

Open Science, Open Doctrine, How to Share Knowledge?

Marie FARGE^a and Jean GASNAULT^b

^a*CNRS, Institut National des Sciences Mathématiques et de leurs Interactions - INSMI; Ecole Normale Supérieure - ENS; Committee for the Accessibility of Publications in Sciences and Humanities - CAPSH (France)*

^b*La Loi des Ours; Université Paris 1, DU Droit et Informatique (France)*

Abstract. The evolution of Open Science in France is almost completely the result of constant friction with the business models that drive major international publishing houses, where each party has adapted to developments introduced by the other, but also of practical steps taken to ensure that shared documents are efficiently collected and made accessible. This Chapter will provide several examples of the development of Open Science in France, such as the platform <http://dissem.in>. How Open Science principles are effectively implemented in the area of legal knowledge in France? What can be done to encourage law scholars to publish their work on a single common platform? And which platform should that be? Should it be improved, and, if so, in what way? Will dialogue resolve conflicts and pave the way for Open Science in a viable economic context?

Keywords. open science, legal doctrine, open access

1. Introduction

The Free Access to Law Movement (FALM)¹ has a long history of promoting free access to legislation and case law, especially in common law countries. The European Union, its Member States, several OECD Member States and the signatory countries of the Hague Conventions have similar objectives. The conclusions and recommendations published in 2012 by the Hague Conference on Private International Law (HCCH) and the European Commission prove this. Where are we with regard to the free and open sharing of scientific knowledge in law? Have practical measures been implemented to improve the sharing of legal doctrine and commentary?

A number of comparative approaches can be adopted to identify and measure recent developments in the sharing of legal science. In this context, an electronic debate on the challenges of open access for legal researchers took place between 2016 and 2017 on the ‘BlogdroitEuropéen’. The Chapter will present the results from an interdisciplinary perspective and will attempt to determine whether French lawyers have been in line with the approach followed by their colleagues in the sciences.

¹<http://www.fatlm.org/>.

While the prevailing working methods of scientists and lawyers correspond to different academic cultures (e.g., the ways to become a professor of mathematics or a professor of law cannot be compared), there are undoubtedly similarities for publishing and peer-reviewing. In France, social sciences and exact sciences academic worlds have started to engage with one another in a number of settings (symposiums, non-profit associations, working groups), with the common goal of harnessing the benefits of Open Science. They are striving to make scientific publications easier to find, and harmonize the way they are described and indexed. By mobilizing and joining forces, their goal is to disseminate the results of scientific research as widely as possible. Although the two communities followed different paths, they reached the same conclusion: research progress inevitably requires sharing, which entails no losses, only gains².

A number of principles have been established over the past 15 years. The Open Access Initiative, announced in Budapest in 2002 and developed in 2003 in the Berlin Declaration, was a pioneering project. Gradually, legal norms and standards emerged, starting with a recommendation from the European Union, which has become the fully-fledged program Horizon 2020. The objective of all these actions is to promote the widest possible access to knowledge, with the clear risk of conflict with existing economic paradigms.

In France, Article 30 of the 2016 *Law for a Digital Republic*³ marks the first significant victory for the advocates of digital commons⁴. Unfortunately, this measure was poorly applied and it has received very little publicity from the government and any from the knowledge market players. Thus, although clear principles and laws have been established, their translation into national legislation has proved difficult. Could this be interpreted as a symbol of Open Science? We can only hope that the situation will change. The French government has reiterated its commitment to the development of Open Science in the 'Etalab Action Plan' for 2018-2020⁵.

This Chapter will address the two following topics⁶.

Section 2 focuses on the development of Open Science, which depends on the international confrontation between the business model of the few major publishers currently dominating scientific publishing and the need of researchers to peer-review, publish and access scientific articles, as easily, widely and efficiently as possible. We will describe the current situation in the world, and then we will focus on France with some specific examples.

Section 3 is devoted to the effective implementation of the principles of Open Science in the field of legal knowledge in France.

²The Open Science Committee set up by the French Ministry of Research mobilises actors in the scientific world, regardless of their discipline <https://www.ouvri.la-science.fr/presentation-du-comite/>.

³Loi n° 2016-1321 du 7 octobre 2016 pour une République numérique, <https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000033202746&categorieLien=id>.

⁴Lionel Maurel's blog post, SILEX, 31 October 2016, *Open Access, quelles incidences de la loi «République numérique»?* <https://scinfollex.com/2016/10/31/open-access-quelles-incidences-de-la-loi-republique-numerique/>.

⁵Etalab (French task force for Open Data). France's Open Government action plan 2018-2020, *Engagement 14: Construire un écosystème de la science ouverte*, <https://gouvernement-ouvert.etalab.gouv.fr/pgo-concertation/topic/5a1bfc1b498edd6b29cb10d4>.

⁶Marie Farge is the Author of Section 2. Jean Gasnault is the Author of Section 3.

2. Open Science

2.1. *The Electronic Publishing Revolution*

The reproducibility of published results is the backbone of scientific research. Objectivity is crucial for science and requires that observations, experiments and theories be checked independently of their authors before being accepted for publication. Indeed, a result to be recognized as scientific must be presented and explained in an article which has been reviewed and accepted by peers, i.e., researchers able to understand, verify and, if necessary, correct it. It is only after successful peer review that a new result can be published and belongs to scientific knowledge. Consequently, the set of all scientific publications is the common heritage that researchers have collectively built over centuries, and are constantly developing. Given the constructive and universal nature of science, any researcher should have access, as early and easily as possible, to all scientific publications. Unfortunately, this is not the case today, as most peer-reviewed journals belong to a few major publishers, who keep scientific articles behind pay-walls. Since all over the world the majority of research programs are supported by public funds financed by taxpayers, not only researchers, but everyone from everywhere should have access to scientific publications.

Before the advent of electronic publishing and of the Web, researchers had never criticized the business model of scientific publishing, where journals were paid by subscription, since there were no other ways for their articles to be disseminated and read. In those years, researchers were sending handwritten manuscripts to be peer-reviewed by researchers who are experts of the scientific domain covered by the journal. Publishers were printing houses in charge of typesetting, printing and selling the journals to libraries. Today, the era of paper publishing is over and replaced by the era of electronic publishing. Indeed, recent articles, as well as older ones that have been digitalized, are exchanged electronically via the Web. Even for journals that are still printed on paper, their production is made electronically. Moreover, most readers download articles from the Web and print them only if needed. This technological revolution has allowed publishers to drastically reduce their costs, and researchers to typeset their articles themselves, while both peer-reviewing and publishing are made online via electronic platforms. Under these conditions it is unfair that publishers still maintain the business model of ‘paper publishing’ and make skyrocketed profits (up to 40%, i.e., twice those of Google or Apple) using ‘electronic publishing’. The explanation for such impressive profits is simple: the investments for producing scientific results and articles are publicly funded, while the ownership of scientific journals and corresponding profits are private.

Foreseeing the opportunity of electronic publishing, a few major companies (Elsevier, Springer Nature, Wiley-Blackwell, etc.) have succeeded in buying most scientific publishers and now own most of the journals researchers need, for peer-reviewing, publishing and sharing their results. They therefore control the market and impose pay-walls to access to articles, which deprive researchers from some of their public funding. Moreover, few dominant publishers have managed to get the vertical control of research since they own, not only scientific journals, but also: the platforms which researchers use for peer-reviewing (e.g., Evise-Elsevier) and for publishing (e.g., ScienceDirect-Elsevier); the platforms which librarians use for bibliometry (e.g., Scopus-Elsevier); the platforms which managers use to evaluate researchers (e.g., SciVal-Elsevier).

Indeed, quantitative indicators designed, controlled and owned by a very small number of publishers hand them control over research policy, which they did not have in the

past. Researchers deplore the fact that today these major publishers control their research activity by selling, not only their articles, but also the tools to evaluate their careers and sort their applications for research contracts.

2.2. *Open Science in the World*

Open Science means free access to any research output (peer-reviewed articles, conference proceedings, data, software, blogs, ...) and to the metadata describing them. The objective of Open Science is to help researchers from all over the world to collaborate, interact, share resources and disseminate results, as freely, rapidly and efficiently as possible, by taking advantage of electronic publishing. This movement is gaining strength worldwide, thanks to more than thirty years of efforts to advocate it and develop the necessary tools (infrastructures, software, etc.). Unfortunately, the majority of scientific journals which researchers use to peer-review and share their results are still owned by a few major publishers which control scientific publishing worldwide. Moreover, publishers also own most of the peer-reviewed articles: their text, data tables, figures and any other additional material (e.g., codes) that researchers are obliged to give them for free, as soon as their articles have been accepted for publication. The ownership of a journal is forever, unless the publisher ends its publication; if a journal is sold or given away, the ownership is transferred to the new publisher. The ownership of articles lasts up to seventy years after the death of the last co-author; publishers thus own and control the access to the last one hundred years of scientific research, at least! It is also unfair that the prestige of a scientific journal depends on the commercial strength of a few major publishers and of their practice of 'bundling' (e.g., Elsevier negotiates only one contract to sell the access to the 3,800 journals of its electronic platform 'Science Direct'). The scientific quality of a journal should rather depend on the expertise and the dedication of its editors and the referees they choose (i.e., researchers who volunteer their time free of charge to review the articles submitted to the journal).

Here are some of the key steps that contributed to the development of Open Science.

In 1974, Donald Knuth, professor of computer science at Stanford University, designed a typesetting software for text and mathematical formulae, called 'TeX' (from the Greek word for art, skill, craft), and published it in open-source for anyone to use. In 1983, Leslie Lamport, mathematician and computer scientist at the Stanford Research Institute, enhanced TeX by incorporating a set of macros that separated content and style in the document. This made TeX easier to use and it became LaTeX⁷, which is today the standard format for articles in physics, mathematics and computer sciences. It has also been adopted by researchers in other disciplines, such as economics and the history of science, as it allows the text to be modified independently of the layout.

In 1989, the physicist Joanne Cohn, from the Institute of Advanced Studies in Princeton, created an e-mailing list for sharing preprints of string theory, which was made possible thanks to the low-bandwidth of the TeX format which theoretical physicists were beginning to use.

In 1990, the physicist and computer scientist Tim Bernes-Lee created at the European Center for Nuclear Research (CERN) the open protocol Hyper Text Transfer Protocol (http) and, in order that it could be adopted by anyone, he decided not to patent it. This was the birth of the World Wide Web (WWW).

⁷<https://www.latex-project.org>.

In 1991, the physicist Paul Ginsparg, from the Los Alamos National Laboratory (LANL), automated the e-mailing list of Joanne Cohn by using the File Transfer Protocol (ftp) and the http protocol of the Web in 1993. This was the birth of the open repository arXiv⁸, which later was moved to Cornell University in 1999. Today, the majority of articles in mathematics, computer sciences and physics are deposited by their author on arXiv as soon as they are submitted to a peer-reviewed journal, or even before. Researchers are keen to follow which new articles of their research domain have been deposited, since the platform arXiv informs them by emails and RSS feeds.

In 1994, the economist Michael Jensen (Harvard University, USA) created the Open Platform Social Sciences Research Network (SSRN) to share preprints for social sciences, the largest open repository in 2013, but Elsevier bought it in 2016 and researchers lost control of this research tool.

In 1998, the professor of learning sciences and technology design John Willinsky (Stanford University, USA, and Simon Fraser University, Canada) released the open-source software Open Journal System (OJS)⁹ to manage editing and peer-reviewing, which is used today by more than 10,000 academic journals.

In 1999, the biochemist Rogerio Meneghini and the information scientist Abel Packer, both from the Federal University of Sao Paulo in Brazil, designed the platform Scientific Electronic Library Online (SciELO)¹⁰ to increase visibility and access to research publications, especially for countries which cannot afford paying the ever increasing subscription costs required by academic journals. It is a network of 14 countries, from Latin America, Caribbean, Portugal, Spain and South Africa, which develop a common methodology for the preparation, storage, dissemination and evaluation of scientific articles of all disciplines. SciELO enables the electronic publication of more than 1,000 peer-reviewed journals which are selected for their scientific quality, the organization of searchable bibliographical and full text databases, the preservation of electronic archives and the production of statistical indicators of the scientific literature usage and impact, including journal evaluation criteria. SciELO is funded by several public institutions from Latin America and Spain.

In 2000, a few researchers around Harold Warmus (Nobel Prize winner and former director of the National Institutes of Health, a federal agency of United States) launched an online petition which called for all scientists to pledge that from September 2001 they would discontinue submission of articles to journals that did not make the full text of their articles available to all, free and unfettered, either immediately or after a delay of no more than 6 months. This led to the creation of PubMed Central (PMC)¹¹, an open repository that archives articles published in biomedical and life sciences journals, and to the creation of the Public Library of Science (PLOS)¹², a non-profit organization which publishes in open access seven biology and medicine academic journals.

In 2002, 16 researchers and librarians, from Europe, Canada and United States, met in Budapest and launched the already mentioned Budapest Open Access Initiative calling for Open Access to all scientific publications which should be considered as a 'public good'. They explained that "Old tradition and new technology have converged to make

⁸<https://arxiv.org>.

⁹<https://pkp.sfu.ca/ojs>.

¹⁰<http://www.scielo.br>.

¹¹<https://www.ncbi.nlm.nih.gov/pmc>.

¹²<https://www.plos.org>.

possible an unprecedented public good. The old tradition is the willingness of scientists and scholars to publish the fruits of their research in scholarly journals without payment, for the sake of inquiry and knowledge. The new technology is the Internet. The public good they make possible is the worldwide electronic distribution of the peer-reviewed journal literature and completely free and unrestricted access to it by all scientists, scholars, teachers, students, and other curious minds. Removing access barriers to this literature will accelerate research, enrich education, share the learning of the rich with the poor and the poor with the rich, make this literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge. For various reasons, this kind of free and unrestricted online availability, which we will call open access, has so far been limited to small portions of the journal literature”.

In 2003, the presidents of 19 national research institutions from Germany, France, Italy, Spain and Hungary published the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities¹³, which states that: “Establishing open access as a worthwhile procedure ideally requires the active commitment of each and every individual producer of scientific knowledge and holder of cultural heritage. Open access contributions include original scientific research results, raw data and metadata, source materials, digital representations of pictorial and graphical materials and scholarly multimedia material. [...] The author(s) and right holder(s) of such contributions grant(s) to all users a free, irrevocable, worldwide, right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship. [...] Our organizations are interested in the further promotion of the new open access paradigm to gain the most benefit for science and society”.

After nearly twenty years of fierce resistance, the major publishers owning most of the peer-reviewed journals have now accepted to publish some articles in open access, but under the condition that authors, or their institution, pay them Article Processing Charges (APCs). Publishers gave the fancy name ‘Gold Open Access’ to this business model, where they still own the peer-reviewed journals and fix the price of APCs in a way that preserves their huge profit margins (i.e., up to 5,000 € per article, or even higher). The impressive lobbying that publishers do, either directly, or via associations, e.g., STM (Science, Technology and Medicine) and AAP (Association of American Publishers), in Brussels, Washington, Beijing, London and elsewhere, is extremely efficient since they are wealthier than the largest research institutions in the world; e.g., in 2017 the turnover of Reed-Elsevier was 8.4 billion € while the budget of the French National Center for Scientific Research (CNRS), the largest in Europe, was 3.3 billion €. In 2012 a group of mathematicians launched the movement The Cost of Knowledge¹⁴, called to boycott of Elsevier and succeeded in stopping the Research Work Act, a bill of the American Congress that Elsevier had lobbied for. The associations STM and AAP together with Elsevier then redirected their lobbying towards Europe. In July 2012 the Gold Open Access model became mandatory in the United Kingdom for articles whose research has been supported by the UK Research Council or the Wellcome Trust. The same month the European Commission also recommended Open Access, but offered researchers the choice between two business models, defined as follows: “Gold Open Access (open access publishing): payment of publication costs is shifted from readers (via subscriptions)

¹³https://openaccess.mpg.de/67605/berlin_declaration_engl.pdf.

¹⁴<http://thecostofknowledge.com>.

to authors. These costs are usually borne by the university or research institute to which the researcher is affiliated, or by the funding agency supporting the research. Green Open Access (self-archiving): the published article or the final peer-reviewed manuscript is archived by the researcher in an online repository before, after or alongside its publication. Access to this article is often delayed (embargo period) at the request of the publisher so that subscribers retain an added benefit¹⁵.

To resist the lobbying exerted by a few major publishers who try to control electronic publishing and Open Access, the researchers from The Cost of Knowledge movement proposed in June 2012 a third model called 'Diamond Open Access' (a terminology inspired from the Diamond Sutra which is the oldest printed document made in 868 in China)¹⁶. This model is characterized by the fact that readers and authors should not pay to read or publish research articles. It is based on the following principles:

- Authors keep their copyrights and attach to their article a Creative Commons License CC-BY (allowing everyone to publish, use or translate their article while only requiring the attribution of the paper to the authors).
- Editorial boards are legal entities which own peer-reviewed journals (i.e., its title and all its assets), whose members are researchers who take the responsibility of peer-reviewing without being paid (since it is part of their academic duty for which they get a salary).
- Publishers are no longer the journal's owners, but become service providers under contract with the journal's editorial board.

In order to reduce the journal's cost, peer-reviewing and publishing can be automated using software, as commercial publishers do for the journals they own. But there is an essential difference with the Diamond Open Access model because researchers use free open-source software that they have developed to match their needs, e.g., LaTeX and OJS developed by the Public Knowledge Project (PKP)¹⁷. If a Diamond Open Access journal is recognized to be useful to its scientific community, and as long as its editorial board can prove good peer-reviewing practice, it could be published for free using the services of a publishing platform, which is a publicly-owned and publicly-funded infrastructure, designed to service a very large number of journals from different fields. The dissemination of the accepted articles would be achieved with the help of retrained librarians, together with publishers hired for their services, who would be in charge of curating metadata in order that all articles could be properly located by search engines and downloaded for free from the Web. The governance of such service units would be similar to other research infrastructures (e.g., large telescopes, particle colliders, or supercomputers). They should be governed by three independent bodies: a scientific committee in charge of selecting the journals allowed to use the service unit for free, an executive committee in charge of designing and maintaining the infrastructure (i.e., choosing computers and hiring technical staff, such as software developers, data managers and publishing specialists), and a user committee in charge of reporting problems to be overcome and needs for better or new services.

In 2016, following the recommendations provided by the conference *Open Science - From Vision to Action* held in Amsterdam in April, Carlos Moedas, the European Com-

¹⁵http://openscience.ens.fr/ABOUT_OPEN_ACCESS/DECLARATIONS/2012_07_17_European_Commission_Towards_better_access_to_scientific_information.pdf.

¹⁶http://openscience.ens.fr/OPEN_ACCESS_MODELS/DIAMOND_OPEN_ACCESS.

¹⁷<https://pkp.sfu.ca>.

missioner for Research, Innovation and Science, announced the Amsterdam Call for Action on Open Science, stating that “After January 1st 2020, scientific publications reporting on the results from research funded by public grants provided by national and European research programs and funding bodies must be published in compliant Open Access Journals or on an Open Access Platforms”¹⁸. In 2017, the European Commission published the book *Europe’s Future: Open Science, Open Innovation, and Open to the World* where it is recommended that “The European Commission could then propose to declare clauses that grant exclusive rights to publishers unfair and without effect, and to force publishers to disclose these contracts. Furthermore, and consequently to Brexit, the European Commission could reconsider the present negotiation about European copyright law. Indeed, besides United Kingdom, other Commonwealth members and United States of America that are ruled by copyright, most of United Nations members are ruled by author’s law. Europe could then play a leading role to promote author’s law, to give a better protection to authors and a legal status to knowledge commons”¹⁹.

In 2018, the European Commission, together with the association Science Europe²⁰ decided to accelerate the transition to full and immediate Open Access to scientific publications. This is the so-called *Plan S* which relies on the following principles:

- Authors retain copyright of their publication with no restrictions. All publications must be published under an open license, preferably the Creative Commons Attribution License CC-BY²¹.
- Funding agencies will ensure jointly the establishment of robust criteria and requirements for the services that compliant high quality Open Access journals and platforms must provide.
- In case such high quality Open Access platforms or journals do not yet exist, the funding agencies will in a coordinate way provide incentives to establish these and support them when appropriate.
- Where applicable, Open Access publication fees are covered by funding agencies or universities.
- When Open Access publication fees are applied, their funding is capped (across Europe) and standardized in accordance with domain-specific requirements.
- Funding agencies will ask universities, research organizations and libraries to align their policies and strategies, notably to ensure transparency.
- Funding agencies accept the principle that all scientists are able to publish their work within Open Access even if their institutions have limited resources.
- The importance of open archives for hosting research outputs is acknowledged because of their long-term archiving function and their potential for editorial innovation.
- The hybrid model of publishing (i.e., whose subscription is paid by libraries and authors are asked to pay for their paper to be open access) is not compliant with the above requirements.

¹⁸http://openscience.ens.fr/ABOUT_OPEN_ACCESS/DECLARATIONS/2016_05_17_EC_Amsterdam_Call_for_Action_on_Open_Science.pdf.

¹⁹http://openscience.ens.fr/MARIE_FARGE/ARTICLES/2017_05_15_BOOK_CHAPTER_FOR_THE_EUROPEAN_COMMISSION/2017_05_15_Chapter_on_publishing_and_peer_reviewing_in_open_access.pdf.

²⁰<https://www.scienceeurope.org>.

²¹<https://creativecommons.org/licenses>.

- Funding agencies will monitor compliance with the principles enunciated and will sanction non-compliance.

The computational biologist Michael Eisen from Berkeley University, one of the co-authors of the Budapest Declaration²² and co-founder of PLOS, expressed his doubts concerning Plan S. He launched an Open Letter in Support of Funder Open Publishing Mandates, which has been signed by many researchers who denounce the Gold Open Access model that Plan S will impose on researchers by 2020: “We, the undersigned, are researchers who believe that the world’s scholarly literature is a public resource that only achieves its full value when it is freely available to all. For too long we have tolerated a pay-for-access business model for scholarly journals that is inequitable, impedes progress in our fields, and denies the public the full benefit of our work”²³.

Today, the Green Open Access model (where authors deposit a version of their articles in an open repository) is widely developed but publishers are lobbying against it, by imposing embargos to delay deposit. Thus they make sure that only the Gold Open Access model allows immediate open access in order for their business model to win in the long-term. Only a few non commercial publishers, e.g., the American Physical Society (APS) authorizes authors to deposit the published version of their articles without any embargo period; this practice is exemplary since it avoids different versions of the same article to circulate on the Web, which is confusing because their type-setting and even their content (e.g., the author’s version before peer-reviewing) are different. It already exists worldwide a large number of institutional or disciplinary open repositories, which are listed in the Directory of Open Access Repositories (DOAR)²⁴, where researchers can deposit a version of their articles. Researchers consider that the Green Open Access model is presently the best solution to disseminate their articles, since it ensures a smooth transition from toll access to open access, while it respects their academic freedom and leaves room for designing new publishing models, such as the Diamond Open Access model. Since embargoes reduce and distort the dissemination of peer-reviewed articles, several countries (e.g., Germany and France) have changed their copyright law to forbid embargoes or minimize their duration.

It is actually possible to overcome the publisher’s embargo by providing an Open Access Button²⁵, which automatically sends an email to the authors and asks them to kindly provide their author version, if their article is still under embargo. Therefore the Green Open Access with an Open Access Button and the Diamond Open Access model, both designed by researchers to disseminate as widely and freely as possible their results, offer immediate Open Access and there are no longer reasons for preferring the Gold Open Access model, designed by publishers. Moreover, a way to publish in Diamond open access is to rely on the open repositories developed for Green Open Access (e.g., Zenodo²⁶ at CERN in Geneva), which leads to the concept of ‘overlay journals’, where authors deposit their article in an open repository to be peer-reviewed; for this authors have two possibilities: either they mention the overlay journal they choose for peer-reviewing their article, or they let any journal editor propose them to peer-review it. An overlay journal is simply a set of links to the articles that have been peer-reviewed and ac-

²²<https://www.budapestopenaccessinitiative.org>.

²³<http://michaieleisen.org/petition>.

²⁴<http://www.opendoar.org>.

²⁵<https://openaccessbutton.org>.

²⁶<http://zenodo.org>.

cepted by its editorial board (e.g., *Discrete Analysis* whose articles are deposited in arXiv and then peer-reviewed by its editorial board²⁷). All articles are thus in Open Access as soon as they have been deposited by their authors in an open repository and they are peer-reviewed afterwards. Moreover, any article can be copied from the open repository, which guarantees that the most useful articles will always remain available somewhere.

2.3. Open Science in France

Research in France is characterized by the fact that most research institutions and universities are publicly owned and publicly funded, in contrast to, e.g., the United Kingdom and United States. The Ministry of Research and Higher Education does not wish to let publishers control the dissemination of research results and impose the Gold Open Access model. For over thirty years the *Centre National de la Recherche Scientifique* (CNRS) was the world's largest producer of peer-reviewed articles, but in 2017 it retrograded to second rank, behind the Chinese Academy of Science. Consequently, the large number of peer-reviewed articles that CNRS researchers publish cannot be supported under the Gold Open Access model that publishers try to impose. CNRS cannot afford to pay APCs without running the risk of bankruptcy, or else should drastically reduce its production by setting a maximum number of articles to be published per year. The strategy of the major publishers is obvious: they want to impose, world-wide and as soon as possible, their Gold Open Access model, in order to preserve their profits and reinforce their control of scientific publishing. They have already succeeded in confusing most of researchers who think that Open Access implies 'author pays'; this is not true since it exists other Open Access models that scientists have designed and adapted to their needs, and that the French Ministry of Research and Higher Education is supporting.

Here are some of the main steps achieved to develop Open Science in France.

In 1999, the historian, specialist of digital humanities Marin Dacos designed the platform *Revue.org* and the open-source software *Lodel* to publish and disseminate research journals of social sciences and humanities. In 2007 he was hired by CNRS to create in Marseilles the *Centre pour L'Edition électronique Ouverte* (CLEO) and develop the publishing platform *Open Edition*²⁸, which offers standard services for free to both readers and authors (only additional premium services are charged to libraries). Up to now, *Open Edition* has published 6,980 books, 508 journals from 31 countries with 16 different languages, 2,926 blogs and 41,494 announcements of conferences.

In 2001, the theoretical physicist Franck Laloë, from *Ecole Normale Supérieure* (ENS) in Paris, suggested that CNRS create the open repository *Hyper Articles en Ligne* (HAL)²⁹ devoted to all scientific fields, including sciences and humanities, on the model of arXiv that is limited to a few exact sciences. HAL is managed by the *Centre pour la Communication Scientifique Directe* (CCSD), a service unit from CNRS located in Lyons, which ensures the long-term preservation of the deposited articles and of their metadata. HAL is moderated to check that only the author version is deposited (this verification requires a few days), and the intellectual property remains with the authors. Articles in physics, mathematics and computer sciences deposited in HAL are automatically

²⁷<http://discreteanalysisjournal.com>.

²⁸<https://www.openedition.org>.

²⁹<https://hal.archives-ouvertes.fr>.

copied into arXiv, and there is a similar agreement between HAL and PubMed Central (PMC) for articles in biology.

In 2003, the director of CNRS, Bernard Larrouturou, together with the directors of several German and French public research institutions, co-signed the already mentioned Berlin Declaration, which states that: “Internet has fundamentally transformed the concrete and economic framework of the diffusion of scientific knowledge and cultural heritage [...] In the interest of our institutions, the new paradigm of Open Access must be encouraged for the benefit of science and society. [...] Our institutions must find appropriate solutions in order to let the financial and legal frameworks evolve in such a way that access and optimal use of the new facilities be guaranteed”.

In 2011, Marie Farge, member of the ethics committee of CNRS, wrote the *Recommendation about relations between researchers and publishers*³⁰. She explained that publishers force researchers to accept the Copyright Transfer Forms in order to give them their copyright for free (although their article passed peer-reviewing and has been accepted for publication by the journal). This is not legal under the French author's right law that differs from copyright law. Indeed, in France researchers own exclusive intangible property right on their articles that they do not share with their employer (French Intellectual Property Code, Article L. 111-1) and “The transfer of the author's rights is subject to the condition that each of the rights transferred is mentioned separately in the deed of transfer and that the field of exploitation of the rights transferred is delimited in terms of its scope and destination, place and duration.[...] The beneficiary of the assignment undertakes by this contract to seek to exploit the assigned right in accordance with the practices of the profession and to pay the author a remuneration proportional to the income received” (French Intellectual Property Code, Article L. 131-3, modified by the so-called *Loi sur le Droit d'Auteur et les Droits Voisins dans la Société de l'Information* (DADVSI) of 1 August). She suggested that CNRS, together with universities and other French public research institutions, negotiate jointly national licenses with publishers, on the model of what the Brazilian Federal State does; this recommendation has been implemented in France since 2014. She also recommended that those negotiations be conducted, not only by librarians, but also by researchers, members of editorial boards and lawyers, specialists of intellectual property law, commercial law and public market law; unfortunately, this recommendation is not yet in use.

In 2014, Antonin Delpuech, a student in computer sciences at ENS in Paris created the platform Dissemin³¹ to help researchers to deposit their articles in open repositories; his motto is: “spot your own pay-walled papers, liberate them in one click”. In 2015, Antonin Delpuech, Marie Farge and three students, all working at ENS, created the non-profit association named Committee for the Accessibility of Publications in Sciences and Humanities (CAPSH) which supports Dissemin. Presently Dissemin harvests more than 100 million scientific articles from many research fields and institutions worldwide, using various metadata sources (e.g., CrossRef and BASE). Dissemin provides researchers with a simple interface to locate and download articles already in Open Access and, for articles that are not in Open Access, it checks which version of the article (preprint, postprint or the published version) their publisher allows the author to deposit in an open repository. Presently Dissemin offers the choice between three open repositories, which

³⁰http://openscience.ens.fr/MARIE_FARGE/ARTICLES/2011_06_27_2011_AVIS_POUR_LE_COMITE_D_ETHIQUE_DU_CNRS/2011_06_27_Avis_CNRS.pdf.

³¹<https://dissem.in>.

are well-indexed, metadata-rich and owned by a public or a non-profit institution: Zenodo funded by the European Commission³², HAL funded by CNRS³³ and Open Science Framework (OSF) funded by the American National Science Foundation (NSF)³⁴. Dissemin's code is written in Python and available for free under the open-source license Affero General Public License (AGPL), and anyone can download it from the open platform GitHub³⁵.

In 2017, the French policy to foster Open Science has been stated in the Jussieu Call for Open Science and Bibliodiversity³⁶. Its goal is the “development of innovative scientific publishing models [...], open-source tools, [...] a secure and stable body of law across different countries to facilitate the availability of text mining, [...] national and international infrastructures which generate the preservation and circulation of contents”. It explains that its “primary aim should be to pool local and national initiatives or to build an operational framework to fund open access publishing [...] and address the needs of the scientific community”. More than 120 institutions from many countries signed it.

In 2018, the Institute of Mathematical Sciences and their Interactions (INSMI) of CNRS created the platform Mersenne³⁷ to peer-review and publish in Diamond Open Access research journals whose articles are formatted in LaTeX. Its guiding principles are: non-profit public service, open-source software using OJS, quality of the peer-reviewing, permanent archiving, transparency on costs and on the journal selection process. It is run by Mathdoc³⁸, a service unit from CNRS and the *Université de Grenoble-Alpes* (AGU) located in Grenoble. All peer-reviewing and electronic publishing services are free to readers and authors, but additional services (e.g., copy editing, proof-reading, plagiarism detection, print-on-demand) are charged. The French Minister of Research and Higher Education, Frédérique Vidal, published in 2018 the National Plan for Open Science and announced that France strongly supports the European policy proposed by the European Commissioner for Research, Science and Innovation, Carlos Moedas, requiring that by 2020 all scientific publications should be in Open Access as soon as they are published. Frédérique Vidal stated that “France is committed to ensuring that research results are open to all, researchers, companies and citizens, without hindrance, without delay, without payment”. For this, she added that Open Science should be taken into account to evaluate researchers and research institutions, and she announced the creation of a special fund dedicated to support Open Science. Today, the results of publicly funded research, namely articles and data, should be by default published in Open Access since “Science is a common good that we must share as widely as possible” and “the role of public authorities is to restore the initial function of science as a factor of collective enrichment”. The goal is to achieve the vision of Elinor Ostrom, a professor of political science at Indiana University, who introduced the concept of Knowledge Commons³⁹ and received in 2009 the Nobel prize in economic sciences for “her analysis of economic governance, especially the commons, showing how common resources can

³²<https://zenodo.org>.

³³<https://hal.archives-ouvertes.fr>.

³⁴<https://osf.io>.

³⁵<https://github.com/dissemin>.

³⁶<http://jussieucall.org>.

³⁷http://www.mathdoc.fr/centre_mersenne.

³⁸<http://www.mathdoc.fr>.

³⁹Hess, C. & Ostrom, E. (Eds.) (2007). *Understanding Knowledge As a Commons: From Theory to Practice*. MIT Press, 367 p.

be managed successfully by the people who use them, rather than by governments or private companies". It is worth recalling here that ideas are not of the same nature as material goods, because when we share an idea we do not lose it. Sharing an idea is thus a positive-sum game, and also the necessary condition for verifying and improving this idea. Hopefully, Knowledge Commons would be easier to develop than traditional commons (e.g., fisheries) since they concern ideas but not material products. Unfortunately, major publishers still control most of scientific publishing because they own the journals, created by researchers, together with the peer-reviewing reports and the articles, written by researchers. Since throughout the world research is mainly supported by public funds, given the high amount of long-term investment required, it is urgent that researchers and their funding agencies recover control of scientific publishing and develop the Knowledge Commons for preserving and sharing research output. Public funding agencies should no longer finance the APCs publishers require for Gold Access Access, but rather offer open repositories and publishing platforms for researchers to use. Indeed, together with research infrastructures necessary to produce scientific results, researchers also need publishing infrastructures to share and to preserve their publications and their data. For ensuring that commercial publishers cannot buy and control publishing platforms, as it too often happens (e.g., the platforms Mendeley, Pure and SSRN were bought by Elsevier), it is essential that those infrastructures necessary to research be publicly owned and developed using open-source software.

3. Towards Open Legal Doctrine

Is law a science like any other? Does legal research have a place in the Open Science movement? Regardless of opinions, the worlds of law and science are very close. Law is a language, an art that is coming into ever closer contact with science (AI, statistics, etc.), and is even gradually applying its methods.

One may get the feeling that the legal research community is responding to the Open Science evolution in a piecemeal fashion, sometimes even coming into apparent conflict, however progress has been constant and the needs of stakeholders in these separate worlds are seen to be converging⁴⁰.

One must also keep in mind that legal scholars have actually been practicing Open Science for a long time. The first open-access legal journals were founded in 1996, immediately following the introduction of the Internet in France, with the Neptunus university-based initiative⁴¹ and, in the public sector, the *Cour de Cassation's* information newsletter. Numerous other projects have followed, with over a hundred journals offering high-quality content being established over the subsequent two decades⁴².

Concomitantly, as mentioned earlier, academics have been successful in updating their regulatory, then legal, environment, making it possible for authors to reference and deposit their work on specially created digital platforms similar to those created for other disciplines as part of the Open Science movement.

⁴⁰<http://bibliotheque-blogs.unice.fr/httbu/2017/01/26/gerer-et-diffuser-les-donnees-de-la-recherche-enjeux>.

⁴¹<http://www.cdm.univ-nantes.fr/neptunus-international-884952.kjsp?RH=1342095979500&RF=1339768387194>.

⁴²List and short presentation of these journals on the Juriconnexion association's Wiki site https://web.archive.org/web/20170606093931/http://www.juriconnexion.fr/wiki/index.php?title=Revues_libres.

Legal literature stakeholders are faced with a real challenge, i.e. gathering together in a single digital location the enormous body of work that is published online in different forms: articles, theses, dissertations, etc. At present, there is no guarantee that all this material will be preserved. The platform that has been made available to researchers is not wholly satisfactory: depositing material could be made easier, document descriptions could be more precise, which would contribute to producing better search results; also, there is room for improvement in the official recognition and research activity ranking processes followed by authors' home institutions. By what means can law scholars be encouraged to deposit their work on a single common platform? Which would be the platform of choice? Could such a repository be improved by developing a European or international document description standard?

It is nevertheless important to note that significant progress has been achieved in the description of research work, the coordination of descriptions and their dissemination, with the creation and continuous enrichment of the Univ-Droit website⁴³. The platform, which is placed under the authority of the Conference of Faculty Deans and is managed by a dynamic team, collects the work of a variety of entities: university libraries, the national cataloguing institution Agence Bibliographique de l'Enseignement Supérieur (ABES), as well as a number of publishers and university laboratories.

Mindsets in the academic world have also changed very quickly over the same period⁴⁴. It is clear that the pathway to obtaining the *agrégation en droit* has hindered the free circulation of research work in the past, and still occasionally creates barriers. However, the enhanced exchange of ideas and experience and the cooperation that derive from sharing, as well as the need to reach out to new readers by disseminating work via channels other than subscription-based journals, combined with the need to see one's work referenced more frequently, have brought together the legal world and different compartments of the human science world.

Uploading articles onto public online repositories is now recommended, encouraged and supported. Thesis supervisors, librarians and administrative authorities are introducing training modules on how to deposit research work and ensure interoperability. The present revolution underway in legal training will no doubt help to consolidate this new practice. France's Pix platform⁴⁵ is already announcing new self-education tools that will facilitate submission and indexing of material. In the meantime, a number of tutorials⁴⁶ have already been made available which provide all the basic information.

This sharing of information is part of a broader movement involving other legal professionals, i.e. lawyers, notaries and bailiffs, for whom good practices in knowledge management represent a valued skill, highly sought after in the workplace. Bar associations have set up their own open access platforms and encourage their members to make their legal doctrine available to the public at large.

Publishers too are feeling the winds of change and are reflecting upon how to adapt their business models. In the past, the various players on the legal market expressed different needs, depending on whether they were undergrads, PhD students, young researchers, university professors, lawyers, or other legal professionals. Additionally, their needs would evolve as their careers would develop.

⁴³<https://univ-droit.fr/>.

⁴⁴<https://www.village-justice.com/articles/etat-recherche-droit,28198.html?>

⁴⁵<https://www.blogdumoderateur.com/pix-competences-numeriques/>.

⁴⁶<https://doc.archives-ouvertes.fr/tutoriels-video/>.

Today, increasingly sophisticated and powerful search engines have brought the majority of legal doctrine into the light. The Isidore search engine⁴⁷, which focuses on open-access scholarly content, is one of the most advanced tools at this time. These new, globalized tools have contributed to changing users' mindsets.

Market players more and more frequently demand having access to everything, and discrimination is less well tolerated than in the past. Publishers have to deal with an increasing demand for unified search capabilities across paid and open-access content. They have become aware that future solutions will necessarily involve joint discussions with users and authors, and will have to be future-proof.

Driven by the goal of fostering open access to knowledge, the Open Law association launched the Open Doctrine project in early 2018, as part of which a number of areas have been identified to date⁴⁸:

- Education: inform and train all legal scholars in order to ensure that all work is deposited onto a single group of servers.
- Technology: provide a unified, reliable and lasting integration of content, and improve access.
- Institutional engagement: enlist the support of academic institutions in highlighting the value of openly accessible research content and work on leveraging content made available on open platforms.
- Economics: formalize various freemium-based data dissemination business models that blend free dissemination and pay-to-use when a service provides added value.

In order to promote this initiative and get the necessary discussion going, an Open Thesis award is to be launched in 2019⁴⁹, which will reward authors who make the full version of their legal thesis freely accessible. The award will be announced officially at a ceremony which will take place at the Cujas university library on May 15th. It is intended to encourage young researchers to share their work, and to reward actions that foster Open Science. Not only will these initiatives undoubtedly benefit young scholars' reputations, in particular in combination with social media, but they also translate a willingness to give French doctrine more international exposure, in Europe and further afield. One must, however, not lose sight of two important aspects: the language barrier and the difficulties future generations will experience in reading today's doctrine. There are numerous challenges in all areas. In law, as is the case in other disciplines, Open Science is but a new step in a long history of academic initiatives geared towards helping the research community function efficiently.

Acknowledgements

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⁴⁷<https://isidore.science/>.

⁴⁸<https://openlaw.fr/travaux/communs-numeriques/open-doctrine>.

⁴⁹<https://openlaw.fr/fonds-de-dotation-open-law>.