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Introduction

This year brings the centennial of the founding of the *Journal of Biological Chemistry (JBC)*. Next year, the publisher of the *JBC*, the American Society for Biochemistry and Molecular Biology, ASBMB (known as the American Society for Biological Chemistry or ASBC until 1987), will celebrate its centennial.¹

The founding and sustaining principle of the ASBMB has been service to science. While the Society is involved in many activities to support science – such as scientific meetings, travel funds for young scientists and science education – its major endeavour is the publication of its flagship journal, the *JBC*. (More recently, the Society has also begun publishing three additional journals, the *Journal of Molecular and Cellular Proteomics*, the *Journal of Lipid Research* and *Biochemistry and Molecular Biology Education*, all of which are guided by the same principles.)

Genesis

In the early 1990s, under the direction of *JBC* Editor-in-Chief Herbert Tabor, the Journal began to explore alternatives to print publication. There were many reasons for this exploration, including the rapidly increasing size of a journal that required weekly publication – the 1990 annual volume was over 22,000 pages. The sheer volume of the Journal's published research was becoming unmanageable from a scientist's point of view. Moreover, each weekly issue was approaching the four-pound weight limit allowed for second-class mail. Fortunately, the US Postal Service, at our request, increased the weight limit to 72 pounds, which we have not yet exceeded. The first effort to alleviate the problem was to create a CD-ROM version of the Journal, thus reducing each annual volume from hundreds of pounds of bound volumes to a few easily stored,

Serving science while paying the bills: the history of the Journal of Biological Chemistry Online

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ABSTRACT: Recent developments in the publication of the Journal of Biological Chemistry (JBC) are discussed, particularly the development of the electronic version of the Journal, JBC Online, and the opportunities and challenges that this mode of publication has presented to its publisher, the American Society for Biochemistry and Molecular Biology (ASBMB) and its mission of service.



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searchable discs. Charles (Chuck) Hancock and Barbara Gordon of ASBMB contracted with Lightbinders and the CD version of *JBC* was launched in 1993. Although the CD was a technical advance and a great improvement over storing back issues of the print version of the Journal, it had many limitations. First, it was not timely – each CD was released months after the printed issue. Additionally, librarians were not willing to substitute the CD for their print versions, even as storage, and never adopted it. By 1994, we realized that the CD version of *JBC* was not going to be an acceptable or sustainable adjunct or alternative to print and we began to consider other possibilities.

In 1994, a fateful meeting of the Stanford University Faculty Senate brought an unexpected opportunity. During a report from the University Library Committee, always riveting, I described the dilemma that the *JBC* was facing with print publication and the unsatisfactory experience with the CD. After the meeting, Michael Keller, the University Librarian, suggested that it was time to consider using the Internet to publish scientific research and that the Stanford University Library would be willing to partner with ASBMB/*JBC* to create the first online journal. Shortly after a series of exploratory meetings, the collaboration began, with joint funding from ASBMB and Stanford University. It is a testament to the strong fiscal management and visionary leadership of ASBMB that substantial funds were available to invest in such a risky endeavour. This was the perfect collaboration since a university library system and a non-profit, society publisher share the same missions of service and information dissemination. Keller, with ASBMB as collaborator, started HighWire Press as the electronic imprint of Stanford University Library. John Sack was hired as Director of HighWire Press, and under Sack's direction, Hancock and Gordon from ASBMB and Fran Steck and Aaron Bigman from Cadmus Journal Services set to work in January 1995 to publish *JBC Online* in time for a debut at the ASBMB Annual Meeting in May of that year. It was a Manhattan Project-like effort, but at the ASBMB Annual Meeting in San Francisco, *JBC Online* was launched to the

surprise, delight and amazement of several thousand meeting attendees as well as to those who had made the heroic effort.

Development

While the initial efforts to start *JBC Online* focused almost entirely on technical issues, we immediately began to consider the full range of implications that came with this mode of publication. How could we develop maximum access? What were the implications for the traditional print journal? How could we sustain online publication financially? How could we join with other journals to connect research topics? The first year of *JBC Online* was made available free to everyone and the second year, 1996, available for a nominal charge as we developed a comprehensive plan for a sustainable future that would allow maximum access and yet continue to pay the bills.

The first decision was key to a sustainable future. For 1997, we established a site license system that allowed *JBC Online* access on an institutional basis. Any institution, defined geographically, could purchase a single online 'subscription' that would allow access for all members of the institution. For example, the US National Institutes of Health (NIH), an organization of more than 18,000 employees, has complete access for a single online subscription fee. There was long, and often amusing, debate about creating what has come to be called 'tiered pricing' based on institutional type/size. The problem was that no one could agree on the proper scaling measure. Should it be total employees? research volume? hospital beds? student enrolments? We decided that one price would fit all and while some, like the NIH, would get a relative bargain, the decision to keep it simple has served us well.

The price for the online subscription was set at about 70% of the cost of a print subscription, reflecting the 30% cost savings of avoiding printing and distribution. Importantly, institutions were offered a choice between a print subscription, an online subscription, or both for the combined price of the two. Even though pricing that allowed choice was very clearly favoured by the librarians with whom we had consulted,

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some institutions were critical and felt that if they bought both print and online subscriptions they were paying twice for the same content. This complaint ignored the fact that even paying for both a print and online subscription to the *JBC* was, pound for pound, still the best bargain in STM publishing. Others, however, recognized that they had been offered the choice and could abandon print in favour of migration to online publications. So, the financial gamble by the Society was to predict how quickly institutions would abandon the print journal in favour of the online journal. We made a bold, naïve and zealous set of predictions in 1996: (i) cancellation of print subscriptions by institutions, especially 'duplicates', would be rapid; (ii) scientists would demand that their institutions subscribe to *JBC Online*; (iii) librarians would recognize the value of *JBC Online*; (iv) the subscription process would go smoothly; (v) we were headed rapidly to abandonment of the print version of *JBC*. The only common thing about these predictions has been that they were all wrong! We have been surprised at how slowly the transition is occurring. We predicted that institutions with duplicate subscriptions to the print *JBC* would be the first to cancel the duplicates and keep only one print subscription for archival purposes. Stanford, for example, had six print subscriptions in 1997 and by 1999 had seven! Some journals have adopted a practice of 'bundling' their print and online journals to avoid the loss of print subscriptions and thus sustain revenues. We rejected this model from the outset, avoiding coercive marketing practices and believing that the 'market' would determine our best product.

The effect on revenues

The revenue that supports *JBC* publication costs comes primarily from two sources: about 60% from institutional subscriptions and about 30% from page charges to authors. There is also a small amount of income from advertising and sale of reprints. Only subscriptions to institutions contribute to net revenue, as print subscriptions to Society members, a vanishing number, are sold at cost and online subscriptions to Society

members are free. Further, *JBC* subscriptions are the lowest in STM publishing. Currently, a *JBC Online* subscription costs \$0.04/page. It costs ASBMB, on average, about \$2,500 to publish each *JBC* paper.

With this as background, what has happened to *JBC* revenues? Subscriptions to print *JBC* began to decrease in the 1980s, well before the Journal's online publication. The institutional print subscriptions continued to drop after *JBC Online* was started but the rate of loss did not begin to accelerate until 2000. Overall, the number of print subscriptions to *JBC* went from 4,500 in 1990 to 1,700 in 2004. Much of this loss was from institutions that had multiple subscriptions of the print Journal and were unloading the 'duplicates' while retaining one print copy as their archive as we had anticipated. (Stanford now has one print subscription!) During the period between 1996 and 2004, online institutional subscriptions went from zero to 1,350. Clearly, online did not offset print loss and the Society poured lots of resources into this project, but the bottom line was that we sustained sufficient overall subscription revenues to cover the costs of publication.

The archive

However, we have gone well beyond the technical revolution and business implications of online publishing and one objective trumped all others: maximum access to *JBC*. Online publishing has been the means to that end.

In 1998, we decided that at the end of each calendar/subscription year all previously published *JBC* content would be free. Importantly, this provided perpetual access for librarians to all the content for which they had paid. 'Free back issues' became a mantra for the many publishers that by now were working with HighWire Press. There were many predictions that we would suffer subscription revenue losses but none materialized.

Also in 1998, we, with leadership from energetic *JBC* Associate Editor Jim Stull, developed a complete electronic manuscript tracking system and the following year a complete electronic manuscript submission

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system. These systems created a completely paperless process from submission to review to publication. There were substantial savings in both cost and time. But the real payoffs were not financial. With the electronic manuscript submission system, we saw an opportunity to develop a rapid publication mode not previously possible and, in 2000, we launched *JBC Papers in Press*. Since authors submitted their manuscripts as PDF files, we realized that we could publish these versions immediately after they were accepted, prior to copyediting. Publication of a paper as a *JBC Papers in Press* establishes scientific priority and is the publication of record. Digital object identifiers (DOIs) were used to index these papers. *JBC Papers in Press* reduced the time between acceptance and publication from eight weeks to one day, to the delight of both authors and readers. Importantly, we decided to allow free access to these *JBC Papers in Press*, making the *Papers in Press* both fast and free. As we had predicted, releasing these papers in this way has had no deleterious effect on our revenues. Another great service and no revenue loss.

Finally, in 2003 we made all back *JBC* content available online starting from the first paper published in 1905. This project makes *JBC Online* a complete archive and has elicited the most enthusiastic response from readers since we launched *JBC Online* and *JBC Papers in Press*. Scanning the back issues has also been a part of an effort for *JBC* preservation. Many of the very early paper issues are in poor condition and we felt that electronic preservation was an important goal. This entire archive has been made available free, and while we could easily have tried to generate revenues from this collection, as other publishers have done, it was not consistent with our mission of service. Librarians have applauded this effort and within days of completion of the archive began shipping their *JBC* print archive to remote locations liberating many linear feet of library shelf space.

As the publisher of *JBC Online*, the ASBMB has been guided by one principle: use this new publication mode to increase

access to the research literature. We have been able to:

- Launch *JBC Online*.
- Provide free back issues.
- Provide every accepted *JBC* paper free as *JBC Papers in Press*.
- Provide the entire *JBC* Archive, from 1905 to 2004, free.
- Retain the lowest subscription rates in STM publishing.
- Pay the bills.
- Generate sufficient revenues for continued innovation.
- Increase manuscript submissions by about 7% each year.

To this point in the changing landscape of scientific publishing our policies/decisions have promoted the Society's mission far better than many would have predicted, but what about the future? The transition from print to online is not yet complete and a new, sustainable system for long-term, stable revenue generation not yet in place. What will we do once we lose most of our revenue from print subscriptions? Given the success of earlier predictions, one is reluctant to make forecasts but there are few options. We will probably increase the subscription charge for *JBC Online* to compensate and possibly ask authors to pay a greater share of the publications costs. The latter will be unpopular since in a survey of a thousand of *JBC* authors, we were told, by a 10:1 margin, that they do not favour an 'authors-pay' business model. One thing will not change, however, and that is our mission of service.

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Reference

1. The early history of both the *JBC* and the American Society for Biochemistry and Molecular Biology can be found at <http://www.jbc.org/cgi/content/full/277/12/e1> and <http://www.jbc.org/cgi/content/full/277/13/e2>.

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