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Darrell W, Gunter
Gunter Media Group, Inc., d.gunter@guntermediagroup.com

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As Worlds Collide — New Trends and Disruptive Technologies

by **Darrell W. Gunter** (President & CEO, Gunter Media Group, Inc.) <d.gunter@guntermediagroup.com>

I'd like to kick off this article with a couple of historical observations. Back in 1996 the scholarly and academic research community had decided to begin to build their electronic journal systems. The academic universities were not quite sure if they were ready to transition from print to electronic, and if they did acquire e-journals they were not quite sure if they would cancel their print. It took quite a few years for the majority of the institutions to sign up for electronic journals. While the publishers were somewhat perplexed that the acquisition of their e-journal platforms was taking longer than expected, they were also part of the problem as well. As most of the publisher's ejournal programs started at 1995 and moved forward, all but one publishing executive debated whether adding backfiles back to Volume 1 Issue 1 would be accepted by the academic research community. The other issue debated was whether books should be digitized or not. At the 2001 **PSP** symposium titled "The E-book: Crouching Dragon or Hidden Tiger?[1] Publishers and librarians actually debated the pros and cons of the eBook. This industry is very slow to move, as there is a necessity to have validated published proof that a move to a new medium such as digital books would be acceptable. Well, the one publishing executive who moved first in both categories was **Derk Haank**, the CEO of **Elsevier**. **Derk** was attending a meeting in Japan, and a Japanese Library Director asked **Derk** when **Elsevier** was going to load up the journal backfiles. **Derk** asked him how important this was to the library community, and he said very important. **Derk** replied in his normal, very confident manner, "We will load them ASAP." Without any hesitation **Derk** informed the **Elsevier** team about his decision, and this ambitious project moved forward on his order. After **Elsevier's**

announcement, the other publishers introduced their backfile programs. When **Derk** moved over to **Springer** one of his first initiatives was to digitize the entire book collection. In 2006 **Springer** had beaten the other scholarly publishers to the punch with his eBook program. These two anecdotal examples demonstrate our industry's lethargy in moving into new technologies.

My hypothesis for this article is that there are several forces (old and new) that are seriously threatening the publisher's traditional subscription pricing model. The scholarly publishers will need to assess their respective positions in the market place and will need to act in a far more expeditious manner than they have in the past. Further, these new emerging technologies are speeding up the collision that we all will face.

Allow me to establish the foundation for my article.

Scholarly Publishing Industry Facts

Over the last 15+ years, the scholarly industry has loaded up 96% of the 24,500 journal titles. These titles generate in access of 800,000 articles per year for an estimated author community of 5.5 million worldwide researchers.[2] It is estimated that it takes an author 90 to100 hours to prepare a scholarly article and it will take two to three reviewers three to six hours to conduct their peer review of a single article. Considering the time it takes the author to write their scholarly article and the daunting task of the researcher to stay up on the ever-growing number of scholarly articles, their time is seriously being challenged. **Mark**

Ware's 2006 paper on the scholarly industry reported that size of single journal grew from 83 to 154 articles. The length of the average article grew from 7.4 to 12.4 pages, and the total pages of the journal grew to 2,216 from 820 pages — a whopping 270%![3] Considering these statistics are a few years old and the trend is increasing each year, we know that the researcher's burden becomes more substantial each year.

Just as challenging is the academic library's challenge to manage their collection within its budget. Unfortunately the average publisher journal price increase is always higher than the average library's budget for serials and monographs. While the publishing community have brought great value to the research community by providing backfiles at a very reasonable cost and providing them access to their entire library of titles, the fact remains that the library's budget and the publisher's subscription price increases have been and will remain in conflict with each other.

New Models/ Open Access

The Open Access movement has gained momentum over the last fourteen years. It seems that every publisher has some type of Open Access position. In addition to **PLOS** and **BioMed Central**, we have seen that **Springer**, **Elsevier**, **Oxford University Press** — just to name a few — have adopted a variety of Open Access policies. While the jury is still out on whether Open Access will be damaging to the publishers subscription pricing

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public sector: our Hive Scholars do not use public funds, are not employees of the University and so are not limited by job descriptions or operational plans. They are able to use their time and budget to deliver what they see as being needed by their community, and this independence allows them to address some of the thornier issues for doctoral researchers which would not otherwise be supported by the University, for example a practical session on how to deal with problems with doctoral supervisors. The Scholars operate in a safe environment where they are free to try new initiatives without fear of failure, where a lack of success is instead seen as an opportunity for reflection and learning.

Our relationship with **SAGE** is one which has been able to develop and grow according to the needs of its partners and in response to the external environment. We carefully record the outputs so that we are able to demonstrate the value of the partnership for each side. Each year we discuss with **SAGE** any new initiatives that either side would like to work on, and then put together a bid for funds. As the scholarly publishing environment is changing so fast its important that the partnership not only have both medium- and longer-term goals but that both sides agree to be flexible enough to respond to shorter-term issues and problems. It is this flexibility and enthusiasm for this relationship(from both **SAGE** and **Sussex**) that make it a success, along with the excitement of developing something tangible together, bringing together both public and private funds which

go beyond the traditional sponsorship of public space. 🌳

Endnotes

1. *http://www.sussex.ac.uk/library/research/hive*

2. *http://www.sussex.ac.uk/library/research/seminarsandevents/seminars2014*

3. *http://www.sussex.ac.uk/internal/bulletin/staff/2013-14/081113/sagescholars?ref=e-mail*

4. *http://www.rcuk.ac.uk/research/outputs/*

model, there is great concern that Open Access will undermine the long established, trusted publishing establishment thereby damaging the editorial and dissemination process. In addition to the **NIH's** announcement of the mandated article depository for **NIH**-funded research, the White House Office of Science and Technology has announced their plans outlining how they will expand public access to the output of the research they fund. The **PSP** organization has announced their CHORUS initiative to address OSTP's policy. As many publishers have signed onto this initiative, it is not clear if OSTP will accept CHORUS in lieu of other federal agency initiatives.

While the number of articles per publisher may not be significant today, it represents another outlet for high quality peer-reviewed scientific articles to be accessed freely on the Web. For anyone who wishes to gain access to electronic journals outside of going to a land grant institution they would have to pay a fee for the article.

Several institutions are now taking active positions for Open Access, most recently **Harvard** and **UC Berkeley**.[4-6] Clearly Open Access will put more pressure on the commercial publishers. Secondly, many institutions are working to implement a digital repository. One of the main issues they are facing to make the IR successful is getting the faculty to deposit their work. In the **Univ. of California** 2007 report on Faculty attitudes, it was noted that the Faculty are aware of the alternative forms of dissemination but are very concerned about preserving their current publishing outlet.

Elsevier introduced a new model for journal publishing by launching *practiceupdate.com* (formally *oncologlystat.com*). This portal offers free access to articles from 100 medical journals, CME, expert opinions, conference information, etc. Registration is free and they will derive their revenues from advertising on their site. This is a very bold initiative but, I think, a very wise one.

Here you see a major publisher doing a live pilot with a new model but to give this new advertising model a fighting chance they must select the right market, content, and manager to launch it.

Grants

While electronics have helped researchers to be more productive, they are still challenged to keep up with the sea of research and other tertiary data. As the researcher faces this hurdle there is a more significant obstacle they must address. That obstacle is the diminishing grants provided by the **NIH**. A report titled "A Broken Pipeline" published back in 2008 discussed the challenges of researchers to obtain **NIH** funding.[7] This report written in collaboration with a number of renowned institutions clearly points out that the downturn in research grants by the **NIH** since 2003 has had a tremendous negative effect on the advancement of research and it is threatening the bench strength of our youngest and brightest minds.

Here are the facts:

- Between 1998 and 2003 the **Clinton** and **Bush** administrations and Congress doubled the **NIH's** budget.

- Unfortunately in 2003 the **NIH** stopped receiving any budget increases, thus they experienced a 13 percent drop in purchasing power.

- The net effect of the loss of purchasing power is that the pace of scientific advances has slowed greatly. The reviewers have become more conservative and are demanding more evidence of the eventual success of the proposed theory prior to approving funding, and they are rejecting ideas that once would have been viewed more favorably.

- Only 1 in 10 first submitted grants get funded.

- Young researchers are affected as they receive 25 percent of the R01 grants down from 29% in 1990.

- Average age of the first time R01 recipient is now 43, up from 39 in 1990.

Here we clearly see that the researcher has the challenge of staying abreast of the latest research and competing more heavily for the very important R01 **NIH** grants. Being able to conduct their research more effectively and thoroughly is essential to them being able to compete for important grants.

The **NIH** established the Clinical and Translational Science Awards to achieve a number of goals.[8] The objective is to establish a consortium of research institutions to achieve the following objectives:

- Provide enriched environments to educate and develop the next generation of researchers training in the complexities of translating research discoveries into clinical trials

- Design new and improved clinical research informatics tools for analyzing research data and managing clinical trials

- Support outreach to underserved populations, local community and advocacy organizations, and healthcare providers

- Assemble interdisciplinary teams that cover the complete spectrum of research—biology, clinical medicine, dentistry, nursing, pharmacy, biomedical engineering, and genomics and

- Forge new partnerships with private and public health care organizations, including pharmaceutical companies, the Veterans Administration hospitals, health maintenance organizations, as well as state health agencies.

Currently, the consortium comprises 60+ academic health centers across the United States (*https://www.ctsacentral.org/institutions*). These institutions are linked together to energize the discipline of clinical and

translational science. In order to compete for these new grants the applying institution must demonstrate their capability to fulfill the CTSA guidelines. Again there is more pressure on the institution and the research community to compete for scarce resources.

Bioinformatics is another emerging trend as the research institutions are embracing this new area of study and it fits in with the **NIH** CTSA program.[9] Considering all of these developments it is becoming very apparent that the research institutions will need to procure research tools that will help their user community to be more effective and efficient in their research.

Trends & New Tools

Search has evolved and will continue to evolve over the years. Basic, advanced, Boolean search has served a purpose but with the explosion of data that the research community is now facing, they are requiring more sophisticated tools that will take them from searching to knowing. There is a great paper from Project 10X titled "Semantic Wave 2008 Report: Industry Roadmap to Web 3.0 & Multibillion Dollar Market Opportunities." The paper was authored by **Mills Davis**, Managing Director, Project 10X.

Mills Davis talks about how the Internet will evolve from Web 2.0 to Web 3.0, the emergence of semantic technologies, and how this new industry segment will grow into multibillion-dollar businesses.[10] On this matrix he shows the semantic wave that consists of four growth stages.

- Stage 1 is the basic Web that connects information.

- Stage 2 is the social Web that connects people.

- Stage 3 is the semantic Web that connects knowledge. I would dare to say that we are at the exciting beginnings of this stage.

- Stage 4 (the future) is the ubiquitous Web that connects intelligence.

Mills further demonstrates how Web 3.0 is different from the previous stages of the Internet evolution as its knowledge-computing power helps to solve complex problems and greatly improves productivity. This graph shows the various stages of knowledge discovery and the components of the technical foundation to make this possible.

During my time at **Collexis** we introduced several products utilizing our proprietary semantic technology. Using either structured or unstructured data, along with our ontology and the **Collexis** proprietary technology a fingerprint of the key concepts is created within the document. From this core technology we are able to create various applications.

Our Experts Profile application came in two versions. The free version *BiomedExperts.com* showed the profiles of 1.4 million researchers and their co-author relationships. The institutional version showed the profiles of their researchers at their institution. These expert profile applications were very powerful as they allow the user to find the most relevant researcher

based on a very specific concept or research term. The other application that we launched was the **Reviewer Finder**. This application had three unique applications. For the publisher it allowed an editor to find the most appropriate peer reviewer based on their researcher profile. For example the editor could cut and paste the author's manuscript into the search box and create a "Fingerprint" of the manuscript and then match it against the "Fingerprints" of their peer review group to determine the best member of their peer review group to review the submitted manuscript. The second application is for grant funding organizations to "Fingerprint" a submitted grant application to determine the best investigator to review the grant application. The third application helps the Director of Research to match the best-qualified researcher to a specific grant.

Technology transfer is another emerging opportunity for the research university. Being able to harness their respective knowledge within their institution is very important. Institutions have been trying for years to know what knowledge exists within their institution. A great example is one of **Collexis**' first Expert Profile customers, **Johns Hopkins**. **Johns Hopkins**[11] had been trying to determine within their research community who was doing what research and who was an expert in a given field. To facilitate collaboration, they opened up a coffee shop where the faculty could mingle, get to know each other, and share ideas. Well, the coffee shop did spur great conversations while folks were getting a cup of Joe, but it did not solve the problem. After a consultation with **Steve Leicht**, the COO for **Collexis**, they initiated a pilot of our Expertise profiling system.

With the **Collexis** Expert profiling application they were immediately able to search and find any relevant expert in any field. Their use of the **Collexis** Expert profiling system immediately and dramatically increased their collaboration among their researchers.

It is important to note that Asklepios Group, a 100-unit hospital system, utilizes the **Collexis** technology and after its implementation **Springer** experienced a 4X increase in the use of their articles. If you have time, please go the URL *http://download.microsoft.com/download/8/f/0/8f02f193-320c-4d0c-b4df-6578e9254ad6/Asklepios.doc* for Asklepios' case study about their experience.[12]

The Collision!

The ever-growing Bioinformatics field requires the research institutions to provide their research community with the best tools and resources to position themselves against their peers/competitors. In addition to this challenge the research community has to deal with the declining grant opportunities from the **NIH**. This collision has the young researchers finding themselves in a pickle as they are working to get their first R01 grant, which helps them to establish themselves in the research community. The competition for the CTSA grants is going to add to the pressure for the

research institutions to procure the necessary Knowledge Discovery tools that will allow them to meet the fundamental requirements of the grant application.

The researcher's time is being challenged with the sea of data that they must maneuver through to find those unique scientific breakthroughs that will help them achieve the R01 grant. Standard search tools will not be sufficient to assist the researcher in the quest for knowledge discovery. With article growth at 3+% per year the challenge is getting greater every year.

The library community's issue of publisher increases is first and foremost in their mind. They are hoping that the Open Access options will relieve some of the pressure they face in meeting their ever flat or decreasing budget. As the academic institutions move towards Knowledge Discovery tools, how will they finance these initiatives? Their financial pie is not getting bigger! No doubt they will look to add these new services and tools, but at whose expense?

The publishing community have their challenges as well. Open Access and the OSTP mandates are certainly top of their minds as these activities are certainly going to tug at their traditional subscription-pricing model. As we have seen **Elsevier** has raised the ante with their practiceupdate.com and several acquisitions including **Collexis**. In regards to the "Semantic Wave," the publishers' aggregators, etc., will need to move faster in determining if they are going to build, partner, or acquire the companies with this semantic technology or they will find themselves (their content) on an island with no bridges to their research community. One fact is undeniable: They will need to do something strategic sooner than later.

We are at the very beginning of the Knowledge Discovery "Semantic Wave." My prediction: more Open Access Journals and more publishers following **Elsevier's** lead with strategic initiatives and acquisitions. Basic Boolean Search coupled with A&I services will remain but most likely will be in the shadow of the new rising star, Knowledge Discovery powered by semantic analytics. 🌳

Endnotes

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6. Univ of Ca. & Greenhouse Associates, Inc., Faculty Attitudes and Behaviors Regarding Scholarly Communication: Survey Findings From The Univ. of California August 2007, *http://osc.universityofcalifornia.edu/responses/activities.html*.

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11. **Johns Hopkins** *http://www.researchprofiles.syynx.de/jhu/jhu.htm*.

12. *http://download.microsoft.com/download/8/f/0/8f02f193-320c-4d0c-b4df-6578e9254ad6/Asklepios.doc*

Against the Grain interviews **Kim Massana** in this issue (p.39). We learned about the acquisition when this issue was in press. Below is an additional question that we asked **Kim** about the acquisition and his answer:

ATG: And it seems that this was just the first step. In a major acquisition that you announced a few days ago, Innovative has purchased VTLS. What does VTLS bring to the table? How does it and the libraries that it serves fit into Innovative's corporate strategy? Why is Innovative being so aggressive in acquiring other companies? Is there a danger that you may be moving too quickly and growing too fast?

KM: In **VTLS** we saw a company with a strong family of library technology products, deep roots in the library community and an impressive global presence that complements ours. **VTLS**, which was serving 2,100 libraries in 44 countries — including major institutions like **Library of Congress**, **Hong Kong Public Library**, and **Queens Public Library** — has a particularly strong presence in both Europe and Asia, which are both strategic priorities for **Innovative**. With the acquisition we have increased our ability to support customers in both regions — we now have major offices in Dublin and Barcelona to serve Europe, the Middle East and Africa (EMEA) and major offices in Delhi and Kuala Lumpur to support our Asia Pacific presence.

One of the immediate results of the two acquisitions is that we have brought on board