



FACULTY BOARD MEETING

FINAL

MINUTES

February 8, 2016

A Faculty Board meeting was held on February 8, 2016 in the Millikan Board Room, California Institute of Technology, California 91125.

Board members present

Richard Flagan, **Chair**
Mary Kennedy, **Vice Chair**
Kristine Haugen, **Secretary**
William Clemons
Mathieu Desbrun
Barbara Green*
Henry Lester
Stephen Mayo*
Thomas Miller
Douglas Rees*
Jean-Laurent Rosenthal*
Joseph Shepherd*
Maria Spiropulu
Angelike Stathopoulos
Edward Stolper*
Paul Wennberg

Board members absent

Jacqueline Barton*
Geoffrey Blake
George Djorgovski
Bradley Filippone
John Grotzinger*
Ali Hajimiri
Fiona Harrison*
Andrew Ingersoll
Elena Mantovan
Michael Ortiz
Ravi Ravichandran*
Thomas Rosenbaum*
Paul Sternberg
Joel Tropp
Leeat Yariv

Invited guests

Mitch Aiken♦
Kristin Antelman ♦
Morteza Gharib
Cassandra Horii
Brian Lee
Cindy Weinstein

Postdoctoral and student representatives

Natalie Higgins, GSC Vice Chair
Catherine Jamshidi, IHC Chair
Jenna Kloosterman, Postdoctoral Association President
Jason Pollack, GSC Chair

Recorder

Annette Ramos

*(ex officio)

♦ **Presenters**

Table of Contents

Call to order	2
Announcements	2
Vice Provosts	2



Deans..... 2

Educational outreach 2

Status of the library..... 5

New business..... 15

Adjourn..... 15

February 8, 2016

Call to order

Prof. Richard Flagan, chair of the faculty, called the meeting to order at 3:12 p.m.

Announcements

Vice Provosts

Prof. Cindy Weinstein, vice provost, announced a Caltech Bioethics Forum on "HeLa Cells in the Lab" to be held on Monday, February 22 from 7:30 to 9:00 p.m. in Baxter Lecture Hall. This event is in conjunction with the book called *The Immortal Life of Henrietta Lacks* (2011), which entering freshmen read during the summer and discussed at orientation. President Thomas Rosenbaum will introduce the forum, and faculty panelists will include Profs. David Baltimore, Ellen Rothenberg, Barbara J. Wold, and Changhuei Yang.

Deans

Ms. Barbara Green, interim dean of students, noted that undergraduates are now finishing their midterm exams. She said that the dean's office has emailed faculty asking them to nominate outstanding students for leadership and academic awards. The deadline for nominations is March 14, 2016.

Prof. Doug Rees, dean of graduate studies, reminded everyone that the Graduate Student-Faculty colloquium will be held on February 11, 2016. He also announced that a new associate dean of graduate studies, Dr. Kate McAnulty, will join us on March 14 from the Pennsylvania State University. She will attend the Graduate Student-Faculty Colloquium.

Educational outreach

Mr. Mitch Aiken, associate director for educational outreach at the Center for Teaching, Learning, and Outreach, gave a presentation about programs that bring Caltech science to the wider community and about how his office can assist in preparing the outreach components of grants. His presentation can be found here: [Educational Outreach Models: Support for Developing Successful Broader Impact and Outreach Plans](#).

Faculty and principal investigators often need to include a broader impact and outreach plan in their grant proposals. Mr. Aiken typically works with them early in the process of grant writing to make sure that these plans are strong, practicable, and meaningful. Mr. Aiken stressed that these plans involve creating programs and establishing contacts with local schools, so that it is imperative for faculty to contact him as soon as possible.



When an outreach plan is in place, the CTLO provides letters of support for faculty to include in grant proposals. The local program partner also provides a letter of support to strengthen the proposal. Once a proposal has been successfully approved, the CTLO works with faculty to implement the outreach. This includes reviewing protocols for interacting with minors, coaching graduate students and postdoctoral scholars, facilitating site visits to K-12 schools, and logistical elements of a proposal such as hosting field trips to Caltech and student researchers in Caltech labs.

Educational outreach models

We have three major models for educational outreach: (1) Caltech faculty, researchers, and students visiting local schools; (2) K-12 students and teachers visiting the Caltech campus; (3) Events held off campus for K-12 teachers and students. Mr. Aiken explained how the CTLO supports each of these.

Caltech faculty, researchers, and students visit local schools

Evening visits to schools, or science nights, are a very popular form of outreach. They may be known by different names at different schools, such as STEM nights or stargazing nights. Caltech faculty visit local elementary and middle schools and share their science in a hands-on environment, and the visits typically include our undergraduate clubs and graduate students as well. For example, Prof. Alan Weinstein hosted an evening on the LIGO project at Longfellow Elementary School's Stargazing and Science Night.

Outreach is also done through teaching in local classrooms. In an especially intensive commitment, undergraduate CMS students are currently teaching coding at Cleveland Elementary; the CTLO works with the undergraduates to plan lessons and discusses the progress of the program. Local teachers and students are benefiting while our undergraduates expand their ability to communicate and renew their own enthusiasm about their studies.

The subject-specific academies in Pasadena's high schools offer natural connections with many scientific fields. As one example, we have been successful with outreach programs at the APP Academy for Mobile, Web, and Game Development, located at Pasadena High School. Students from Prof. Ralph Adolphs' lab recently spoke to high school students studying robotics at this academy; they explained connections between brain functionality and decision making and encouraged the high school students to think about how to apply this to programming for robots. David Hsieh, assistant professor of physics, and his lab have also visited the APP Academy to give a series of lectures on the centrality of algebra to physics, quantum mechanics, and quantum physics.

Meanwhile, there is an Engineering and Environmental Science Academy at Muir High School that we support by serving on the academy's advisory board, hosting campus visits, and bringing undergraduate and graduate students as guest speakers and engineering project mentors. For example, as part of Engineering Week, the undergraduate club called the Society of Women Engineers invites girls from Muir High School to the Caltech campus to attend Introduce a Girl to Engineering Day. We have incorporated the Engineering Academy into the broader impact component of several grants.

**K-12 students and teachers visit the Caltech campus**

The CTLO can work with faculty to arrange field trips to bring local students to campus for hands-on presentations in labs. Faculty should also be aware that summer programs on the campus are a major avenue for outreach. For example, the Community Science Academy is a 6-week program that gives high school students experiences in biology, chemistry, and engineering labs. InnoWorks is a summer day camp program for middle school students; it is largely run by Caltech undergraduates, with support from the Institute for Quantum Information and Matter (IQIM). ID Tech camps feature courses on coding, programming, engineering, and 3D printing.

In addition, Caltech offers a summer academy for girls ages 4 through 14 called Project Scientist with a different curriculum each week. Research shows that girls who are involved with science at a young age are more likely to continue their studies. As part of Project Scientist, a series called STEM Stars brings women faculty and JPL scientists to visit with the girls to talk about their own biographies and how they became interested in the sciences. Some scholarships are provided for the ID Tech and Project Scientist camps.

One of the programs that faculty have most often written into grants is the Summer Research Connection, which resembles the SURF program and is designed for high school students. High school students work with faculty in the lab for a summer and gain a deep understanding of the research; the students also attend seminars and present their work. The Summer Research Connection has attracted many high school students and has proven successful in fulfilling NSF grant requirements. Another program that draws an especially large number of students onto the campus is the annual Mechanical Engineering 72 robotics competition for Caltech undergraduates. Middle school students are invited to attend the finals, select their favorite teams, and track their progress through the competition heats. The students have a chance to interact with the Caltech competitors and learn more about the field of robotics as a potential career.

We also hold community science events for K-12 educators; these are very popular and are often used in grant proposals. Typically, these consist of a lecture by a Caltech faculty member followed by a breakout session where teachers circulate between about 35 stations staffed by graduate students and observe demonstrations that they might use in their classrooms. They can also talk with other teachers who are already using the same demonstrations. These events take place in the Caltech gym.

Off-campus events for K-12 teachers and students

The CTLO can also help to facilitate experiences for students at other locations. One ongoing activity which Caltech sponsors in partnership with Pasadena City College is an Engineering and Science Expo, where our undergraduate clubs give presentations. In 2014 our CMS students accompanied students from the APP Academy to the Microsoft campus for a Hackathon. Also recently, a small group of local students visited SpaceX as part of an ongoing mentorship program written into an NSF grant by Professor Brian Wernicke.

Proposal outcomes

Mr. Aiken explained that the CTLO has contributed to 33 proposal submissions since 2013. The majority of these grants were early career grant proposals to NSF. Ten awards have



resulted so far, and eight are pending. Even in the proposals that were not accepted, reviewers' comments on the broader impact sections were very positive, suggesting that the CTLO can make a valuable contribution for faculty. Some of the comments from reviewers include: "... significant targeted education and public outreach in the proposed program"; "Exceptionally strong in both science and outreach"; and "Strong, well tested. Likely high impact".

Conclusion

Mr. Aiken again encouraged faculty to contact him for assistance in educational outreach and grant writing. He provided a handout with more information on outreach models, which can be found here: [Outreach Models](#)

Questions

Prof. Mary Kennedy asked whether any of the local high schools has a medical academy. Mr. Aiken said that Blair High School has a health career academy. Prof. Kennedy asked if there is an academy for biochemistry. Mr. Aiken said that biology and chemistry are taught separately at this level.

Prof. Angelike Stathopoulos asked whether local schools contact Caltech to arrange these programs, or vice versa. Mr. Aiken said that both are true. The CTLO has established relationships with a core group of Pasadena schools, but other schools also approach him. He noted that there is also an ongoing need to identify people at Caltech who would like to participate in outreach. For example, Mr. Aiken attends the monthly Coffee@Caltech for new postdocs sponsored by Human Resources, and this has been a good way of spreading information about our outreach programs and finding potential participants. He can then match people with opportunities.

Prof. Flagan commented that some students also apply for fellowships that have outreach requirements. He asked whether the CTLO has guidance for students about preparing these applications. Mr. Aiken said that he can assist these students, and that one of the major ways is providing outreach opportunities that can be added to the student's resumé.

Status of the library

Ms. Kristin Antelman, university librarian, discussed current developments and initiatives in the library, relating both to the library's physical space and to our changing use of digital resources. Her presentation can be found here: [Caltech Library](#)

Strategic directions

Ms. Antelman began by explaining that the library is currently pursuing four major areas of strategic focus. First, because the former Millikan Library holds fewer and fewer library facilities, we should consider Sherman Fairchild Library (SFL) to be Caltech's main library. Second, new digital scholarship services supported by new leadership staff are being implemented. Third, the library is continuing its core mission to digitize and preserve historically important collections and to collect and disseminate Caltech's intellectual output. Lastly, the library is realigning its strategy for content acquisition, both print and electronic, to optimize our investment and to use the library's position to the best advantage.



Migration from Millikan Library

Ms. Antelman explained that library services now occupy only three floors of the Millikan building. Library staff occupy the second floor, there is student study space on the ninth floor, and all user-facing services that were formerly located on the first floor of Millikan have now been moved to SFL. The library also has book storage in the basement of Millikan, space that is very important because the Annex will be vacated as of May 1, 2016. In preparation, staff has freed up as much space as possible in the Millikan basement without discarding anything that is not available online or that faculty has said should not be discarded. A very conservative approach has been taken.

Sherman Fairchild Library (SFL)

Thinking of SFL as Caltech's main library presents many challenges, above all relating to the design and size of the space. First, SFL was designed to be a branch library, so that its layout and size are not optimal for a central library. At 20 years old, the building is also not modern or suitable for the way students work now; for example, there is not enough flexible space. In its current configuration, SFL also does not have enough space to accommodate the staff who are arriving from Millikan. Ms. Antelman explained that the library recently worked with a firm specializing in space and organizational design to investigate whether a different design could provide enough space in SFL to house all staff without losing space for users. The answer was that this could be achieved by reducing the amount of space devoted to staff and creating meeting rooms and spaces to be shared by staff and users. That plan also suggested that low-use print collections be located elsewhere. Ms. Antelman stressed that this is only the result of a feasibility study and not a set plan.

Meanwhile, in an effort to reconceptualize the potential uses of SFL, the library engaged student groups on campus to submit a Moore-Hufstedler Fund proposal last year to open a TechLab for 3D printing and scanning in SFL. The proposal was successful, and the TechLab opened in autumn 2015. Three 3D printers are now available, and 120 print jobs have been run, with 85% of those related to instruction or research. The library has been invited to recruit students who have used the TechLab to present at a poster session for the American Association for the Advancement of Science (AAAS).

Prof. Kennedy asked whether Ms. Antelman had been asked by the administration to reduce staff. Ms. Antelman said she had not, and that in fact the library has been able to add staff in the last year.

Digital scholarship

The library's new leadership staff includes Gail Clement, head of research services, who has joined us from Texas A&M University, and Stephen Davison, head of digital library development, who has joined us from UCLA. Mr. Davison will also serve as interim head of archives until a new search for an archivist fills the position permanently; the recent search was not successful.

Digital tools for data management and for scientific authoring are examples of the new research services that the library is bringing to campus. On the first of these, Ms. Clement



has been involved with the Data Carpentry organization, which promotes tools for data management and analysis and is a sibling of the Software Carpentry organization, funded by the Moore Foundation's Data Driven Discovery initiative. Ms. Clement hosted a hands-on workshop on working with data in November 2015, in partnership with the Data Carpentry organization and Prof. Victoria Orphan. Ms. Clement has also negotiated with Overleaf, a real-time collaborative writing and publishing platform, to obtain access to a collaborative authoring platform for WriteLaTeX. The Caltech community has responded very enthusiastically to the WriteLaTeX platform. Overleaf sent trainers at no charge to our campus last week, and an increase in usage has followed. Overleaf is very efficient when faculty are writing papers as part of a team. The platform also has a custom Caltech thesis template, allowing students to write a thesis with formatting rules already in place.

The Caltech Collection

The library's mission to preserve and disseminate the Institute's intellectual production has become broader in a digital age. Our repository of Caltech publications, the Caltech Collection of Open Digital Archives (CODA), is now one of the largest, most comprehensive, and most heavily used institutional repositories in the country. This collection began in 2009 when the Faculty Board endorsed the recommendation of the Ad Hoc Committee on Scholarly Output and Distribution to create a collection of the published scholarship and research of the Caltech community. Today, with the support and cooperation of the faculty, the library collects into the archive a record of all papers originating from Caltech. The library aims to acquire the final version of each paper and to make it freely available as far as the law allows. CODA's affiliate repositories include CaltechAUTHORS, CaltechTHESIS, and others. CODA currently contains 54,236 items with 7,033,533 cumulative downloads; 75% of the items are full text and 71% are open access.

It is also anticipated that by the spring of 2016 the library will have created a data repository to complement CaltechAUTHORS. This will be built on an open-source repository platform called Invenio, which was developed and is maintained at CERN. A start-up service provider in Norway called TIND Technology hosts Invenio as a service and can create a custom version for us. Ms. Antelman said that the library is paying to use TIND Technologies' platform to replace our antiquated library management system. We will be able to deposit any type of digital object, including data sets, software, presentations, images, and more. The platform will have GITHUB integration, making it useful as a repository for software. Invenio is a trusted digital repository that will meet funding agencies' requirement that researchers deposit data or other assets.

Prof. Kennedy asked whether the repository will be backed up. Ms. Antelman said that using this platform it will be. Also, file formats are converted over time, there are fixity checks and bit level checks, and the platform is compliant with other standards.

Prof. Kennedy asked how the faculty will learn how to use the platform. Ms. Antelman said that the process is quite straightforward, but the library can provide consultation if needed. She explained that the library is already assigning Digital Object Identifiers (DOIs) to objects in the CODA repositories, and this will also be done for the data repository. This will allow all types of objects to persist and be found.



Prof. Kennedy asked about the capacity of the system. Ms. Antelman said that it will be unlimited, although a very large file might be inconvenient to upload through a browser; in that case, the researcher should contact the library. Prof. Kennedy asked whether the new system will mean that individual labs no longer need their own storage. Ms. Antelman said that labs should probably maintain their own storage; the data repository is meant for the long term. The platform is also web-based, so that it may not be ideal for frequently viewing large files.

Prof. Henry Lester asked whether the cost of these applications would ultimately be charged to faculty's research grants, and whether the library at some point in the future will ask for a Caltech account number in order to store data. Ms. Antelman said this is possible. The funding plan is not certain, and the library will learn more as they pilot the program. Prof. Lester commented that his understanding is that ultimately these services will be supported by research budgets. Ms. Antelman said that she agrees this is a typical practice in universities.

Prof. Ed Stolper, provost, commented that storing data is mandated by the NSF. However, overhead in relation to the library is a complex issue. The amount of overhead that can be charged for a library is capped at about 3%, so we cannot simply report the full cost of our library and ask for that overhead to be reimbursed. On the other hand, if we are mandated to store data, an argument could be made that this should be included separately in the overhead rate. While that would be a tax on grants, it would be an indirect cost rather than a direct cost.

Ms. Antelman explained that the platform the library is providing is complementary to discipline-based data platforms that are already widely used by Caltech faculty.

Archives and preservation

Ms. Antelman said that the library is making progress with digitizing archival collections as funding becomes available. The first digitized collection, the Paul B. MacCready Papers (ca. 1930-2002), should be released soon. This project was funded by the MacCready family. The second project, the Donald Glaser Papers (1926-2013), funded by the Glaser family, is in progress.

Another area of digital stewardship is preservation. Caltech is now a member of the Digital Preservation Network (DPN), a consortium of North American universities that cooperate to preserve digital publications in a distributed system. We have five terabytes of storage per year for the first six years of our membership; additional storage would need to be paid for. This is a modest amount, but the material is highly preserved and replicated across five storage nodes. The library will very selectively place five terabytes of unique content into this platform every year. DPN commits to preservation for 20 years, whether or not the institution remains a member.

The library is also starting an experiment in archiving email using a new tool called EPADD. The pilot project is the email donated by Prof. Emeritus Marshall Cohen. EPADD can be used selectively as chosen by the donor, and it supports intelligent searches, sequestering of confidential information, and graphing by frequency of communication.



Prof. Jean-Laurent Rosenthal asked whether the sender or the recipient owns an email for the purpose of privacy. Ms. Antelman said that the recipient does. She explained that Stanford has been making archival email available through the same platform for some time, but it is done in a very secure environment.

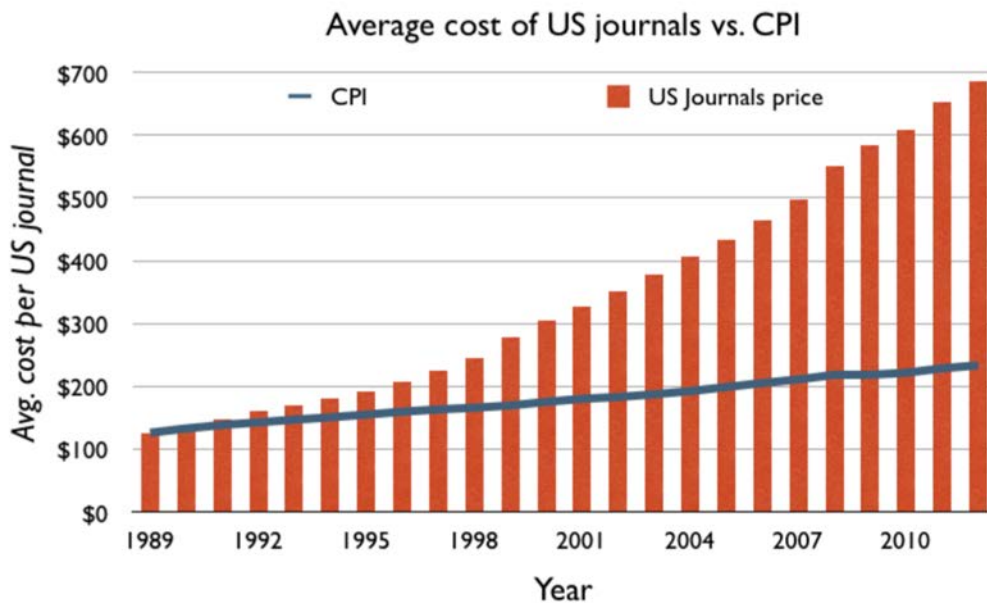
Content acquisition

Ms. Antelman said that several factors are shaping our evolving strategy for acquiring content for the library. Our constrained budget, along with high price inflation, is obviously very important. We also need to improve options for borrowing material and for supplying articles; we need to provide better service through DocuServe and document suppliers than in the past. Lastly, the expansion of open access publication has brought us new opportunities.

Price inflation

The chart below shows the rise in subscription prices of all American scholarly journals from 1989 to 2012. While the most recent years are not included, it clearly shows that over roughly the last 25 years the price of these journals has risen by about 7% per year; in the most recent period, the rate of increase has been 5%-6%. For STEM journals alone, the inflation rate is even higher.

Prof. Kennedy asked whether the high inflation is caused by publishers' monopolies. Ms. Antelman said that on the systemic level the answer is yes, but not entirely. The chart here shows price inflation for society journals; if commercial journals were included, inflation would be even greater.



Source: 2012 Study of Subscription Prices for Scholarly Society Journals

allenpress.com/system/files/pdfs/library/2012_AP_JPS.pdf



Prof. Rosenthal pointed out that learned societies have a clear motive for participating in journal price inflation. In his experience with the *Journal of Economics*, which is published by the American Economic Association and Cambridge University Press, the press regularly proposes that the journal raise its subscription rate for libraries, and some of this revenue is returned to the association. Libraries cannot cancel their subscriptions, because the journal is bundled with other publications. Consequently, even if associations do not print their own journals, the subscription model has been very lucrative for them.

Prof. Flagan commented that other societies have negotiated with their publishers to limit the rate of price increase to the Producer Price Index (PPI) on a per page basis.

Ms. Antelman said that monopolistic forces resulting in high costs are operating both at the level of journal brands and on the commercial level of publishers such as Elsevier and Springer that have acquired smaller publishers. There is not truly free competition in any area of the market.

Open access

A great deal of material is now available in open access; the challenge to the individual researcher is to find it. Caltech has recently licensed an application called oaFindr, designed to make it much easier to find open access content. The service will be integrated with Caltech Connect, so that if a user searches for an article that is not in our collection, a link will appear saying “oaFindr has found a high quality PDF of this article.” This should offset the impact of our not subscribing to some journals.

Prof. Joseph Shepherd commented that on websites where articles are posted by their authors, such as ResearchGate, it is not clear to him how much of the content is actually open access as allowed by journals. A concern arises when our students post on these sites. Ms. Antelman said that publishing companies such as Elsevier have approached authors and requested that articles be taken down.

Prof. Lester said that if oaFindr will be integrated with Caltech Connect, it seems to follow that only library users with Caltech credentials will be able to access it. Ms. Antelman said that this is correct and that oaFindr is a licensed platform. We are paying a modest amount for this service, because the company acts on our behalf to harvest a high-quality set of resources from reputable repositories.

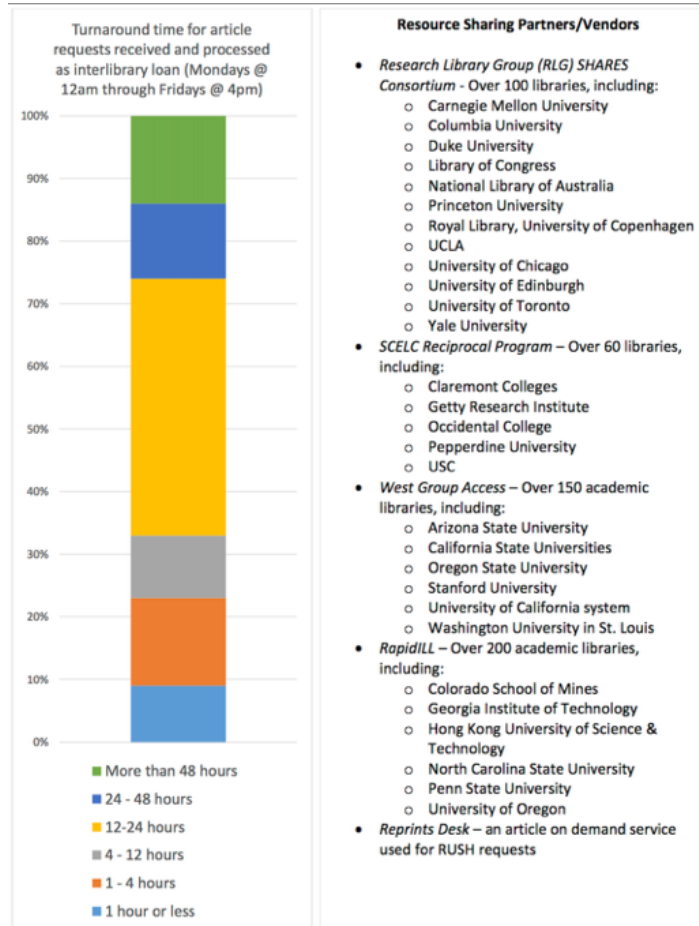
Improved document delivery options and resource sharing

Ms. Antelman showed the chart below to illustrate the current performance of DocuServe. Approximately 75% of requests are fulfilled within 24 hours. Given the wide range of material that is requested, this is a good figure, and it has been improving significantly in the last few years. The numbers in the chart are for requests sent during business hours.

A further initiative began when the Library Committee proposed to Ms. Antelman that faculty would value 24-hour access to a document supplier independent of the library. The library is now working with Reprints Desk, a content workflow company, to pilot a new rush article delivery service. The rush service will deliver articles within minutes, 24 hours a day, seven days a week. During the pilot period, the cost to faculty will be \$15 per article.

This figure is subsidized; the total cost to the library will be approximately \$25 to \$30 per article.

DocuServe performance



Prof. Kennedy asked whether a service like this results from reductions in our subscriptions to online journals. Ms. Antelman confirmed that the library is redirecting some resources from journals to improve the document delivery service, which can have a much broader reach. Prof. Kennedy asked whether interlibrary loan is still free of charge. Ms. Antelman said that it is; only the new rush delivery service will cost \$15 per article for faculty. If the library user can wait 24 to 48 hours, article delivery is still free. If the library user decides that the article is needed within minutes, it will cost \$15 during the pilot program. Ms. Antelman pointed out that charges were removed from interlibrary loan requests about a year ago; following this, borrowing activity increased for all users but above all for postdocs, graduate students, and undergraduates.

Prof. Kennedy asked for clarification about the DocuServe service that charges the user for a photocopy or scan of a book owned by our library. Ms. Antelman said that in this case the library is charging for the cost of the labor involved in retrieving the book from the shelf and scanning it for the faculty member. The interlibrary loan fee was eliminated so that faculty and students would not be penalized for our not subscribing to every journal; however, it is an optional service for library staff to go to the stacks and make copies.



Prof. Kennedy asked whether there are also journals in the stacks that the library subscribes to. Ms. Antelman said that there are not; there is no redundancy today.

Materials budget realignment

Ms. Antelman said that the library is realigning about 10% of its budget during 2016. \$550,000 will be spent collectively on DocuServe, restoration of titles, new licensed resources, and inflation. Another \$3.4 million of the materials budget is spent on collections. Investments in new resources with institution-level only access will include Springer eBook Collection, Springer Materials—The Landolt-Bornstein Database, American Institute of Physics, AAAS Science Classic, and SPIE Digital Library. Ms. Antelman explained that it is reasonable for us to invest in these resources because they cannot be acquired individually. We also obtained significant discounts in licensing the Springer eBook Collection. The payment will be amortized over three years and will give us 30,000 titles from 2005-2015 across all of the subject collections. Before this, we had access to only the mathematics and physics collections.

Prof. Lester asked for more information about Science Classic. Ms. Antelman said that this is the science back file, and it is heavily used.

Ms. Antelman also reported that the library will be vacating the Annex as of May 1, 2016. This requires us to make a selection of the printed books that are currently housed there. Faculty are invited to comment to indicate which titles they believe are important to keep; a searchable title list of holdings in the Annex is at <http://collections2016.library.caltech.edu/annex>

Not all titles can be kept, so comments are advisory. There are currently 7,000 books in the Annex, and there is room for 3,500 in the basement of Millikan.

Prof. Kennedy asked whether faculty can view a list of the journals being cancelled. Ms. Antelman confirmed that the library's website will show users how the electronic collection is being managed.¹ The starting point for recent decisions was the library's calculation of our cost per downloaded article in 2015; based on this, Ms. Antelman worked with the Library Committee to arrive at a cost per download above which a journal should be canceled. The committee concluded that it was reasonable to eliminate any journal costing over \$10 per download, because most of these are available to borrow for around \$6.50. In all, about 650 titles have been canceled for 2016.

Prof. Mathieu Desbrun asked whether the library might collaborate with other, larger universities to acquire materials. This already happens informally: if faculty cannot find what they need here, they often get the material from colleagues at other institutions. Ms. Antelman confirmed that we are part of a buying consortium, although we do not partner with UCLA because they obtain their material through the University of California digital

¹ "Management of the Caltech Library's Print and Electronic Collections: Changes for 2016," <<http://collections2016.library.caltech.edu/>>; "Cancellations," <<http://collections2016.library.caltech.edu/cancellations>>.



library system. The prices we pay are competitive with the consortium buying model. Our problem with pricing for journals is an old one: we are considered a research-intensive institution and are charged a price based on that category, not on the number of our faculty and students. While databases are sometimes priced according to the number of users, journals are not.

Prof. Kennedy said that while she appreciates these economic forces, she wonders whether our library budget may be less per person than at comparable research universities. Ms. Antelman said that our budget in the aggregate is less than at comparable research universities, but it is not less per person. We are paying more per capita than Stanford is for the same materials because of how they are priced.

Prof. Kennedy asked whether the library budget has increased in the last ten years. Ms. Antelman said that it has not increased to her knowledge, but salaries have increased.

Prof. Kennedy asked Prof. Stolper why the library budget has not increased. Prof. Stolper said that as in all cases, there must be a balance between our resources and the needs of the community. He has not heard comments that our research needs are not being met. As an example of our investment in the library, we will now be offering a variety of vehicles for downloading materials, and articles are usually available for download in a maximum of 24 to 48 hours. Prof. Kennedy said that sometimes 24 to 48 hours is not adequate. Prof. Paul Wennberg said that his research is well supported by the library. Prof. Desbrun commented that Caltech is small and that we need to understand this in considering our library service. We cannot readily generate economies of scale.

Prof. Rosenthal said that not counting bundles, we are subscribing to twenty journals per faculty member. There is a budgetary constraint, but the download model is also economically reasonable for us when the cost of a download is low and money can be saved.

Prof. Wennberg commented that economies of scale may be working in our favor if we can now pay \$15 to obtain a publication within minutes.

Ms. Antelman noted that problems would arise if we relied entirely on the borrowing model. As more libraries cancel journal titles and we have fewer libraries to borrow from, publishers will raise the download cost per article. There are also copyright regulations restricting the number of articles from a given journal issue that can be borrowed on interlibrary loan. Prof. Kennedy asked what would happen if we reached that borrowing limit. Ms. Antelman said that the library would need to pay a fee or subscribe to the journal.

Ms. Antelman said that the 650 journal titles being canceled made up about 5.5% of article usage last year. 94% of article usage from 2015 is still being supported.

Prof. Wennberg raised the subject of the open access requirement for federally funded research, which will go into effect within the next year. He asked whether this requirement will change the acquisitions model for libraries; in a year, we may not need to buy any



journals. Ms. Antelman said that this question is being considered especially for the 650 titles that are being canceled. The library is investigating how many of these will be available via open access within a year.

Prof. William Clemons agreed that it can be inconvenient to find that the library does not hold a particular journal. However, we know that many of Caltech's unique qualities come from its small size. In these cases, if the need is urgent, he telephones a colleague from another university or buys the article himself.

Further to the question of future developments, Ms. Antelman invited Prof. Flagan to report on the Berlin 12 Open Access Conference, which he attended in December. Prof. Flagan said that at this conference, representatives from 19 nations discussed the specific question of transforming scholarly publishing from a subscription model, with publishers as gatekeepers, to an open access model. It is important to understand that the new open access model would not mean that no money is involved; rather, open access would shift costs from the subscriber to the author or author's institution.

The conference participants are now asking universities to sign a letter of intent to endorse a systemic change to open access. The key mechanism for this change would be to convert funds that are currently spent on journal subscriptions, along with those now spent on author fees for open access publication, into a single pool of funds to support the transition to sustainable, open access business models by coordinating payments to maximize access while minimizing costs. Coordinating the two modes of payment could help to minimize the current "double dipping" by publishers who sell access through subscription fees and then charge more to authors to make individual papers open access, although subscribers have already paid for their access.

Prof. Flagan pointed to a pioneering agreement between the Max Planck Society and Springer made in 2015, allowing Max Planck researchers to publish their articles open access in more than 1,600 Springer and Nature journals while maintaining or enhancing their access to Springer and Nature journals, about 2,000. An especially important point in this arrangement is that the open access articles are available immediately. The Max Planck also reduced its total cost for publication and access to journals from this publisher. The Max Planck is willing to share information from its negotiation to help other institutions.

Prof. Kennedy asked what Caltech can do to advance these developments. Prof. Flagan said that currently about 12% of all of Caltech's initial article publications are immediate open access in so-called "gold" open access journals that allow readers around the world full access to all of the journal contents. Many more papers are open access through the Caltech libraries' support of dissemination of author versions as allowed by publishers. There will be a tipping point when a sufficient fraction of initial article publications, on the order of 40% or more, are immediate open access, beyond which journal publishers will no longer be able to sustain the subscription model. Caltech hosted a Conference on Scholarly Communication in 1997 that made many of the points raised in the recent open access conference. One working group, a panel of provosts led by Steve Koonin, suggested that the fees for open access publication should be the responsibility of the institution rather than



the individual author, so that the cost to the author's grant would not influence the choice of where to publish. The Berlin conference proposed combining subscription costs and author fees into a single pool as a mechanism that might ease the transition, and it asked Caltech and other institutions around the world to sign a letter of intent to support this move.

Ms. Antelman said that in principle, we could seek to arrange open access to all articles by Caltech researchers in the journals to which we subscribe. So far the only success of this scope has been on a national level, with the agreement between Springer and the Association of Dutch Universities in 2014. Clearly, an entire nation negotiating with a publisher can bring convincing resources to bear.

Prof. Shepherd commended Ms. Antelman's work in improving the library's systems, document delivery options, open access, and resource sharing. He said that he views the library as a significant and valuable entity at Caltech.

New business

There was no new business.

Adjourn

The meeting adjourned at 4:51 p.m.