intelligence Group, Nikkei Business Publications, Inc.](10/11/2018)



Bit on Twitter!
[@NII_Bit](https://twitter.com/NII_Bit)

Twitter

Twins Hirotaka and Masataka Yoneda participated in the International Olympiad in Informatics. Both got great results! They make the most of being twins by developing their programming skills through friendly competition with each other. #International Olympiad in Informatics #IOI2018 #twins (9/7/2018)

* Some text edited/omitted.

Essay

A Bio-researchers' View on Promoting OA

Noriko Osumi

Vice President, Tohoku University
Director, Tohoku University Library
Professor, Graduate School of Medicine

Many societies and journals exist in the field of medical and life science, which consists of a large population of researchers including from those studying tiny molecules to researchers specializing in ecosystems and epidemiology. Thus, the field is rich in diversity, yet the current consensus among the majority is that it is the norm to submit articles to international journals in English.

For these bio-researchers, the first

question on open access (OA) is whether they can download the 'Journal of XXXX' at their home universities. The price of journal packages from major publishers is soaring, and the operating subsidies of national university corporations are being reduced every year due to compounding, which means that not only personnel costs but also basic expenses such as library costs are being cut.

Researchers have another question: "The article processing charge (APC) of Journal A has gone up again. Shall I submit my article to non-OA Journal B?" A brief explanation may be necessary here.

Growth in the researcher population has intensified competition among researchers. Researchers must perform well in order to get an academic position, and this performance is often expressed as scores. For example, the number of article citations, that of citations per field (FWCI), *h*-index (evaluation index for researchers calculated based on the number of article citations), the number of views, downloads, and shares on SNS, and scores based on journal impact factor (IF). Researchers want to publish their articles in journals that have as high an IF as possible while keeping APCs down.

In terms of the current cost-effectiveness of APC and IF, *PLoS ONE*, which was established to promote OA and is operated by an NPO, has been overtaken slightly by *Scientific Reports*, which was

launched later as a commercial OA journal. Japanese researchers who love foreign brands are easy prey for a certain company, and they now publish an enormous number of articles in *Scientific Reports*. Consequently, Japan is paying twice in the form of subscription fees and APCs to overseas publishers.

Unlike research in theoretical physics and similar fields, life science research is particularly labor-intensive, and life scientists are struggling to secure research hours. This is why they do not jump on board to launch a high-IF journal in Japan working together with other researchers. It is difficult to get past the sentiment expressed as, "OA is preferable, of course. An institutional repository? Oh, it has no IF."

I have been appointed as Director of Tohoku University Library since April 2018. I believe that if we emulate Haruaki Deguchi, President of Ritsumeikan Asia Pacific University, who says "Know history, the world, and data" and if we share this among researchers, then the promotion of OA at this university and throughout Japan will lead to new creativity.

Note

This essay is based on a lecture I gave at a SPARC Japan seminar in November 2018, titled "Obstacles Preventing Promotion of OA in Japan: The View of One Life Scientist." The lecture materials and video will be released on the following website: <https://www.nii.ac.jp/sparc/event/2018/20181109.html>

Future Schedule

January 23 | "The Forefront of Informatics" 7th Public Lecture: "New Developments in Terahertz Radiation—Far-IR Radiation Can Do More than Simply Roast Coffee Beans" (Speaker: Professor Kazuhiko Hirakawa Institute of Industrial Science, University of Tokyo / Research Member, Science of Hybrid Quantum Systems in Scientific Research on Innovative Areas, Global Research Center for Quantum Information Science, NII). For details and registration, go to <https://www.nii.ac.jp/event/shimin/>.

January 24 | Science Council of Japan Public Symposium "Approaches to Law Using AI." TKP Garden City Premium Jimbocho. For details, go to <http://research.nii.ac.jp/~ksatoh/>

ai-law-symposium/.

February 8 | ROIS Symposium. Ito Hall, University of Tokyo.

February 12 | Special SINET Session 2 "New Sports Performance Research Toward Tokyo 2020—Exploring the Performance of Top Athletes" (Speaker: Professor Akira Maeda Director, Sports Performance Research Center / Executive Adviser to the President, National Institute of Fitness and Sports in Kanoya). For details, go to <https://www.sinet.ad.jp/news/2018-10-12-post-6385>.

March 7–8 | Cyber Security Symposium in Dogo 2019 (Exhibitor)

Notes on cover illustration

From the conventional method in which someone wanting to read an academic article pays a subscription fee (left), to open access in which someone wanting to disseminate an article pays a processing charge (right). Against a backdrop of rising prices for e-journals, efforts to convert to the OA shown on the right-hand side of the illustration have begun.

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into Knowledge



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