

## 21 The Pasts, Presents, and Futures of SciELO

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Launched in 1998, the Scientific Electronic Library Online (SciELO), of which I am the director, has made important contributions to the research and democratization of scientific knowledge. It has done so through a not-for-profit network of over 1,000 journals and by emphasizing the academic, cultural, and social relevance of scholarly communications. These journals are housed within university departments and faculties, in other research institutions, at scientific societies and professional associations, all spread across 16 countries, including Latin America and the Caribbean, Portugal, Spain, and South Africa.

The network is dispersed; as an average, most institutions in the SciELO Network publish fewer than two indexed journals. This poses challenges for sustainability. Indeed, when SciELO was founded, most of these journals were barely breaking even. There were only a limited number of subscriptions to their print editions, their presence was known only to small and insular research communities, and they held low or no international visibility. These titles were also ignored by the indexes of the Institute for Scientific Information (ISI, now Clarivate Analytics), which were emerging in the eyes of authors, research authorities, journal publishers, and editors as the favored—albeit flawed—benchmark list of high-quality journals. In part, SciELO emerged in order to mitigate this situation through the adoption of digital open-access publishing, indexing, and dissemination, at scale.

Since that time, SciELO has managed to position itself as a benchmark of quality journals and has commensurately elevated the status of Latin American publications in proportion to its scientific production. It has been followed by other regional open-access initiatives such as *La Referencia*, a regional network of open-access repositories, and Redalyc, a centralized aggregator of journals, both of which are more thoroughly detailed in Dominique Babini's chapter.

In 2018, SciELO celebrated its twentieth birthday by hosting a public forum of SciELO Network authorities, journal editors, and scholarly communication editors. Culminating in the “20 Years of SciELO” week event, with over 700 participants, the network also took this opportunity to revisit the future goals for the platform. In particular, representatives of the national collections agreed to update the “common action lines” for the platform, in order to advance our journals’ professionalization, internationalization, and sustainability for the next five years, with an emphasis on the transition to broader paradigms of open science.<sup>1</sup> This paints a bright picture for the future of SciELO and we expect the network to continue for many years to come. In this chapter, though, I will revisit the determinant forces that shaped the creation and development of SciELO and will project how these renovated forces can drive the future of the platform.<sup>2</sup>

### **Building a Common Publishing Model**

SciELO is a program based on international cooperation, in which nations work together to adopt common technical standards for academic publishing. This cooperation manifests in the form of a common “meta-publisher”; that is, a virtual space that aggregates journal publications into a single location. From its very outset, SciELO was conceived as an open-access model, seeking to gain economies of scale, to adopt best editorial practices, and to maximize interoperability, visibility, and credibility. The model thrives on a balance between improving the capacities and qualifications of journals while respecting the independence of their editorial policies, missions, and research-community profiles.

Initial planning of the publishing model took place over a one-year pilot, beginning in February 1997 and formally launching in March 1998. The pilot model consisted of a partnership between the São Paulo Research Foundation (FAPESP) under Professor Rogerio Meneghini and the Latin America and Caribbean Center on Health Sciences Information of the Pan American Health Organization at the regional office of the World Health Organization (BIREME/PAHO/WHO) under my leadership. The initial relationship between FAPESP and BIREME was brokered by the Brazilian Association of Scientific Editors (ABEC), a tripartite relationship which bestowed on the model an authoritative status in research advancement and scientific information

management. The pilot selected 10 leading journals from Brazil, which were already indexed by ISI or MEDLINE, spanning the scientific disciplines.

One of the most sought-after outcomes from this early pilot was the development of a trustworthy bibliometric database. In line with other leading research agencies in Latin America in the late 1990s, FAPESP was already running a program to support journals published by institutions from the State of São Paulo, which is responsible for nearly half of all Brazilian research articles and one quarter of Latin America's output. At that time, journals requesting financial support were mapped to a predefined ranking of journals in Brazil based on "academic relevance," defined by scientific committees from each discipline. There was also a similar program and ranking system to fund journals at the national level run by the Brazilian National Council for Scientific and Technological Development (CNPq). SciELO was designed to improve this extant situation, in which rankings were established without any bibliometric indicators due to the limited coverage of the bibliographic indexes and lack of existing performance metrics.

BIREME's expertise in scientific information management—derived from its regional technical cooperation through the Latin American and Caribbean network of health science libraries—made it an ideal partner for the development of this database. Indeed, BIREME's background in this space came from its provision of multilingual access to health science literature using the United States' National Library of Medicine (NLM) MEDLINE database and its regional complement, the Latin American and Caribbean Health Sciences Literature (LILACS). BIREME was also one of the five Medical Literature Analysis and Retrieval System (MEDLARS) centers that the NLM promoted in the late 1960s to disseminate the MEDLINE database. Through these projects and others, BIREME acquired substantial expertise in the operation of bibliographic databases in multilingual contexts with accessible and affordable methodologies and technologies. In the late 1990s, for example, it developed the Virtual Health Library (VHL) as its platform for web-based international cooperation to maximize access to health science information, a strategy that was aligned with UNESCO's Information for ALL Program.<sup>3</sup>

SciELO was initially conceived by BIREME as an associated network of the VHL. Thus, the creation of SciELO is also rooted in cooperation with the United Nations and with North America. For instance, a key collaboration between BIREME and UNESCO was the development of the public-domain


















ISIS database software—used for information retrieval—which was widely used by libraries in developing regions and is still today a key component of SciELO's operating platform.

From these common goals—also sanctioned by the Information Department of the Chilean National Council for Scientific and Technological Research (CONICYT), and a workshop held in March 1998 in São Paulo—SciELO was born. The launch was signaled by a special issue of *Ciência da Informação* and the first article describing the SciELO publishing model was published in Portuguese and translated and published in Spanish.<sup>4</sup> Early international dissemination of the SciELO project and model took place at the 1998 and 1999 workshops and conferences on electronic publishing in science organized by the International Council for Science (ICSU) and UNESCO.<sup>5</sup> Shortly thereafter, SciELO's importance for developing regions was highlighted in *Nature* in 2002 and in *Science* in 2009.<sup>6</sup>

After SciELO's launch in Brazil and Chile, the platform expanded rapidly, both in geographical scope and in subject coverage. For instance, the model was adopted over the next 11 years by 12 other Latin American and Caribbean countries, as well as Portugal, Spain, and South Africa. In terms of subject areas, in 2000 we launched the SciELO Public Health collection, specifically for health-related journals. These changes also led to some reallocations of roles. SciELO Brazil, for instance, now acts as the secretariat for the network and is responsible for communications, network meeting organization, and the management, maintenance and development of the methodological and technological work packages, training, and guidance for establishing new collections. Since 2010, BIREME, by contrast, has restricted its operation to the coordination of SciELO Public Health.

As part of its expansion, SciELO also developed a set of simple protocols for establishing new collections. Each new collection must be led and funded by a nationally recognized research and technology organization, beginning with a three-month “pilot collection” of three to five journals operating in an intranet setting. This is followed by an open web operation under the label of an “in-development collection” for approximately six to eight months. Finally, when all requirements are in place, the collection moves to certified status (which can be revoked if the quality standards drop). While the network is open to thematic collections, so far only the public health collection has taken this option. A tentative plan to operate a social sciences

collection with selected articles from SciELO journals translated into English did not materialize due to the lack of resources and complexities around the quality control of translations. Joining the SciELO Network, of course, remains a voluntary decision at both the national and journal levels. The status of the network, as of 2018, is shown in figures 21.1 and 21.2.

	<i>Argentina</i>   CAICYT-CONICET
	<i>Bolivia</i>   Viceministerio de Ciencia y Tecnología
	<i>Brazil</i>   FAPESP CNPq CAPES BIREME-PAHO-WHO FapUNIFESP
	<i>Chile</i>   CONICYT
	<i>Colombia</i>   Universidad Nacional de Colombia
	<i>Costa Rica</i>   Biblioteca Nacional de Salud y Seguridad Social
	<i>Cuba</i>   Centro Nacional de Información de Ciencias Médicas (Infomed)
	<i>Ecuador</i>   SENESCYT - Secretaría de Educación Superior, Ciencia, Tecnología, Innovación y Saberes Ancestrales
	<i>Mexico</i>   UNAM, Dirección General de Bibliotecas
	<i>Paraguay</i>   Instituto de Investigaciones en Ciencias de la Salud Universidad Nacional de Asunción
	<i>Peru</i>   Consejo Nacional de Ciencia, Tecnología e Innovación Tecnológica CONCYTEC
	<i>Portugal</i>   Direção-Geral de Estatísticas da Educação e Ciência
	<i>Spain</i>   Instituto de Salud Carlos III Biblioteca Nacional de Ciencias de la Salud
	<i>South Africa</i>   Academy of Science of South Africa - ASSAf
	<i>Uruguay</i>   BINAME-CENDIM-FM-Udelar
	<i>Venezuela</i>   FUNDASINADIB
	<i>Public Health</i>   BIREME-PAHO-WHO FAPESP

**Figure 21.1**

SciELO Network collections.

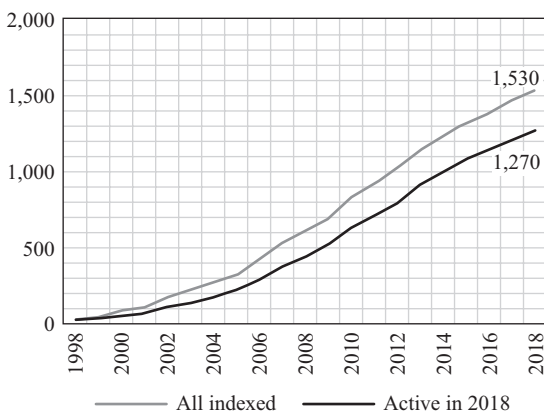
Distribution of SciELO Network collections by year of starting, type of collection, number of journals indexed, total of articles, May 2019							
Year started	#	Collections		Journals Indexed			Documents
		Collection	Status <sup>1</sup>	All <sup>2</sup>	Active <sup>3</sup>	Certified <sup>4</sup>	
1998	1	Brazil	C	372	298	298	386,617
	2	Chile	C	121	107	107	64,632
2000	3	Costa Rica	C	42	37	37	9,832
	4	Public Health <sup>5</sup>	C	20	18	18	42,727
	5	Cuba	C	77	67	67	33,478
2001	6	Spain	C	60	43	43	38,237
	7	Venezuela	C	60	37	37	18,971
2003	8	Mexico	C	214	127	127	66,295
	9	Argentina	C	150	107	107	39,872
	10	Colombia	C	236	227	227	72,031
2004	11	Peru	C	31	31	31	9,618
	12	Portugal	C	68	46	46	18,745
2005	13	Uruguay	C	25	21	21	4,667
2006	14	Social Sciences <sup>6</sup>	I	33	33	33	665
	15	West Indian	I	1	1	1	1,307
2007	16	Paraguay	D	15	14	14	2,310
2009	17	Bolivia	C	27	23	23	4,758
	18	South Africa	C	78	76	76	28,104
<b>Total Network</b>				1595	1268	1247	824,159
1 - C=Certified; D=in Development; I=Interrupted							
2 - All journals indexed: actives, excluded, name changed or publication interrupted							
3 - Journals being published regularly							
4 - Journals from collections that comply with SciELO standards							
5 - Includes 12 journals and 23,394 articles already indexed in national collections							
6 - Includes 23 journals and 523 articles already indexed by national collections							

**Figure 21.2**

Distribution of SciELO Network collections by start year, status, number of journals indexed, total of articles (May 2019).

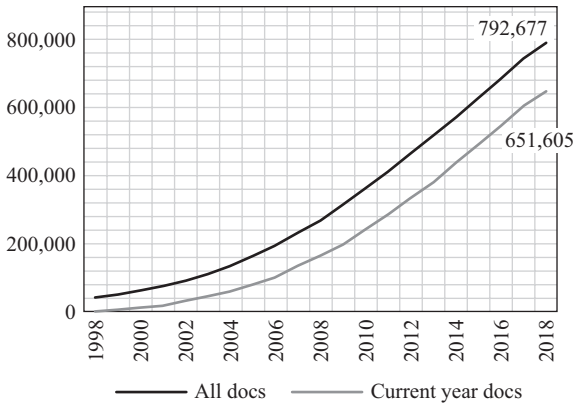
## Documenting the Evolution of the SciELO Program and Network

The growth and evolution of SciELO can be seen in the distributions of the annual total number of journals (figure 21.3) and documents indexed by the network of national collections (figure 21.4).<sup>7</sup> For journals, one distribution accumulates all indexed journals and another only those that remained active (for there are many reasons why journals may be discontinued: non-compliance with indexing criteria, interruption of publication, a turn to for-profit publishing, and at the journal's decision). The annual growth of the active journals was 21 percent per year over 20 years, starting with 26 journals in 1998 and ending with 1,270 in 2018. The number of journals indexed tends to stabilize toward a core in each collection, resulting in overall decreasing growth, well expressed by the annual growth for successive quinquennials: 40 percent, 26 percent, 16 percent, 7 percent (figure 21.5). The current SciELO Network has reached a stable level of 51,000 newly published documents per year, 90 percent of which are articles and reviews. The documents are physically hosted on nationally operated servers but conceptually they are integrated within the SciELO common virtual space. In fact, the metadata of the newly input documents are physically uploaded weekly by the national collections into the network repository. With over 800,000 documents, the SciELO Network repositories serve a daily average of over 1,000,000 HTML and PDF articles, using COUNTER-compliant

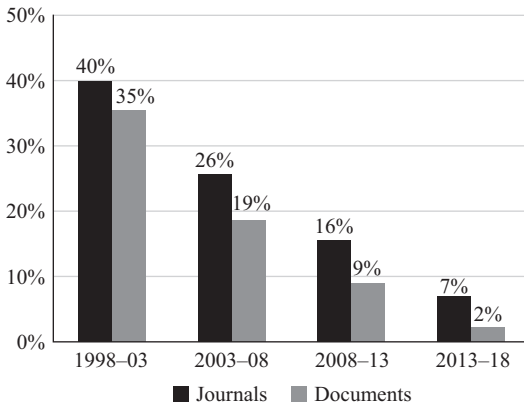


**Figure 21.3**

Yearly increase in SciELO Network journals.



**Figure 21.4**  
Yearly increase in SciELO Network articles.



**Figure 21.5**  
SciELO Network quinquennial rate of growth.

metrics (a standard for measuring article hits in a way that doesn't count duplicates).

SciELO's collections span a variety of subjects and editorial policies. There is no predefined pattern, priority, or privilege with respect to the composition of the collections. Multilingualism is also an inherent characteristic of research communication in the SciELO Publishing Model.<sup>8</sup> Indeed, figure 21.6 evidences the diversity of the composition of the SciELO national collections in terms of the distribution of number of journals and documents



published in 2017 by major knowledge areas, language, authorship affiliation, and citations per article from inside and outside the SciELO Network. As can be seen, Brazil is responsible for about 40 percent of the contents, followed by Colombia, Mexico, and Chile. Together these four countries publish about 70 percent of the documents. Paraguay is not included in the table because it is not yet a certified collection. About 12 percent of the documents are not identified as communicating research, which is the case with opinion editorials, obituaries, and so forth. Brazil publishes an average of 71 such articles per journal per year while all other collections publish an average of 30 articles.

With respect to thematic areas: health sciences, human sciences, and applied social sciences comprise 67 percent of the articles. The presence of other disciplinary spaces is limited, reflecting the general scope of the research communicated by nationally published journals. Exceptions here include agricultural topics, covering 17 percent of articles from Brazil and reflecting the importance of this area within the country's economy. Further, biological sciences have a prominent profile in Costa Rica and South Africa, with 17 percent and 27 percent of their articles, respectively. Spain's collection is restricted to health sciences, which also comprises more than 50 percent of the output from Cuba, Peru, Uruguay, and Venezuela. Multidisciplinary categories include journals with three or more thematic areas assigned. Except for South Africa's and Brazil's collections, non-English articles prevail in more than two-thirds of the articles of 12 collections and in more than 90 percent of seven collections. SciELO Brazil journals, which traditionally faced a limited global reach due to their Portuguese native language, made a huge effort to increase the number of English articles, achieving 70 percent in 2017 and planning to reach 80 percent in the coming three to five years.

With respect to the proportion of foreign authorship (that is, authors from outside the nation hosting the journal) and global reach, the selected countries in figure 21.6 had valid data for at least 85 percent of the articles. For different reasons, Brazil and Cuba publish predominantly national authors, while Chile and Costa Rica have a foreign author on more than 50 percent of their articles.<sup>9</sup> In addition to the language of publication and authorship, the source of the citations the research received is an indicator of degree of globalization. Taking the Web of Science (WoS) ALL Database as the source because it covers all SciELO journals, figure 21.6 shows for the documents published in 2015 by each collection the distribution of the

citations per document received from SciELO Network journals and from all WoS ALL Database journals up to May 2019. Overall, there is a threefold increase when moving from SciELO to WoS ALL Database, always taking into consideration that the actual citation values per collection depend on the distribution of thematic areas, language of publication, and authorship affiliation. Brazil's and Chile's multithematic collections perform better in citations per document in both contexts. In terms of presence in international commercial bibliometric indexes, figure 21.6 also shows the

Country	Composition							Major Thematic Areas				
	Journals	% Journals / total	Docs	% Docs / total	Citable docs	% Citable docs / docs	Articles / journal	Agriculture	Applied social sciences	Biological sciences	Engineering	Exact and earth
Argentina	124	10%	3,438	5.9%	2,905	84%	23	8%	17%	15%	2%	4%
Bolivia	17	1%	175	0.3%	137	78%	8	4%	23%	8%	6%	9%
Brazil	291	23%	22,593	39.1%	20,566	91%	71	17%	7%	9%	8%	3%
Chile	104	8%	4,457	7.7%	3,895	87%	37	9%	18%	14%	9%	9%
Colombia	227	18%	6,929	12.0%	6,095	88%	27	8%	22%	5%	11%	5%
Costa Rica	34	3%	1,020	1.8%	917	90%	27	8%	25%	17%	9%	3%
Cuba	64	5%	3,298	5.7%	2,902	88%	45	10%	13%	2%	9%	3%
Ecuador	13	1%	276	0.5%	257	93%	20	0%	37%	0%	39%	14%
Mexico	169	13%	6,101	10.6%	5,020	82%	30	10%	29%	13%	7%	7%
Peru	29	2%	1,171	2.0%	979	84%	34	9%	8%	13%	0%	4%
Portugal	46	4%	1,799	3.1%	1,524	85%	33	9%	40%	0%	2%	2%
South Africa	74	6%	3,262	5.6%	2,979	91%	40	7%	11%	27%	9%	9%
Spain	42	3%	2,488	4.3%	2,016	81%	48	0%	0%	0%	0%	0%
Uruguay	22	2%	593	1.0%	404	68%	18	0%	29%	7%	0%	0%
Venezuela	14	1%	194	0.3%	174	90%	12	17%	3%	13%	18%	0%
Total	1,268	100%	57,794	100%	50,770	88%	40	11%	14%	10%	7%	4%

**Figure 21.6**

SciELO Network collections coverage by major thematic areas and global visibility given by proportion of English articles and foreign authors, citations per document received in WoS ALL Database and presence in Scopus and SJR.

presence of SciELO Network in the 2019 edition of Scopus, which offers incomplete but elaborate journal coverage. SciELO Bolivia and Ecuador are not in Scopus and SciELO Venezuela is not considered because it is not updated. About half of the SciELO journals are indexed and about 70 percent are above the twenty-fifth percentile of Scimago Journal Ranking (SJR), with SciELO South Africa and Brazil journals above 91 percent and 87 percent respectively (this could be due to language factors as these latter two nations, as noted, publish predominantly in English).

					Global Visibility							Country
Health sciences	Human sciences	Linguistic, literature and arts	Multidisciplinary	Articles in English	Articles author's abroad affiliation	Wos citations/doc received			Scopus indexing			
						From SciELO journals	From WoS ALL database journals	Increase	% Journals indexed	% Journals SJR Q1, Q2 or Q3		
29%	34%	3%	0%	7%	–	0.23	0.69	3.01	30%	41%	Argentina	
22%	19%	0%	16%	6%	–	0.08	0.19	2.31	–	–	Bolivia	
40%	18%	3%	3%	70%	24%	0.85	2.68	3.15	73%	87%	Brazil	
30%	22%	7%	1%	26%	52%	0.56	1.76	3.11	75%	72%	Chile	
24%	24%	3%	6%	25%	39%	0.40	0.91	2.28	35%	69%	Colombia	
24%	17%	7%	8%	16%	61%	0.22	0.72	3.29	9%	67%	Costa Rica	
62%	6%	0%	2%	3%	21%	0.20	0.33	1.63	30%	5%	Cuba	
11%	0%	9%	0%	7%	48%	0.00	0.00	0.00	–	–	Ecuador	
18%	21%	1%	6%	20%	36%	0.34	1.09	3.19	45%	62%	Mexico	
61%	20%	2%	0%	6%	–	0.36	0.77	2.16	28%	25%	Peru	
37%	20%	4%	4%	23%	–	0.22	0.60	2.74	35%	31%	Portugal	
28%	30%	5%	8%	94%	–	0.36	1.35	3.75	58%	91%	South Africa	
100%	0%	0%	0%	34%	33%	0.57	2.02	3.52	86%	58%	Spain	
54%	26%	3%	0%	2%	48%	0.18	0.39	2.11	5%	0%	Uruguay	
59%	6%	0%	0%	6%	–	–	–	–	–	–	Venezuela	
37%	20%	3%	4%	42%	31%	0.55	1.69	3.06	49%	69%	Total	

## SciELO, Open Access, and Technology

The SciELO model and platform have brought technological innovations to the production of its included journals. The most important of these was the pioneering adoption of open access as inherent to online publishing, which happened four years before the Budapest Declaration. Three main conditions made this possible.

First, SciELO's successful implementation as a pilot project embraced the innate characteristics of the web and developed a common methodological and technological solution to index, publish, and disseminate journals online with minimal or no costs for the institutions responsible and with no interference with the paper-based publication. Thus, SciELO was created as a public platform using the ISIS public domain software developed by UNESCO and BIREME to run collections of journals allowing anyone access to journal content. In 1997, very few journals had access to online publication and those that had were mostly restricted to PDF files. Indeed, this intervention was so early that full-text databases and HTML web publication were perceived as radical innovations and faced strong resistance. Second, most of the quality journals targeted by SciELO were nonprofit with subscription fees intended to recover only the costs of publication. However, journals with many subscriptions, particularly in the social sciences, resisted open access and took a long time to embrace this model. Third, as stated before, the institutional authority given by FAPESP and BIREME was essential. Worthy of mention is that the new publishing model succeeded in national contexts unused to innovations because SciELO became a quality seal.

A key facet of the successful implementation of the SciELO publishing model was to build a qualified indexing function. The purpose was to supplement the role played by indexes in the US, which were not properly covering the journals of Brazil and many other countries. This was partially because of the publishing characteristics of these journals—such as scattered publication of journals, multilingual publication, research subjects or schools of thought distant from the scope or inclinations of the indexes. It was also, though, due to the lack of lobbying capacity to influence bibliographic indexes compared to that of commercial publishers. The emergence of SciELO as an international index of quality journals represented a breakthrough for national scholarly publishing, overcoming existing restrictions, and the lack of information and capacity faced by public and institutional policies to govern the

advancement of journals. For although Google Scholar and other emergent indexes do not, technically, differentiate results by national source, the way in which research communicated by noncommercial publishers, particularly from developing regions, is consistently undervalued—as shown by many other chapters in this book—puts the lie to the myth of an a-national meritocracy.

To return to open access, though, taking open access as an inherent condition of a web publishing model was a programmatic and political decision by SciELO, made to enhance the relevance of the research communicated by quality journals, to maximize that research's visibility under the broad concept and belief in scientific knowledge as a public good, and as a determinant of academic, social, cultural, and technological development. In terms of open-access operation, SciELO evolved to formally adopt the Creative Commons Attribution License (CC BY) as the standard license, thus contributing to universal nonrestricted, continued access to updated, qualified, and relevant scientific information and knowledge. This was adopted, in particular, to minimize the so-called know-do gap (in which research is not translated from its theoretical groundings) that affects developing countries through the implementation of research, but also to improve the local flow of scientific information and to maximize the capacity for action of evidence-based public policies and services, continued improvement of research and education, support for professional practices, and a public library to inform citizens.<sup>10</sup>

Integral to the evolution of SciELO's dissemination power is the platform's compliance with bibliographic standards, which were progressively applied to the entire full text using XML semantic markup elements.<sup>11</sup> The first version of SciELO's implementation restricted SGML markup to the identification of the article's front bibliographic reference elements, the back-matter bibliographic references, and the beginning and end of full-text paragraphs. Since 2015, however, SciELO has implemented the Journal Article Tag Suite (JATS) standard through the SciELO Publishing Schema, which is updated every six months. The idea here is to work progressively toward all bibliographic elements being controlled by multilingual dictionaries to assure text quality and improve interoperability. The pace of adoption of new methodologies and technologies across the network is determined by the coordinators of the national collections according to their own specific conditions and priorities. In complex cases, such as the adoption of JATS in 2015, it is expected to take five or more years to cover all journals.

The most important challenge SciELO and similar journals face, however, lies in governmental and institutional policies that have prioritized a simplistic use of crude metrics, such as the journal impact factor, as proxies for the value of research. Similar barriers are imposed by universities whose research policies are driven by university rankings. Sadly, there are plenty of studies that have shown that research published by nonetheless high-quality, nationally published journals receives fewer citations than commercially high-“impact” journals; a phenomenon that is not properly addressed by the algorithms that calculate impact.<sup>12</sup> For example, a lack of international collaboration lessens impact (used in a broader sense) of research oriented to local problems, which are better investigated by nationally affiliated researchers. In the same vein, non-English articles are restricted to domestic or regional citations.

### **The Collective Building of the Present and Future of SciELO**

SciELO’s foundations of governance and operation have remained essentially constant from its inception. Principles of decentralization, disintermediation, and networking—key web-inherent attributes—drive the governance, implementation, and operation of the SciELO Program in order to maximize inclusion, academic autonomy, and widespread development of capacities and infrastructures as the basis for autonomous national policies on scholarly communication with global interoperability. The entire flow of research communication is technologically aligned with scholarly communication standards and best practices. Under these principles, SciELO features a well-established *modus operandi* that encompasses all network collections and individual journals covering different subjects and a variety of editorial policies. SciELO collections have the implicit objective of promoting quality journals within an inclusive vision of bibliodiversity.

SciELO’s development is conducted with no formal bilateral or multilateral signed documents at the level of the network of collections and within national collections. The SciELO Network and its common virtual space are voluntary, and collectively built and developed by both the national collections and their individual journals. They are driven by three main agreed lines of action covering the next five years. The first line of action is professionalization. This line aims for the production of state-of-the-art

journals for the sake of improving research capacity and democratization of scientific knowledge. The internationalization line seeks an appropriate balance of the presence of national- and foreign-qualified researchers as editors, peer reviewers, and authors, as well as publication in the English language in order to maximize the proactive presence in the international flow of scientific information. The third line of action seeks the strengthening of operational and financial sustainability of the journals as a commitment to the research community. The ultimate objective is to increase credibility and competitive positioning to induct journals as proactive participants in the global flow of scientific information.

The transition to open science as a fully open workflow is the programmatic plan for the future of SciELO.<sup>13</sup> Following national and international advancements in open-science implementation, the three lines of action for SciELO journals are enriched, in the first place, by the acceleration of research communication, which requires the widening of the publishing flow to include preprints, and the continuous publication of individual manuscripts as soon as they are approved. Secondly, the exhaustive citation and deposition of all data, software source code, and any material or content that underlies articles will be required to be available in certified repositories to ease their reuse, and particularly the reproduction of the research process and results. Finally, the strengthening of transparency and progressive opening of the peer review process, players, and decisions.

These lines of action, embedded within the open-science practices listed above, project a renewed future for the SciELO Program, with journals focusing their role progressively on the validation of research. Open science broadens the research communication spectrum via the use of preprints and data repository servers, so journals are being moved from their traditional role to become part of an interconnected complex system of information sources and communication vehicles. It is also expected that the comprehensive nature of open science will contribute to enhancing the evaluation of SciELO and similar journals by national research agencies and institutions beyond the simplistic adoption of rankings. The richness of open science and the related complexities do represent threats to journals, but they open also new opportunities to enhance their role in the future of scholarly communications: an approach to which the SciELO Program is committed.

## Notes

1. SciELO, "Priority Lines of Action," SciELO 20, August 17, 2018, [https://www.scielo20.org/redescielo/wp-content/uploads/sites/2/2018/09/L%C3%ADneas-prioritarias-de-acci%C3%B3n-2019-2023\\_en.pdf](https://www.scielo20.org/redescielo/wp-content/uploads/sites/2/2018/09/L%C3%ADneas-prioritarias-de-acci%C3%B3n-2019-2023_en.pdf).
2. For a more thorough list of works about SciELO, see SciELO, "Bibliography about SciELO," SciELO, accessed June 2, 2019, <https://scielo.org/en/about-scielo/bibliography-about-scielo/>; see also Dennis F. Shaw, eds., *Proceedings of the Second ICSU-UNESCO International Conference on Electronic Publishing in Science: Held in Association with CODATA, IFLA, ICSTI & STM Publishers at UNESCO House, Paris 20–23 February, 2001* (Oxford: ICSU Press, 2001).
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7. The term “documents” refers to all types of text published, while “articles” and “reviews” apply to research-related communications. Documents include articles and reviews in addition to editorial and other non-peer-reviewed texts.

8. Rogério Meneghini and Abel L. Packer, “Is There Science Beyond English? Initiatives to Increase the Quality and Visibility of Non-English Publications Might Help to Break Down Language Barriers in Scientific Communication,” *EMBO Reports* 8, no. 2 (2007): 112–116, <https://doi.org/10.1038/sj.embor.7400906>.

9. In the case of Cuba, this is due mainly to the political embargo that has been affecting all aspects of the country and that reflects limited international interoperability and cooperation. In the case of Brazil, one reason is the native Portuguese language that until recently predominated in the communication of research by many journals. This naturally limited submissions by non-Portuguese native-language researchers. With the internationalization promoted by SciELO, English became the main language used by most of the journals, which is easing the submission of manuscripts by foreign authors, so there is an increasing proportion of foreign authors.

10. Sally Theobald et al., “Implementation Research: New Imperatives and Opportunities in Global Health,” *The Lancet* 392, no. 10160 (2018): 2214–2228, [https://doi.org/10.1016/S0140-6736\(18\)32205-0](https://doi.org/10.1016/S0140-6736(18)32205-0).

11. Markup costs are rolled into the overall costs to produce a journal. It is carried out in different ways by national collections. Most of the national collections demand that journals send the articles in XML and PDF, so each journal has its own devolved mechanism for marking up articles. Due to the complexity involved in marking up according to the SciELO Publishing Schema (JATS implementation), many journals now employ third parties to undertake this work. There are also cases where journals have in-house mark-up solutions. In a few cases the national coordinators undertake the mark-up.

12. Vincent Larivière and Yves Gingras, “The Impact Factor’s Matthew Effect: A Natural Experiment in Bibliometrics,” *Journal of the American Society for Information Science and Technology* 61, no. 2 (2010): 424–427, <https://doi.org/10.1002/asi.21232>.

13. SciELO, “Priority Lines of Action.”



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