Caught in a CrossFire: Academic Libraries and Beilstein†

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The introduction of Beilstein CrossFire in 1994 led many academic librarians to re-examine their treatment of the *Beilstein Handbook of Organic Chemistry*, which in a number of cases had been dropped from their subscription list. While cost factors were weighed against the requirement to cancel primary journal subscriptions when decisions were made to drop the printed *Beilstein*, other factors were found to be important when CrossFire was considered. The factors which influenced academic librarians to subscribe to CrossFire are examined in this paper. Also covered are the reception to the product after its introduction and a comparison to the funding of the CAS ONLINE Academic Program, which does not have a fixed subscription cost.

INTRODUCTION

Beilstein CrossFire covers over 6.5 million compounds, dating from 1779 to the present. For academic institutions, a subscription includes both the currently published print volumes of the handbook and the database. Searching is possible in the database by structure or substructure of a compound and by "facts"—such things as physical properties, bibliographic data, roles in reactions, etc. The CrossFire system is structured on a client/server computer architecture. In addition to the Beilstein database itself, another nine databases could be installed on the server to run under CrossFire.

A survey of academic chemistry librarians in 1993 revealed that a substantial number of them had chosen to sacrifice the subscription to the *Beilstein Handbook of Organic Chemistry* in order to salvage funds for the maintenance of primary journal subscriptions. Those who had substituted online searching of the Beilstein database for the print subscription reported that relatively little searching of the complex online file was actually being done.[1] With the introduction of the Beilstein CrossFire database system in 1994, many academic chemistry librarians took another look at Beilstein as a significant source of information for chemists. The combination of a fixed cost and graphical user interface was enough to convince some academic chemistry librarians that creative funding efforts were justified in order to subscribe to CrossFire. Nevertheless, the continuing upward spiral of the costs of primary chemistry journals seemed to be hindering chemistry librarians from making the product available to their clientele. Therefore, it was decided to conduct a survey to discover the level of awareness of the Beilstein CrossFire option among academic librarians and the degree of success they had found in making the product available to their users. A second survey of CrossFire users in the author's own institution was conducted to determine the utility of the product to their research efforts.

METHODOLOGY OF THE SURVEYS

In the summer of 1995, targeted inquiries were sent to colleagues seeking input on questions that might be asked and any concerns they had at that point about Beilstein CrossFire. Based on their input, an e-mail questionnaire (see Chart 1) consisting of 19 questions was sent to two Internet distribution lists, CHMINF-L (Chemical Information Sources Discussion List, with membership composed of both chemists and librarians) and STS-L (serving largely members of the Association of College and Research Libraries Science and Technology Section, a unit of the American Library Association). CHMINF-L has been in existence since May 1990 and is a well-established vehicle for rapid distribution of chemistry information on the Internet. It currently has over 1400 subscribers worldwide.[2] A final group of people who received the questionnaire was the subscribers to CIC-BEIL, a controlled membership listserve devoted to members of a consortium who have subscribed to CrossFire. The simple followup mail questionnaire at Indiana University went to faculty, post-doctoral fellows, and graduate students in the Department of Chemistry, approximately 250 people, and received 36 responses (see Chart 2).

RESPONSES TO THE E-MAIL SURVEY

Demographics. There were 25 librarians and 5 chemists at 25 different institutions who chose to respond to the questionnaire. Eleven of the responding institutions had subscriptions in place for CrossFire, with nine of those having subscribed through the library consortium that was surveyed. Thus, there were actually more nonsubscribers (14) than subscribers at the time of the survey. Since, as noted earlier, financial pressures had forced a number of academic libraries to cancel subscriptions to the handbook, it was of interest to know how many of the respondents were still subscribers to the *Beilstein Handbook of Organic Chemistry* (and/or Beilstein Current Facts CD-ROM) prior to considering the subscription to CrossFire. Twelve subscribers to the handbook and seven subscribers to Current Facts were among the respondents.

The institutions from which responses were received had on average 41 chemists on their faculty (median: 31), and 14 of those on average were organic chemists (median: 10).

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S0095-2338(95)00250-2 CCC: $12.00

Chart 1

QUESTIONNAIRE ON BEILSTEIN CROSSFIRE

The entire Beilstein Handbook of Organic Chemistry is available through a client/server database search system known as CrossFire. Beilstein CrossFire contains the chemical structures and more than 350 different chemical and physical properties for over six million compounds, searchable by structure, chemical or physical property, and other parameters.

A number of academic institutions have either subscribed to CrossFire or have considered subscribing to it in the last year. If your institution fits into either of those categories, please respond to the questions below. The information is being gathered for a presentation to be made at the American Chemical Society Meeting on August 22, 1995.

All responses will be kept strictly confidential. Please assist in this endeavor by sending your e-mail response by August 15, 1995 to:

WIGGINS@INDIANA.EDU

--Gary Wiggins, Chemistry Library, Indiana University, Bloomington,
IN 47405 (Voice: 812-855-9452; FAX: 812-855-6611)

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1. I am a:

___librarian
___chemist
___other (please specify)

2. My academic institution has subscribed to CrossFire.

___Yes
___No (if no, jump to question 5)

Comment:

3. For those who have subscribed to CrossFire, the subscription was placed by:

___the library.
___another academic unit.

Comment:

4. For those who have subscribed, was the subscription placed through a multi-university or multi-college consortium or agency?

___Yes
___No
Comment:

5. Did your institution have a current print subscription to the Beilstein Handbook of Organic Chemistry at the time of your consideration of Beilstein CrossFire?

___Yes
___No
Comment:

6. Did your institution have a current subscription to Beilstein Current Facts on CD-ROM at the time of your consideration of Beilstein CrossFire?

___Yes
___No
Comment:

7. Was CrossFire recommended for purchase by any chemistry faculty at your institution in the last year?

___Yes
___No
Comment:

Chart 1 (Continued)

8. How many fulltime chemistry faculty are there at your institution?

9. How many of the chemistry faculty are organic chemists (or work in fields closely related to organic chemistry)?

_____

10. Do you think that CrossFire should or will be used by chemists other than organic chemists at your institution?

___Yes
___No
Comment:

11. How serious a problem is the fact that only a Windows client is included with CrossFire at the present time?

Comment:

12. Is (or was) the necessity to obtain and maintain a server for CrossFire a significant barrier to subscribing to CrossFire at your institution?

___Yes
___No
Comment:

13. What was the most significant factor in your decision to subscribe or not subscribe to Beilstein CrossFire?

Comment:

14. What one electronic scientific database currently in use at your institution do you consider the chief competitor to Beilstein CrossFire?

Comment:

15. Is the item identified in question 14 fully subsidized by your institution for searching by your clientele?

___Y
___N
Comment:

QUESTIONS FROM THIS POINT ON ARE FOR SUBSCRIBERS ONLY.

16. How long after the order was placed was CrossFire available for searching at your institution?

___ months

17. What was the most significant factor that resulted in the length of time you listed in question 16?

Comment:

18. What problems have you encountered since the installation of CrossFire?

___lack of time to learn to search CrossFire

___lack of adequate training

___lack of adequate documentation

___other (please specify):

Comment:

19. What has been the reception given to CrossFire by users at your institution?

Comment:

THANK YOU FOR YOUR ASSISTANCE!

Chart 2

To: Chemistry Faculty, Post-Docs, Graduate Students, Staff
Subj. Use of Beilstein CrossFire

From: Gary Wiggins
Chemistry Library
August 8, 1995

Please take a few minutes and give me some feedback on Beilstein CrossFire by August 14.

The entire Beilstein Handbook of Organic Chemistry is available through the client/server database search system known as CrossFire. Beilstein CrossFire contains the chemical structures and more than 350 different chemical and physical properties for over six million compounds, searchable by structure, chemical or physical property, and other parameters. The database is loaded on a server at the University of Wisconsin and can be searched in the Chemistry Library on computers #1 and #5. In addition, it can be searched on a number of the computers in 006 and 046.

1. Have you ever searched Beilstein CrossFire?

___Yes ___No (Please answer #2 and #3 and return the questionnaire.)
Comment:

2. Would you like to have a training session on the use of Beilstein CrossFire?

___Yes ___No

Comment:

3. I consider myself to be a:

___biochemist ___physical chemist
___inorganic chemist ___analytical chemist
___organic chemist ___other (please specify)

4. Did you find the information you expected to find in your search?

___Yes ___No

Comment:

5. Was the user interface (client software) easy to use?

___Yes ___No

Comment:

6. What has been the most benefit you have derived from using Beilstein CrossFire?

Comment:

In only 6 of the 25 academic institutions had CrossFire been recommended for purchase by a chemist. The respondents were asked if they thought CrossFire would be of use to other types of chemists at their institutions, not just to organic chemists. Overwhelmingly, they answered in the affirmative to the question, with 24 of the 27 respondents to the question saying that the database should be of use to others, particularly medicinal chemists, pharmaceutical chemists, physical chemists, and chemical engineers.

Lack of a Macintosh Client Packaged with the Product. Many organic chemists in the United States have embraced the Macintosh as their computer of choice, unlike the situation in Europe where CrossFire was developed. The original release of CrossFire did not include a Macintosh client, although one was unveiled at the Fall 1995 ACS Meeting. (Those with certain commercial Macintosh chemical drawing software could use a Macintosh client even before that time.) It was thought that this might be a significant drawback in gaining the support of the organic chemists for CrossFire. This was found to be the case, as illustrated in Table 1. Only five of the respondents saw the lack of a Macintosh client as no problem, while nearly half of the 27 respondents saw it as a major problem.

Table 1. Lack of a Macintosh Client as a Hindrance To Adoption of CrossFire

response	N	major problem	10
no problem	5	very major problem	3
slight problem	9		

Lack of a Server as a Potential Hindrance. CrossFire requires a substantial investment in hardware for the server. At a minimum, an IBM RISC System/6000 with 12 Gbyte of hard disk storage space and 16 Mbyte of RAM running AIX 3.2x is needed. It was thought that libraries in particular might not have access to such computing power at this point in time. That seems not to be a problem, as 17 of the respondents indicated that the server did not present any significant barrier to the installation of CrossFire. Only nine

felt that the server would be a hindrance to implementing the CrossFire system at their institutions.

Competition from Other Electronic Products. There are ever-growing numbers of database products from which chemists and chemistry librarians can choose. Although CrossFire has a huge number of compounds in its database and an enormous number of facts about those compounds, it was felt that the perception among librarians, and perhaps even chemists, might be that other products filled their needs adequately. Seventeen respondents pointed to *Chemical Abstracts* or CAS ONLINE as the chief competition for CrossFire. Three people saw the Beilstein database on STN or Dialog as significant competition, and a like number mentioned the *Dictionary of Organic Compounds*. However, seven people noted that there is no product comparable to Beilstein CrossFire, and a number of others qualified their answers in like manner. Of the 17 people who added comments to their responses, this one is typical: "NOTHING is a true competitor to Beilstein. We only have substitutes which help, but do not solve, our need".

Some libraries are in fact subsidizing the use of electronic products at their institutions. Seven of the respondents indicated that the product they named as the chief competition to CrossFire was fully subsidized, and one library provides a partial subsidy. The majority of institutions do not pay the costs of online searching by chemists, however, with some respondents commenting on the problems which open-ended pricing of online searching presents to them. One subscriber to CrossFire said, "If a flat rate pricing structure were in place for CA files, CrossFire would have had much more serious competition..."

Subsidized Online Searching of CAS ONLINE at Indiana University. From July 1984 through August 1994 Indiana University provided a full subsidy to all users at its Bloomington campus for the actual costs of searching on the STN CAS ONLINE Academic Program. (A 50% subsidy was in effect the final four months of 1994.) Users of the CAS ONLINE Academic Program at any Ph.D.-granting institution pay only 20% of the full STN charges for searches on the CA and Registry files, so it was the 20% of the full charge that was being subsidized over the years. The original CAS ONLINE Academic Program had a fixed cost of $500 per month. In recent years, the CAS ONLINE service appeared as a choice on the campus-wide information system. It had become a very popular service that could be accessed by holders of IUB computer accounts from anywhere in the world. Since the passwords were programmed into the local VAX system that provided access to the service, it was relatively secure.

A look at the IU usage and cost figures in the last few years reveals the dilemma faced by academic institutions that choose to subsidize fully online services that have open-ended costs. Although there was substantial usage of the CAS ONLINE service at Indiana University Bloomington when it was free to the end-user, there was a dramatic drop in usage in the three months immediately following the shift of full costs to the user, as shown in Table 2. From an average of nearly 200 users who conducted approximately 760 searches in each of the first quarters of 1991−1994, the usage dropped to 29 users who performed only 70 searches in the first three months of 1995.

The cost per use for CAS ONLINE at IUB rose 35.8% from $7.01 to $9.52, during the first quarters of 1991−1994 (see Table 2). This reflects the general experience with the overall costs of the CAS ONLINE service, as shown in Table 3. IUB experienced a cost increase in excess of 50% in fees paid for the service between fiscal years 1990−1991 and 1993−1994, the last complete year in which the service was fully subsidized for all users. From an average monthly cost of $2417 in FY 1993/1994, the average dropped to $351 in the first six months of 1995 when there was no subsidy. In November 1995, it shrank to $181.

Table 2. IUB CAS ONLINE Academic Program Usage and Costs: 1st Q, 1991−1995

year	users[3]	uses[3]	cost	cost/use
1991	161	560	$3925	$7.01
1992	219	1002	$9361	$9.34
1993	204	718	$5534	$7.71
1994	210	754	$7181	$9.52
1995	29	70	$597	$8.53

Table 3. IUB Payments for CAS ONLINE Academic Program Searching

fiscal year	total	fiscal year	total
1984/1985	$ 6 000 (fixed cost)	1993/1994	$29 007
1990/1991	$19 178	1994/1995	$ 9 184
1991/1992	$25 726	1995/1996	$ 3 500 (est)
1992/1993	$22 377		

In the final analysis, fixed-cost services ultimately spelled the end of the CAS ONLINE subsidy at IUB. Although they lack some of the sophisticated search techniques and breadth of coverage of traditional online vendors' offerings, the fixed-cost scientific and technical databases available on the IUB campus-wide CD-ROM LAN and fixed-cost online services for the ERL (SilverPlatter) databases set the stage for the adoption of the more expensive but fixed-cost Beilstein CrossFire at IUB. With ever more computer-based services vying for all libraries' limited funds, it is not surprising that cost in general was seen as the most significant factor in the respondents' decision to subscribe to or forego the Beilstein CrossFire option. Cost-related factors were mentioned by 19 of the respondents to the question. One chemist lamented: "Industry may be able to pay, but our budgets are stretched to the limit".

PROBLEMS ENCOUNTERED AFTER DECIDING TO SUBSCRIBE

Delays in Implementing the System. There were numerous obstacles encountered by the chemistry librarians at the 11 institutions where they worked once the decision was made to subscribe to Beilstein CrossFire. In fact, at only two of the institutions was the service available to the clientele within 1 month of ordering. Another five brought the service up within 2−6 months, and four more required in excess of 8 or more months to actually begin using it. Almost all of the delay in implementing CrossFire was caused by local factors. In some institutions, the process of getting the legal contract signed took considerable effort. Bear in mind that nine of the 11 institutions placed their subscriptions through the library consortium established under the auspices of the Committee on Institutional Cooperation (CIC), a longstanding cooperative agreement between the members of the athletic conference known in the United States as the "Big Ten" plus the University of Chicago. While there were examples of interlibrary coop-

eration among the CIC libraries prior to the CrossFire endeavor, the purchase of a commercial database service was new to the organization, as it is for library consortia in general in the United States. Ultimately, the CIC allowed three non-CIC participants to enter into the agreement, with the database maintained on a server at the University of Wisconsin.

Computer Problems. Lack of the requisite hardware and software as well as insufficient or nonexistent network connections in the libraries was another factor. Libraries are struggling to find adequate computer support at their institutions to cope with the complexities of establishing a client/server environment. The need to deal with a number of computing units outside the library led to delays in some instances. Nevertheless, once the system was finally installed, the problems reported were minimal.

Miscellaneous Factors. One common complaint was the lack of time to learn the new system. Nine of the respondents voiced this concern, and another six felt that the training they had received was inadequate. Although Beilstein Information supplied each subscriber with training manuals, the librarians felt, by and large, that they were either inadequate or were not appropriate for their situation. Others complained of a lack of promotional materials and a lack of training facilities at their institution.

RECEPTION BY THE USERS OF CROSSFIRE

Despite such obstacles, the subscribers to Beilstein uniformly reported enthusiastic responses by the chemists and others who were using CrossFire. One librarian commented, "While we've always had the paper copy, many faculty and students resist using it. CrossFire will help them realize what they were missing". In fact, members of the CIC consortium have reported dramatically increased use of the paper version of Beilstein since CrossFire became available at their universities.

The experience at Indiana University Bloomington is perhaps typical of the reaction of users to CrossFire. The CrossFire client is loaded on two public microcomputers in the Chemistry Library and on an additional seven machines in a computer classroom adjacent to the library. Although eight out of 11 respondents who had used CrossFire felt the client software was easy to use, 16 of the respondents requested additional training. Comments about the product indicated their satisfaction with CrossFire:

"It provides easy access to physical data and synthesis."

"A rich information source. Definitely the first thing to do before we get into any synthesis." CrossFire should become even more useful to those seeking synthesis or reaction information on organic compounds with the addition of a reaction component in 1996, and most of the CIC participants have elected to enhance their CrossFire subscriptions with the reaction database.

CONCLUSION

That an expensive information product was able to find a market in today's academic library environment is testimony to the quality of the Beilstein CrossFire database. Academic librarians must constantly evaluate the funds at their disposal to provide materials and services to their clientele and utilize those funds in a manner that will provide the best return on the investment. For the libraries that chose to subscribe to Beilstein CrossFire, it was clear very shortly after its introduction that the proper decision had been made. That is not to say that Chemical Abstracts Service and other vendors who price their offerings with variable costs have inferior products. Academic libraries have whole-heartedly embraced CO-ROM technology and other fixed-cost options for databases, but that says much more about the status of their budgets than it does about the appropriateness of CD-ROM for large database searching. Perhaps in time, other producers of large databases will see the benefit of fixed-cost pricing of their products.

REFERENCES AND NOTES

(1) Wiggins, G. Using the Beilstein Database in Academic Chemistry Libraries (as delivered at the American Chemical Society Meeting, Chicago, August 16, 1993). URL: http://www.indiana.edu/~cheminfo/gw/beil93.html.

(2) Wiggins, G. CHMINF-L: The Chemical Information Sources Discussion List. *J. Am. Soc. Info. Sci.* **1995**, *46*, 614−617.

(3) In Table 2, "Uses" refers to single search sessions, regardless of the number of databases searched; "Users" includes repeat users.

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