



Quarterly Report  
**Biodiversity Heritage Library**  
Q2 FY13: January - March 2013



# Biodiversity Heritage Library

The vision of the Biodiversity Heritage Library is to ***inspire discovery through free access to biodiversity knowledge***. To further facilitate this lofty ambition, on March 18, 2013, BHL implemented an entirely new user interface, complete with service and content enhancements that allow users, particularly scientists, to better interact with and utilize BHL resources.

The new interface was informed by usability studies, is based on the design and functionality of the BHL-Australia portal, and was implemented in collaboration with the BHL-Au design and development team.

The core user community of BHL is scientists and taxonomists, both of whom have the fundamental need to efficiently locate bibliographic citations and perform species-specific research. Bibliographic citations are frequently articulated at the article-level, thus stipulating the need to search library database by article title. Prior to the new interface implementation, BHL content was only generally indexed at the journal title level. However, using algorithms developed by Rod Page of BioStor, a selection of BHL content has been broken down into individual articles and parts and made available within the new interface, thus fulfilling a primary need voiced by the scientific community.

BHL has always supported taxonomic name searches, allowing users to search for a specific scientific name and retrieve a bibliography listing all occurrences of that name throughout the BHL corpus, with links to the relevant pages in BHL. Now, thanks to work performed as part of a Global Names Architecture grant, a new algorithm capable of identifying previously undiscovered taxon names throughout the BHL corpus has been developed. Nearly 50 million name instances, translating to over 20 million new unique names, have been identified, allowing users, especially scientists, to obtain a more accurate reflection of a species' publication history.



In addition to these important improvements and a new look and feel for the entire website, the BHL book viewer has been updated, allowing users to view multiple columns of pages on screen at once and more easily navigate to a specific page within a book. The custom PDF creation process has also been improved, allowing users to select pages for their PDF while in the book-viewer mode and more easily review the PDF before creation.

BHL development staff are hard at work implementing additional suggested improvements gleaned from user feedback about the new interface. The continued incorporation of user feedback into development decisions reflects BHL's ongoing commitment to ensuring that its content and services consistently meet the needs of its user community and facilitate efficient scientific research.

## Membership Updates

In February, the Library of Congress joined the BHL as its 15th member library. Participating at the Steering Committee level, LoC promises to contribute to the digitization of historical science literature in the collection. Also in February, longstanding BHL members the American Museum of Natural History and Cornell University enhanced their participation to the Steering Committee level. BHL Steering Committee members contribute \$10,000 in annual dues to support project development and help guide the strategic direction of the project.

## Computerworld Laureate

In March, BHL was named a 2013 Computerworld Laureate for excellence in using information technology to promote positive social, economic and educational change. Founded by the International Data Group in 1988, the Computerworld Honors Program celebrates innovative IT achievements. Program awards will be presented at the Gala Evening and Awards Ceremony on June 3, 2013.

# Highlights...

## UMICH Spring Break Intern

From March 4-8, BHL hosted Irina Zeylikovich as an alternate spring break intern from the University of Michigan School of Information. With a focus on BHL outreach, Irina performed environmental scans of comparable digital library social media efforts and identified popular topics for BHL outreach. She also began developing a system to help organize outreach efforts.

## BHL at ALA

BHL staff hosted a booth, in conjunction with the Field Book Project, at the American Library Association 2013 Midwinter Conference in Seattle, WA, January 25-28. The booth offered a chance to connect with the thousands of librarians and information professionals that attend ALA, introducing them to our open access initiatives and fantastic free resources.



## Women's History Month

To celebrate Women's History Month in March, BHL launched its thirteenth iTunes U Collection, entitled "Notable Women in Natural History," highlighting a selection of works featuring women who have made significant contributions to the historic literature of Botany and Zoology. 26 volumes are available for free download through iTunes via this collection.

## Celebrating Darwin Day

BHL celebrated Darwin Day in February with a week's worth of social media content dedicated to this great man of science. Posts highlighted the Charles Darwin's Library BHL, iTunes U, and Flickr collections. For the event, BHL partnered with the Darwin Manuscripts Project (DMP) at the American Museum of Natural History, which aims to provide free access to digitized versions of Darwin's scientific manuscripts.

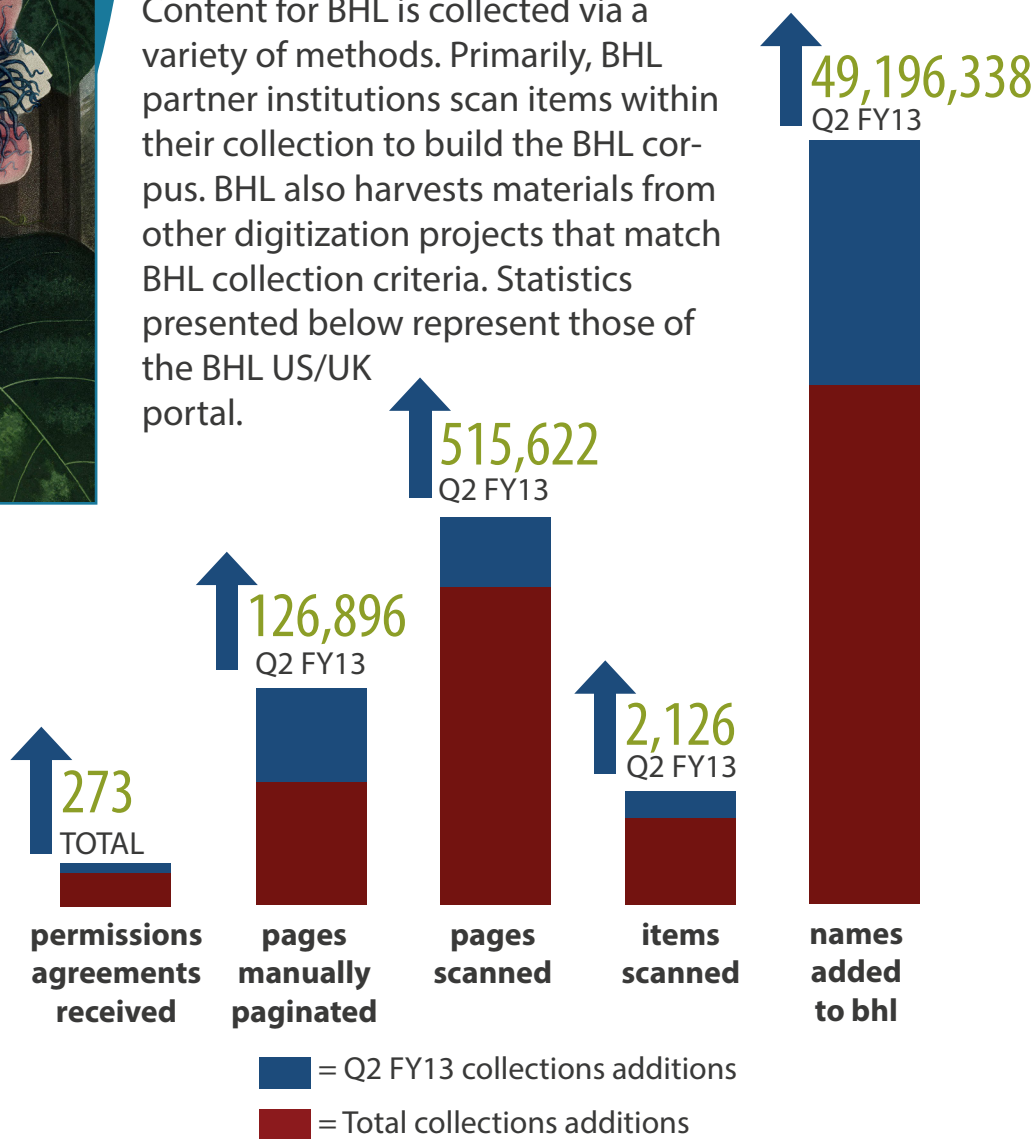


# collections profile

## growth & management

### collections stats

Content for BHL is collected via a variety of methods. Primarily, BHL partner institutions scan items within their collection to build the BHL corpus. BHL also harvests materials from other digitization projects that match BHL collection criteria. Statistics presented below represent those of the BHL US/UK portal.

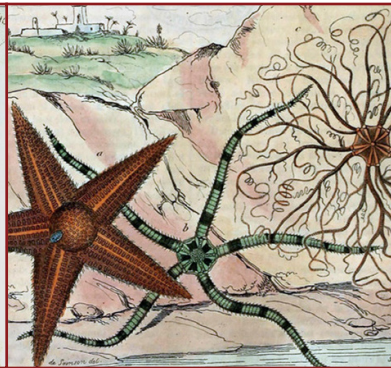
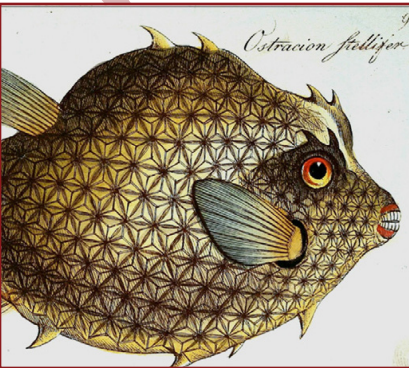


#### Dr. Joshua Drew, Marine Biologist

“BHL is a very important part of my research on coral reef fish. First, it allows me to see the whole history of a species laid out before me. Secondly, having access to historical literature is essential to characterizing what ecosystems used to look like, what species were present and what peoples’ opinions of the health of the ecosystem were like throughout time. Since we don’t often have old photographic evidence of reef ecosystems, I rely on the historical literature to get a glimpse of how these wonderfully diverse ecosystems used to look.”

↑ 112,104 TOTAL ITEMS IN BHL    ↑ 40,510,149 TOTAL PAGES IN BHL

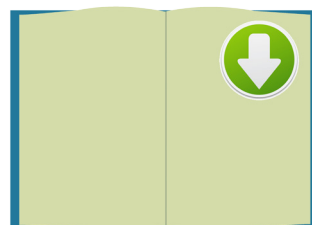
↑ 294,612 TOTAL MANUALLY PAGINATED PAGES    ↑ 150,478,128 TOTAL NAMES IN BHL



## collections stats continued



**362,040**  
TOTAL PAGES  
CONTRIBUTED  
BY GLOBAL  
BHL PARTNERS



**144,668**  
TOTAL PDFS  
GENERATED  
ON BHL

**91,880**  
TOTAL ARTICLES  
ADDED TO BHL

**53,895**  
TOTAL DOIs  
ASSIGNED  
IN BHL

BHL's global partners currently include Europe, China, Australia, Egypt, Brazil, and Africa.

## user feedback stats

**324**  
Q2 FY13

issues  
received  
**5,209**  
(total)

**97**  
Q2 FY13

scanning  
requests  
received  
**2,087**  
(total)

**16**  
Q2 FY13

special  
handling  
scanning  
requests  
received  
**433**  
(total)

**154**  
Q2 FY13

scanning  
requests  
closed  
**1,169**  
(total)

**332**  
Q2 FY13

issues  
closed  
**3,832**  
(total)

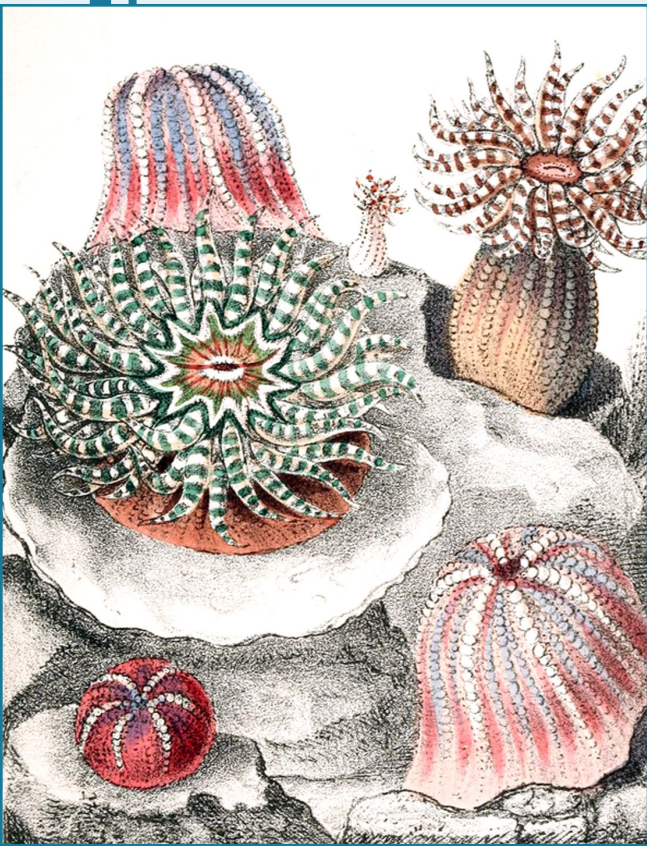
BHL collects user feedback and collaborates to resolve this feedback using an issue tracking system called Gemini. User feedback includes notification of errors with scanned content, suggestions for service improvements, and requests for content to be scanned. Many scanning requests are considered "Special Handling" as they constitute requests for rare, oversized, or fragile material.

■ = Q2 FY13 additions

■ = Total additions

# the money picture

## costs & revenue 2012

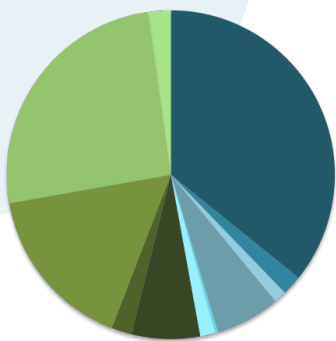


### **BHL Project Costs and Funds Raised in 2012**

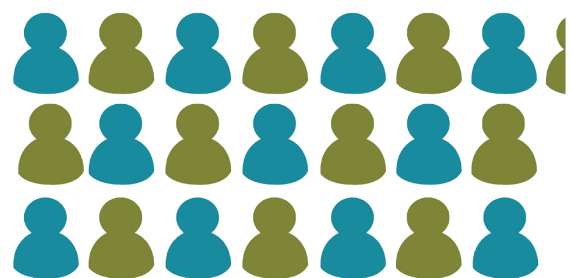
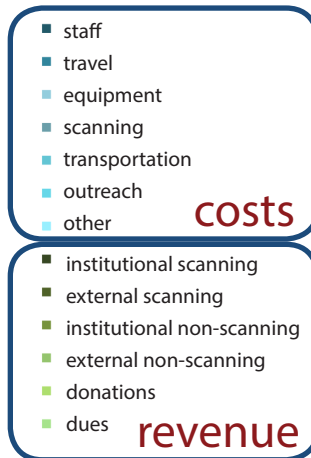
Project costs for BHL, arranged according to stipulated categories, as well as in-kind financial support or funding raised by each member institution, is articulated below. Calculations for equivalent full-time staff working on BHL in 2012 at BHL member libraries is also provided. The figures shown also include costs, staff, and funds raised by BHL central services, including the BHL Secretariat and BHL Technical Team. The Secretariat, hosted by the Smithsonian Libraries, includes the BHL Program Director, Program Manager, and Collections Coordinator. The Technical Team, hosted by the Missouri Botanical Garden, includes the BHL Technical Director, Developer, and Data Analyst.

**\$2,038,975.87**  
TOTAL PROJECT COSTS 2012\*

**\$2,287,410.81**  
TOTAL FUNDS RAISED 2012\*



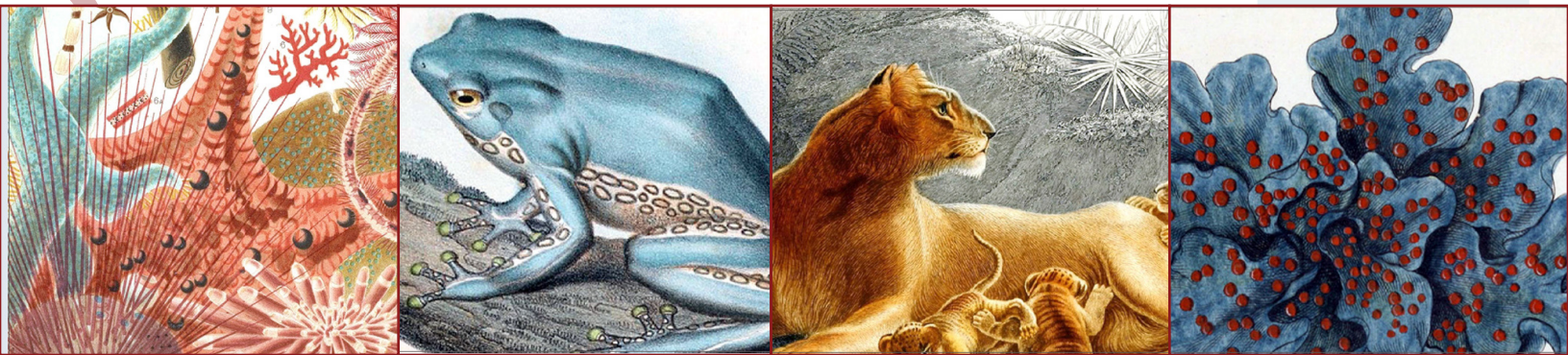
2012 BHL costs & funds raised



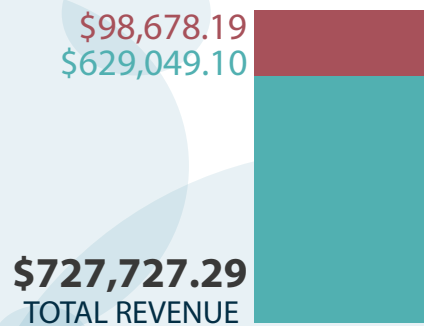
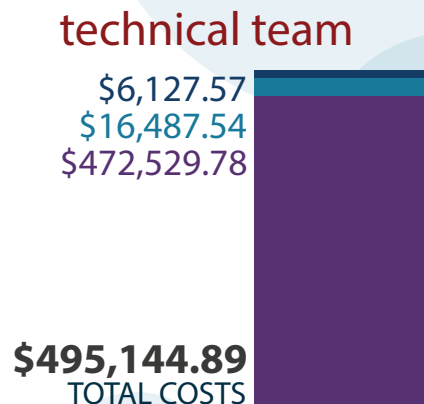
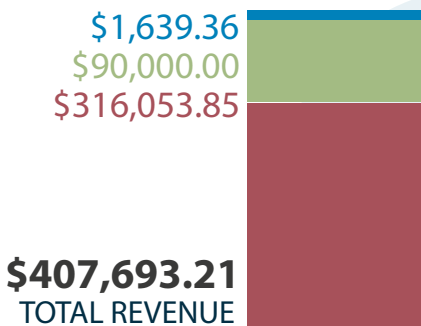
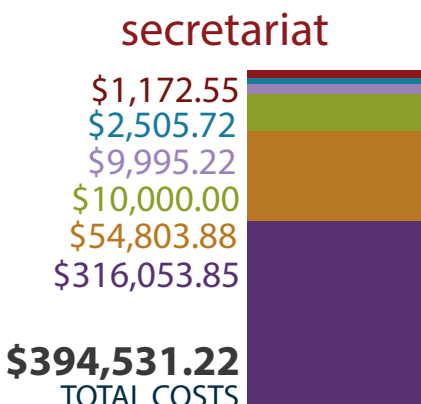
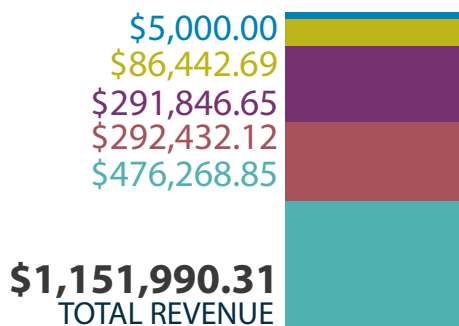
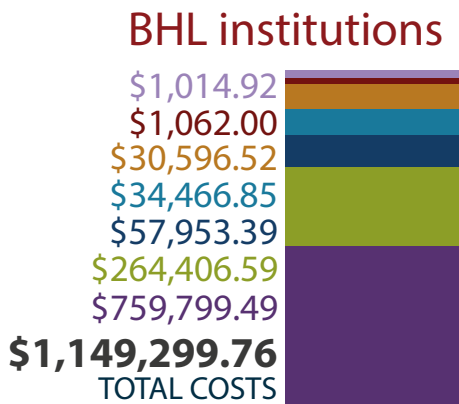
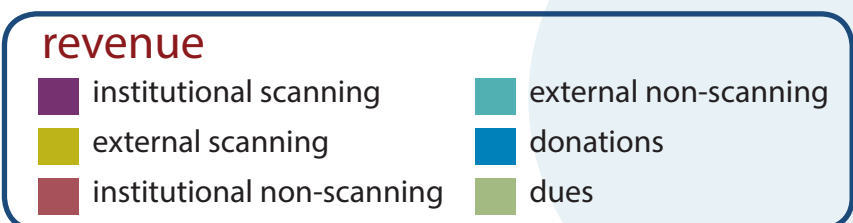
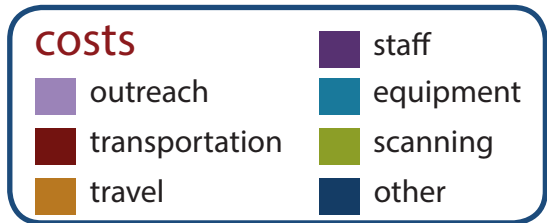
**21.25** EQUIVALENT FULL-TIME EMPLOYEES

- institutional scanning:** funds received from parent institutions in addition to regular budget to support BHL scanning activities
- external scanning:** grants received for BHL scanning activities from outside organizations or foundations
- institutional non-scanning:** funds received from parent institutions in addition to regular budget to support BHL non-scanning activities
- external non-scanning:** grants received for BHL non-scanning activities from outside organizations or foundations
- dues:** \$10,000 annual dues provided by bhl member institutions to support BHL activities

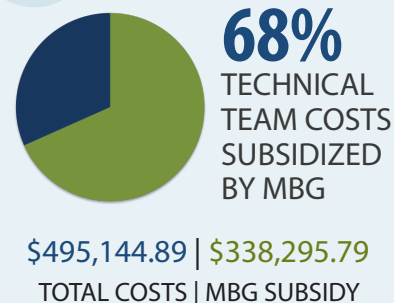
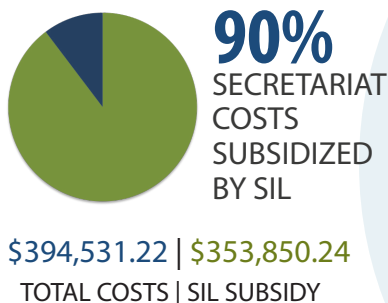
\* Does not include Harvard Botany and Missouri Botanical Garden Library figures



# the breakdown



As the BHL Secretariat is hosted by Smithsonian Libraries (SIL), and the BHL Technical Team is hosted by the Missouri Botanical Garden (MBG), both institutions cover a significant portion of the costs associated with these units. These graphs demonstrate the portion of Secretariat costs subsidized by SIL and Technical Team costs subsidized by MBG.





Dr. Cynthia Parr

# bhl & eol

## transforming science with computable data

More than ever before, scientific information is being liberated from the silo of the physical page through the creation of digital surrogates. When leveraged fully, this enables scientific research to be conducted significantly more efficiently. But, for true scientific discovery to occur using this wealth of digital information, scientists must be able to connect the data from countless different sources. How do those in the bioinformatics community facilitate these connections? ***How do we ensure that we're not simply substituting digital silos for analog ones?***

For Dr. Cynthia Parr, Chief Scientist for the Encyclopedia of Life (EOL), an online biodiversity encyclopedia with a mission to create a webpage for every species, this is a critical question.

Educated as a behavioral ecologist with a principal interest in ornithology, Parr spent her early career in the fields of molecular systematics, information visualization, and semantic web research. In 2008, she joined EOL as the Director of the Species Pages Group, which is responsible for aggregating the scores of data ingested by EOL to create species pages.

To date, EOL species pages contain information such as descriptions (e.g., text about morphology and ecology), distribution maps, multi media files like images, sound recordings and videos, and links to BHL literature about each species. EOL's interface and functionality currently best accommodates biodiversity enthusiasts, students, and educators, but there's a world of untapped potential for scientists in the data housed within the system.

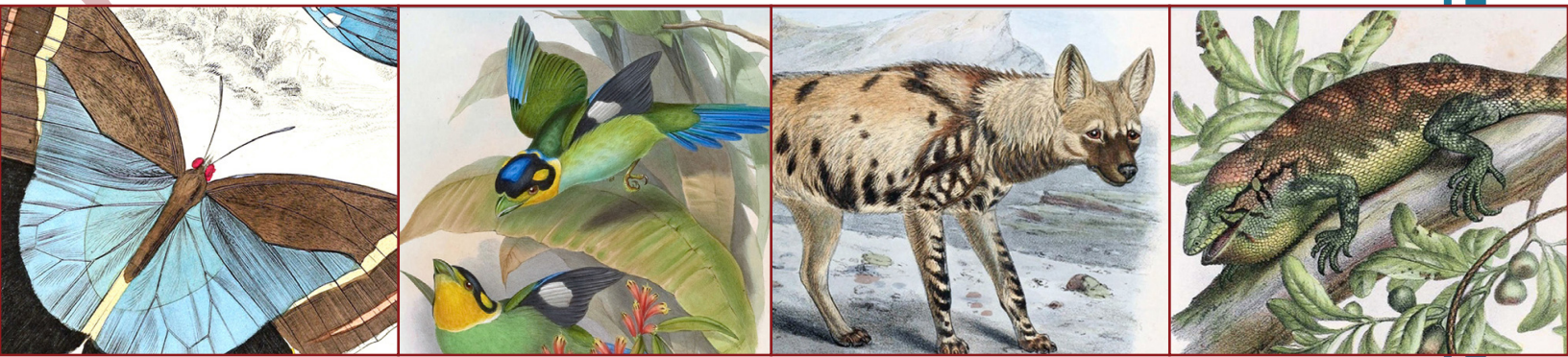
"Right now, EOL has lots of information that scientists want – especially in the BHL literature references – but it's not set up in a way that allows them to easily perform large scale analyses," explained Parr.

In her new role as EOL's Chief Scientist, Parr will not only continue to build EOL's content, but will also serve as a liaison with the scientific community. To better serve this audience, EOL's current goal is to structure the information on EOL as computable data, supporting the sort of cross-cutting analysis scientists truly need.

"In general science is moving faster today because open data allows scientists to better reuse and combine previously-published research results, perform metadata and trend analysis, articulate relationships, and make discoveries that weren't possible before we could connect all of the data dots," articulated Parr. ***"With computable open data, we should be able to see the forest and not just the trees."***

Of course, the forest doesn't exist without the trees, meaning that you need each data unit in order to perform this big picture analysis. Much of the data required comes from published literature.





“For biological sciences, and particularly taxonomy, access to historic literature is key,” emphasized Parr. “In order to describe a new species, or evaluate what we know about a species, we must understand its history, which is captured in the published record. **Many species have not been studied since they were originally described, and therefore everything we know about that organism may be contained in a single reference in an obscure book or journal.**”

Unless these publications are made widely available through open access libraries like the Biodiversity Heritage Library, critical pieces of the larger biodiversity knowledge puzzle may go on missing. Understanding the complex ecosystem we live in requires understanding all of the elements that impact it.

“We currently know of about 1.9 million species, but there are many still undiscovered,” explained Parr. **“Performing large scale biodiversity monitoring will require inferring knowledge based on what we already know. Published literature is our knowledge record.”**

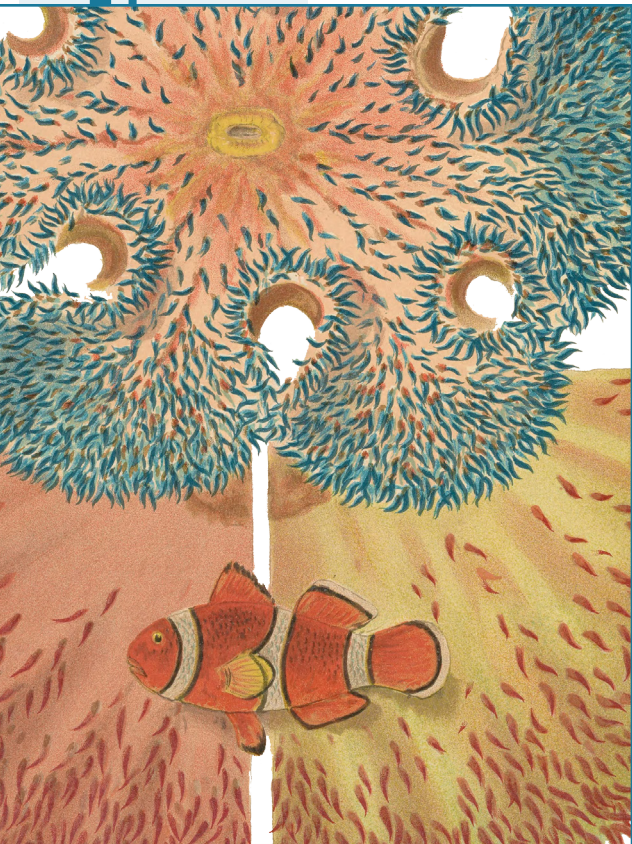
Deciphering how earth’s biodiversity fits together requires understanding the distribution of organismal traits in evolutionary trees and across ecosystems. Currently, however, there is no single place to find traits that have already been described. That’s a problem EOL hopes to address.

“Our vision is to create something like a trait bank,” said Parr. “EOL has the infrastructure to gather together all this disparate descriptive information, like that found in BHL, web profiles, or image databases. The next step is to turn all of that into trait data that can then be analyzed along with genetic data to get this complete picture of organisms and ecosystems.”

BHL resources constitute a major source of information needed to create a trait bank. For EOL and other biodiversity projects to utilize this content, it must be made openly and consistently available for text mining. By continuing to replicate its data across multiple servers and locations, BHL is actively working to ensure that this requirement is met and that its content remains truly open.

**“The information supplied by BHL is precisely the type of data scientists are coming to EOL for,”** said Parr. “Going beyond simply linking to BHL pages within EOL, but mining BHL data sets, extracting the information there, and incorporating it prominently on EOL, is something we’ve always wanted to do. We have the content. All we have to do is work with BHL to find the right way to expose it.”

As BHL and EOL continue to collaborate in the big data environment, the richness of both collections will be made continually more apparent. Consistently, scientific discovery affirms that, with the right information, anything is possible. BHL and EOL have the right information. Now it’s time to explore the possibilities.



# bhl content usage

## measuring the use of bhl resources

Measuring the use of BHL resources involves more than simply tracking website visits. BHL content is dispersed amongst a variety of databases and websites, including the BHL blog and Flickr. Furthermore, thanks to the DOIs (digital object identifiers) associated with our collections, we can also track usage originating from users clicking on citations to BHL content in external sources. The statistics presented here attempt to capture a complete picture of BHL usage while also considering where that usage originates from.

*Dr. F. Christian Thompson,*  
Entomologist

"I love the BHL. I may have the finest private library on flies (Diptera), but now I find it faster, easier, etc., to go to the BHL and get the page I want, rather than stepping into the next room and pulling my own copy off the shelf."

**VISITS**  **14%** Q2 FY13 VISITS OVER QUARTERLY AVERAGE

Q2 FY13 **411,901** TOTAL VISITS

**401,097** WEBSITE VISITS | **10,804** BLOG VISITS

Q1 FY13 **402,201** TOTAL VISITS

**393,751** WEBSITE VISITS | **8,450** BLOG VISITS

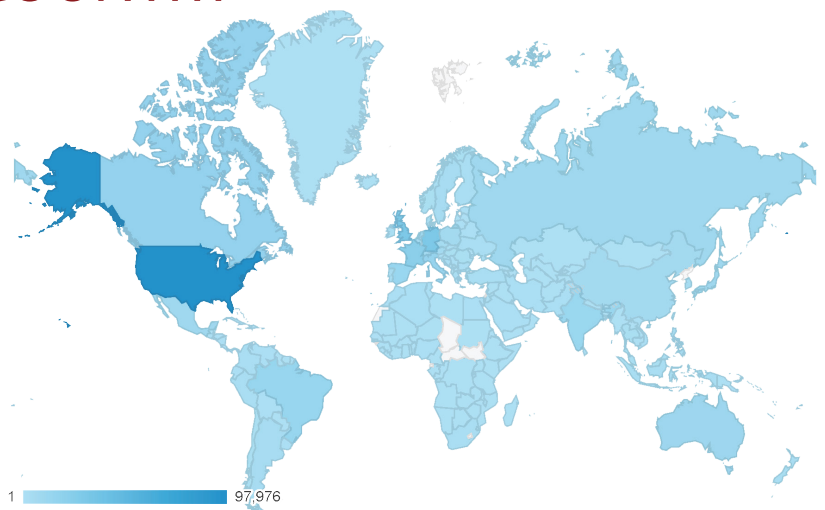
QUARTERLY AVERAGE PAST YEAR **361,849** TOTAL VISITS

**353,315** WEBSITE VISITS | **8,534** BLOG VISITS

## Q2 FY13 USAGE BY COUNTRY

TOP COUNTRIES:

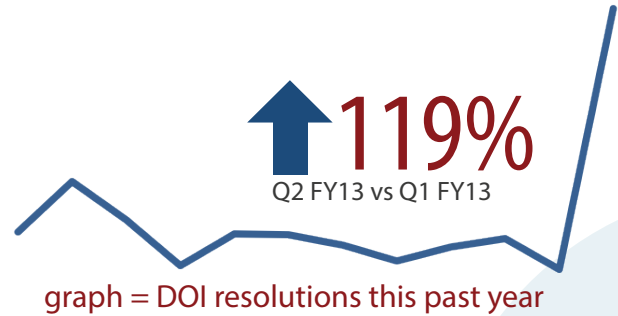
- UNITED STATES: 97,976 visits
- UK: 29,422 visits
- GERMANY: 29,292 visits
- FRANCE: 21,837 visits
- CANADA: 16,148 visits
- ITALY: 13,787 visits
- BRAZIL: 13,451 visits
- SPAIN: 11,670 visits
- INDIA: 11,404 visits



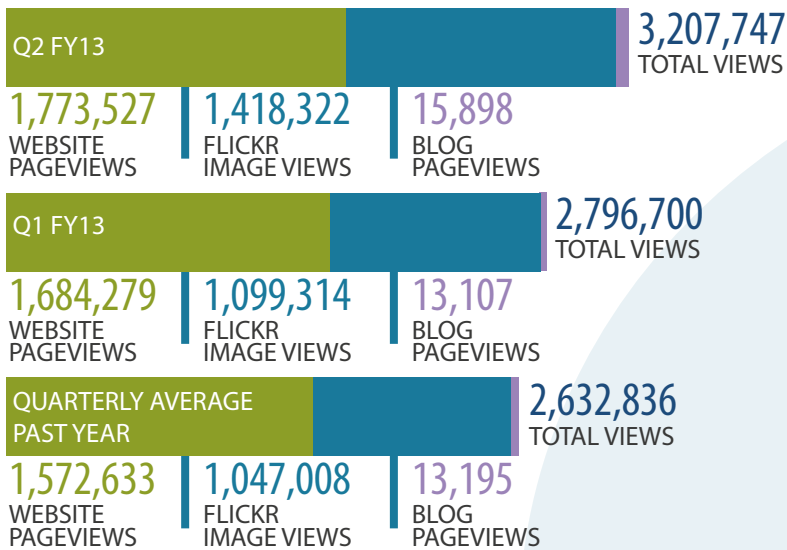


**DOIs** Q2 FY13 = 29,523 | Q1 FY13 = 13,479  
total resolutions past year = 79,441

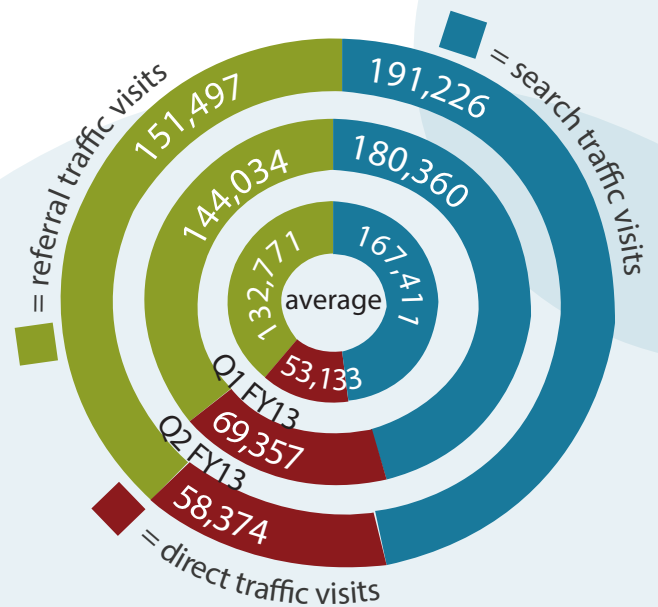
Each DOI resolution translates to a visit to BHL. When users cite BHL resources, they can include the DOI (essentially a link) to that item in BHL. Thus, DOI resolutions represent a baseline for how much traffic comes to BHL because users cite our collections.



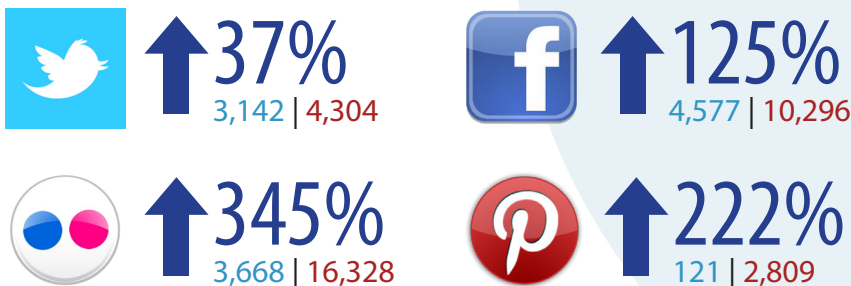
**VIEWS** **22%** Q2 FY13 VIEWS OVER QUARTERLY AVERAGE



**WEBSITE TRAFFIC SOURCES**



**VISITS TO BHL FROM SOCIAL MEDIA PLATFORMS**  
APRIL 2011-MARCH 2012 VS APRIL 2012-MARCH 2013

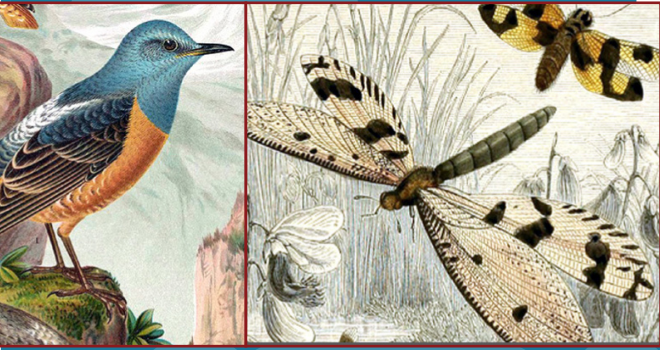


**VISITS TO BHL FROM SOCIAL MEDIA**  
APRIL 2012-MARCH 2013  
49,898 TOTAL VISITS



# bhl users

## measuring the bhl audience



### BHL and the EOL Rubenstein Fellows

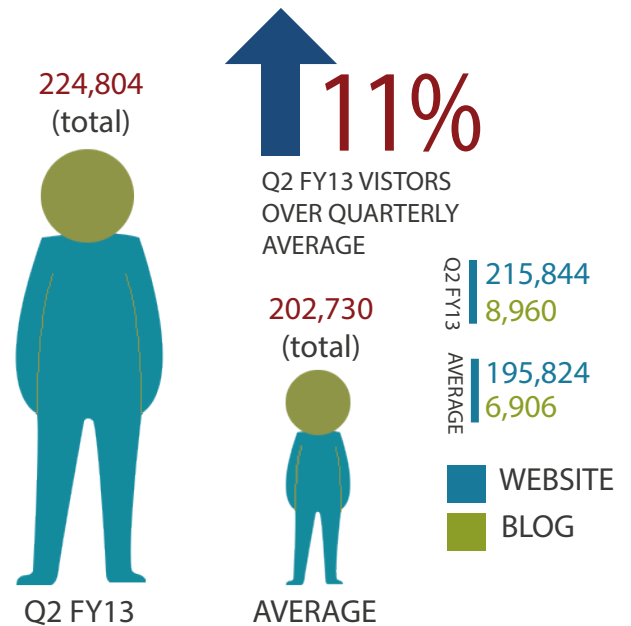
Every year, the Encyclopedia of Life hosts the EOL Rubenstein Fellows program. An international competition, the program supports the work of scientists interested in taking advantage of online collaboration and outreach possibilities for scientific research and information. EOL Fellows are expected to distribute their research through EOL, performing activities that will “add new content, such as images, maps or descriptions, to EOL pages.”

Many of the fellows supported thus far have made extensive use of BHL for their research, including Dr. John Sullivan, evolutionary biologist and ichthyologist, studying the phylogenetic interrelationships and evolution of freshwater fishes. Sullivan used the Rubenstein Fellowship to supplement a nine-month Fulbright Research Fellowship in the Democratic Republic of the Congo. His Fulbright work included creating an inventory of fish species found in the vicinity of Kisangani, a city on the Congo River at the base of the Upper Congo rapids, and helping to build capacity at the University of Kisangani in ichthyology.

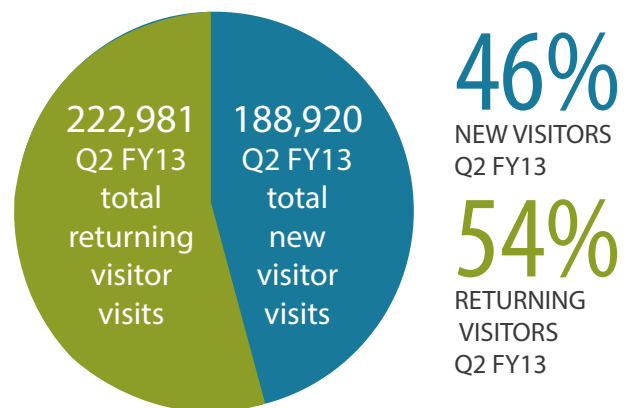
BHL plays an important part in that research. “I tend to think of BHL as my personal ichthyology library. I have retrieved dozens and dozens of species descriptions from it that are now on my personal computer for instant reference. *Even if I lived in a library that had these volumes on the shelf, it would take me longer to locate what I was looking for.* I can then take those PDFs BHL generates for me and attach them to the species pages I create in EOL. Now anybody in the world has instant access to the original species description in a couple of clicks!”

The BHL audience is much greater than simply the number of visitors to the BHL website. It also encompasses those that use BHL resources on our other outreach platforms, including Flickr, our blog, Twitter, Facebook, and Pinterest. To reflect a complete picture of our audience, we must measure all of these users.

### UNIQUE VISITORS



### NEW VS RETURNING VISITORS

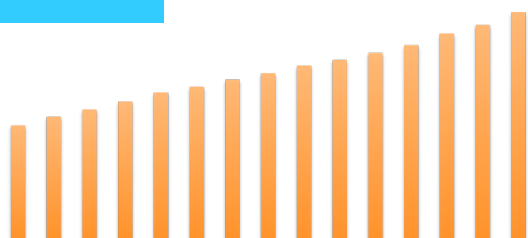




**TWITTER  
FOLLOWER  
GROWTH**



**100%**  
SINCE APRIL 2012



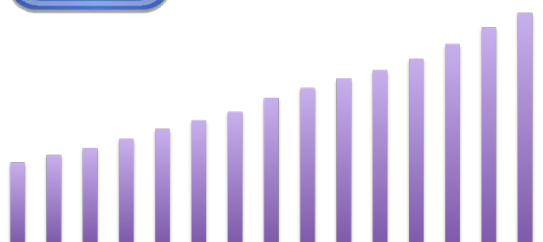
FOLLOWERS  
AS OF  
MARCH 2013 **2,616**  
NEW  
FOLLOWERS  
IN Q2 FY13 **366**



**FACEBOOK  
FOLLOWER  
GROWTH**



**188%**  
SINCE APRIL 2012



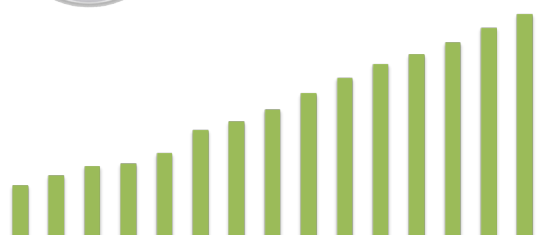
FOLLOWERS  
AS OF  
MARCH 2013 **5,078**  
NEW  
FOLLOWERS  
IN Q2 FY13 **1,168**



**FLICKR  
FOLLOWER  
GROWTH**



**330%**  
SINCE APRIL 2012



FOLLOWERS  
AS OF  
MARCH 2013 **2,568**  
NEW  
FOLLOWERS  
IN Q2 FY13 **464**

## BHL & Moths of the World

In November, 2004, *Butterflies and Moths of the World: Generic Names and their Type-Species* was awarded the Podalirius star for best website about butterflies and moths. The aim of the website is to compile a comprehensive catalogue of all the published Lepidoptera genus-group names along with full-color images of most families.

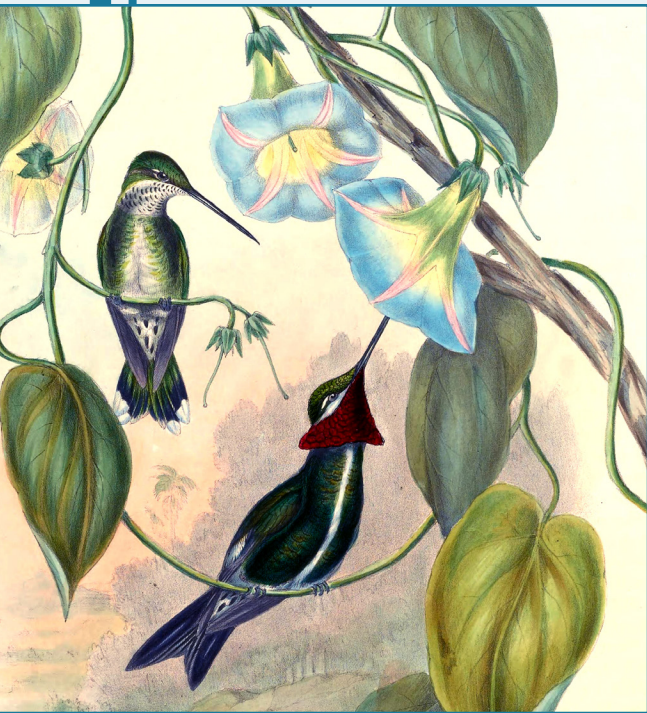
Senior website author, Dr. Brian Pitkin, Scientific Associate at NHM, London, uses BHL to accomplish this feat, linking to BHL scanned books and journals. As of 2013, the website included BHL links for:

**Genera:** 21,884 (68%) of the 32,165 references

**Type species:** 17,858 (64%) of the 27,930 references

**Type-species designations:** 2,540 (64%) of the 3,945 references

**Bibliography:** 3,808 (43%) of 8,883 references



# meaningful usage

## measuring user engagement

Measuring the success of BHL is about more than just tracking usage and audience. We also want to evaluate whether our users are having meaningful interactions with our content. How much time does a user actually spend on our site, how many pages do they view when they visit us, and how frequently are they returning to use our services? Within our other outreach platforms, are users simply passively monitoring what we're posting, or do they actually interact with it, have conversations with us about it, enhance it, and share our content with other people? The metrics presented in this spread attempt to reflect how engaged our users really are with us and our resources.

## WEBSITE ENGAGEMENT

The ratio of visit frequency, depth and length has remained fairly steady. Ideally, we would like to see the ratio of maximum frequency, length, and depth increase each quarter.

### FREQUENCY

Q2 FY13 Q1 FY13 AVERAGE



- Maximum:** Visits from visitors that come to BHL 9+ times per month
- Moderate:** Visits from visitors that come to BHL 2-8 times per month
- Minimum:** Visits from visitors that come to BHL 1 time per month

31% AVERAGE  
MAXIMUM

22% AVERAGE  
MODERATE

47% AVERAGE  
MINIMUM

### DEPTH

Q2 FY13 Q1 FY13 AVERAGE



- Maximum:** Visits that involved viewing 20+ pages in BHL
- Moderate:** Visits that involved viewing 2-19 pages in BHL
- Minimum:** Visits that involved viewing only 1 page in BHL

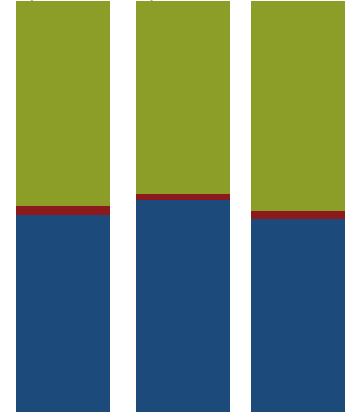
4% AVERAGE  
MAXIMUM

48% AVERAGE  
MODERATE

48% AVERAGE  
MINIMUM

### LENGTH

Q2 FY13 Q1 FY13 AVERAGE

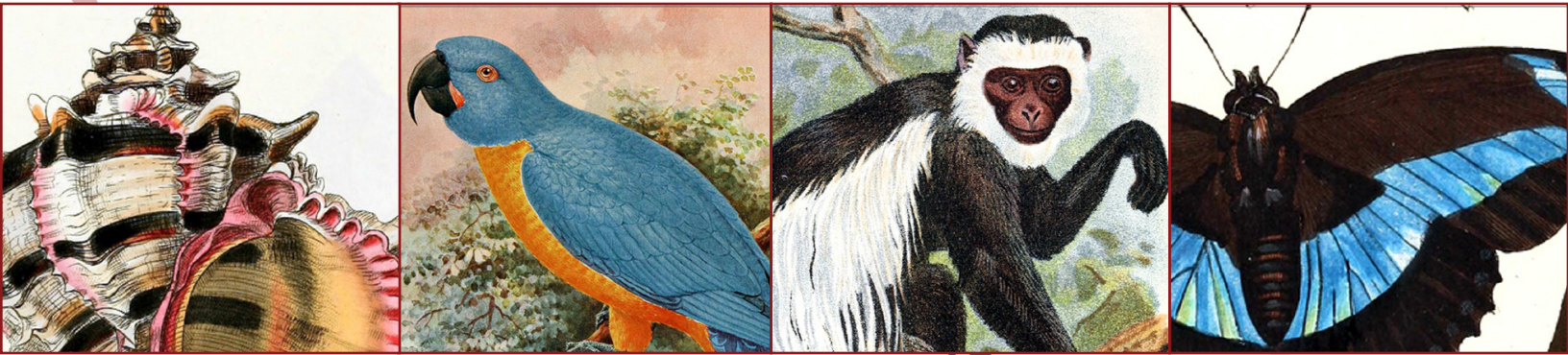


- Maximum:** Visits that last more than 3 minutes
- Moderate:** Visits that last 1-3 minutes
- Minimum:** Visits that last less than 1 minute

51% AVERAGE  
MAXIMUM

1% AVERAGE  
MODERATE

48% AVERAGE  
MINIMUM



## TWITTER ENGAGEMENT JAN 2012-MARCH 2013



↑ **2%**

RETWEETS/MENTIONS

8,120  
CLICKS ON LINKS

↑ **19%**

CLICKS ON LINKS

2,512  
RETWEETS/  
MENTIONS



## BHL & the Wonderful World of Cacti

Studying botany, and the Cacti family *Opuntia* in particular, is one of Joe Shaw's passions (representing over 25 years of work). A botanist by training, Joe now concentrates his efforts on scientific writing, one aspect of which involves his website *Opuntiads Web*. The site provides descriptions, photographs, and illustrations for over 100 *Opuntia* species, with links to original descriptions of the corresponding species in BHL.

## FACEBOOK ENGAGEMENT JAN 2012-MARCH 2013



↑ **268%**

ENGAGED USERS

35,161  
INTERACTIONS

↑ **261%**

INTERACTIONS

26,268  
ENGAGED USERS

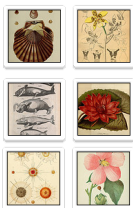


interactions = liking/commenting on/sharing a bhl facebook post  
engaged users = users who perform interactions

The historic literature found on BHL allows Shaw to investigate and articulate the details and differences of each *Opuntia* species on his website. Incorporating original species descriptions allows users to understand the species as it was first documented for science. As Shaw asserts, BHL "is immensely helpful. I have been able to sort taxonomic tangles going back 200 years."

## FLICKR ENGAGEMENT: TAGGED IMAGES

Users can add tags to BHL images in Flickr. If these are species name tags, the images can be ingested into EOL and associated with the corresponding species page.



**70,977**  
IMAGES IN FLICKR

↑ **15%** OF FLICKR  
COLLECTION  
TAGGED BY USERS  
**10,687** IMAGES TAGGED

# enabling research bhl & anatomical ontologies



Katja C. Seltmann

## Dr. Torsten Dikow, Revisionary Systematist and Entomologist

"As a taxonomist who has to deal with numerous historical publications to decipher the identity of species and type specimens, my research relies heavily on old publications. The high-quality scans produced by BHL in PDF format allow me to have the vast majority of papers and books on the fly species I study with me on my laptop. Therefore I can always check a certain publication even when I'm traveling to other museums, out in the field, or just away from my desk."

The realm of ontology concerns the nature of reality, determining what exists, how it fits within a hierarchy, and how various elements are organized according to similarities and differences. Traditionally a philosophical question within metaphysics, today ontology has a firm application within systems biology as well.

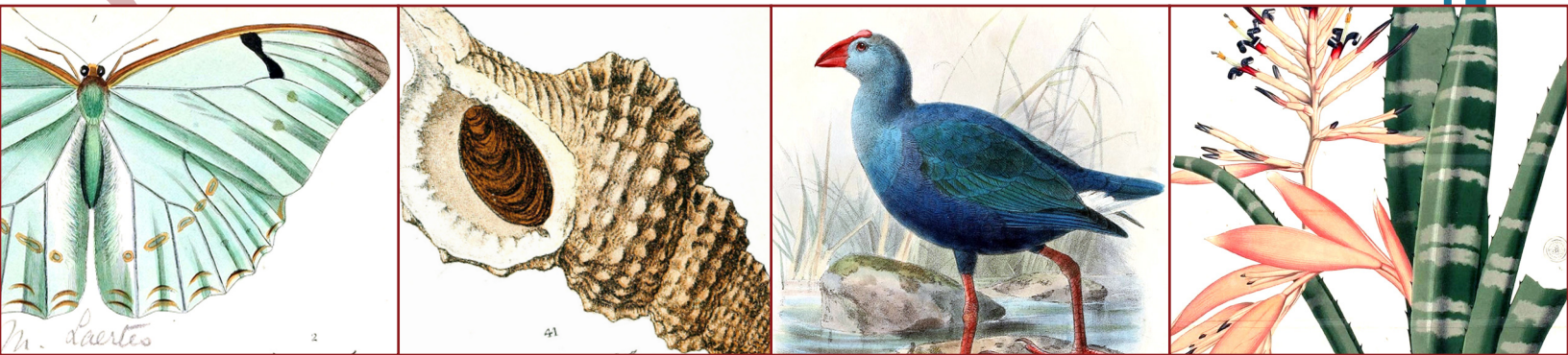
Anatomy ontologies describe the structural and developmental relationships between the various parts of an organism. Defining anatomical ontologies reveals a complete list of distinguishing characteristics for that organism or group of organisms. The act of creating an anatomical ontology requires precise definitions of the terminology used to describe a variety of phenotypes.

Authors that have contributed to the past 250 years of taxonomic literature did not use standardized vocabularies. Katja C. Seltmann (Project Manager for the Tri-Trophic Thematic Collection Network <tcn.amnh.org> at the American Museum of Natural History) desired to find a way to efficiently analyze this multi-century body of literature to create a single anatomical ontology, specifically for the insect order Hymenoptera. Accomplishing this feat required utilizing the Biodiversity Heritage Library (BHL).

Millions of pages of analog biodiversity literature, spanning the 15th-21st centuries, are digitized and made freely available online by the Biodiversity Heritage Library. Among the over 59,000 titles in the collection is the *Journal of Hymenoptera Research (JHR)*, published by the International Society of Hymenoptera since 1992. *Seltmann and a team of four other researchers utilized this publication from BHL to help build the Hymenoptera Anatomy Ontology (HAO).*

The NSF-funded Hymenoptera Anatomy Ontology is based on a language recognition tool (called the "Proofer"), which can be implemented across biodiversity literature in order to discover domain-specific anatomy terms. Employing the tool across the OCR for *JHR* resulted in





the discovery of nearly 1200 new terms for HAO. Furthermore, the development of the ontology is iterative. As the “Proofer” is applied to new collections of literature, it finds matches to existing terms as well as proposes new terms to add to the ontology. A human is required to review the proposed terms, selecting those to be added to the growing database.

After creation, this ontology can be applied as a filter to the literature in order to reveal trends in term occurrence within species descriptions, ultimately allowing researchers to analyze hundreds of years’ worth of scientific publications without having to sift page by page through the texts. The tool is thus instrumental in improving the efficiency of scientific research, and the process and impact was detailed in the 2012 PLoS ONE article “Utilizing Descriptive Statements from the Biodiversity Heritage Library to Expand the Hymenoptera Anatomy Ontology” (Seltmann et al.).\*

According to Seltmann, the Biodiversity Heritage Library plays a critical role in modern scientific research, including her own work. *“I am very fond of the BHL. It set a precedent for open access to literature that I feel initiated a cascading of change in our expectations. Sharing information, publications and open access is no longer the suspicious topic it used to be only a few years ago. Now, expectation is that publications, data and otherwise will be readily available. BHL, in my opinion, was truly one of the first examples of an open model becoming successful in the biological community, and, because it was useful, it changed attitudes.”*

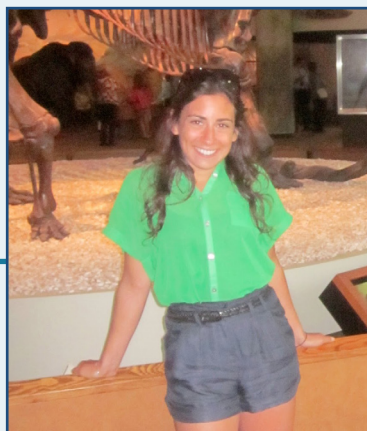
The process used to create the Hymenoptera Anatomy Ontology can be applied to other disciplines in order to build any phenotype-relevant ontology. However, as the PLOS article articulates, *“Natural language processing methods for biological data discovery is only possible through open access publications, and efforts such as the Biodiversity Heritage Library to make legacy literature freely available. This exercise to observe trends in the terminology illustrates how the accessibility to literature facilitates anatomy ontology construction.”*

This use case thus provides a clear example of how the BHL is inspiring scientific discovery through free access to biodiversity knowledge.

\* Seltmann KC, Péntzes Z, Yoder MJ, Bertone MA, Deans AR (2013) Utilizing Descriptive Statements from the Biodiversity Heritage Library to Expand the Hymenoptera Anatomy Ontology. PLoS ONE 8(2): e55674. doi:10.1371/journal.pone.0055674



# scientist profiles & the biodiversity heritage library



**Who:** Frieda Benun Sutton, evolutionary biologist and tarsier enthusiast

**Where:** Recent graduate from CUNY Macaulay Honors College at Brooklyn College, future PhD student in Evolutionary Biology, and after-school class and camp teacher at the American Museum of Natural History

**Research Specialty:** Tarsiers

**BHL Use:** Frieda used BHL to support her research for her thesis project comparing scientific literature on the classification of tarsiers before and after the cladistics revolution. "I was looking for a very specific and somewhat obscure symposium from 1919 to use as my pre-cladistics platform, and miraculously, I was able to find it online! Often, I would be looking for just a key word to link me to an idea or person and I could easily find it with just a quick search of the documents downloaded from BHL."

**BHL Impact:** "I am greatly indebted to BHL. I honestly do not know if my thesis project would have been possible without it. At the very least, it made my research significantly easier. I'm happy to know that there are resources and people out there that are committed to digitizing and making available scientific literature, old and new."



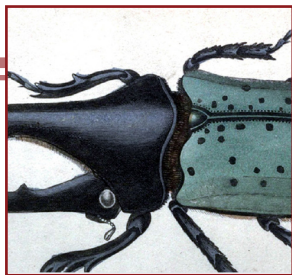
**Who:** Dr. Dai Herbert, invertebrate zoologist

**Where:** Curator, Mollusca, KwaZulu-Natal Museum and Honorary Professor, University of KwaZulu-Natal, South Africa

**Research Specialty:** molluscan diversity and biogeography in southern Africa

**BHL Use:** The fields of taxonomy and systematics requires access to original species descriptions, often found in old and rare literature sources. As Dr. Herbert articulated, "Hardly a week goes by when I don't use BHL to go back to original sources to check information. When fully engaged in a project, I might use it almost daily."

**BHL Impact:** "BHL is a tremendous and extremely valuable resource. I frequently need to refer to the older literature, but before the advent of the internet and the BHL, this was usually a very frustrating task because much of the relevant material was not available in South Africa. The BHL has greatly alleviated this problem. This resource has done an enormous amount to enhance the capacity of developing countries to undertake taxonomic research on their biota. I am extremely grateful to those who set up and manage this resource. Keep up the good work!"



**Who:** Dr. Jose Nunez-Mino, forest ecologist and conservation biologist

**Where:** Field Project Manager, The Last Survivors, Dominican Republic

**Research Specialty:** Leading conservation efforts to save the last two endemic non-flying mammal species of Hispaniola (Haiti and the Dominican Republic)

**BHL Use:** Dr. Nunez-Mino uses BHL to conduct his research on the Hispaniolan solenodon and Hispaniolan Hutia, which involves investigating current and past distributions of both species. Much of this information can only be found in legacy literature.

**BHL Impact:** "BHL is an amazing resource. I can look up information about the two species I am studying. Both were described in the 1830s but very little is known about them though some information is available in the historical literature. For example, Gonzalo Fernández de Oviedo was the first to write about hutias in 1535 when he mentions that they were widely eaten and very tasty. We have also been able to access some great drawings of the species which we can use to both raise awareness and educate."

**Who:** Dr. Gary Poore, taxonomist and carcinologist

**Where:** Curator, Crustaceans, Museum Victoria in Melbourne, Australia

**Research Specialty:** Isopod and Decapod Crustaceans. Responsible for naming almost 400 new species over the course of his career

**BHL Use:** As a taxonomist, Gary's work requires that he regularly delve into the historical literature to ensure that any new species he might be describing has not been previously named, and that current nomenclature accords with the conventions of the International Code of Zoological Nomenclature. To find and read the historical literature, Gary uses the BHL because it is always conveniently at his fingertips.

**BHL Impact:** "The BHL is a great resource for the researcher working in taxonomy. It saves me so much time. Without it, I would have to go through library catalogues, and if our library didn't have an article, I'd waste days or weeks waiting for inter-library loans. It provides easy access to the historical literature, right back to Linnaeus and beyond."

## *Inspiring discovery through free access to biodiversity knowledge*

The Biodiversity Heritage Library (BHL) is a consortium of 15 natural history and botanical libraries that work collaboratively to make biodiversity literature openly available to the world as part of a global biodiversity community.

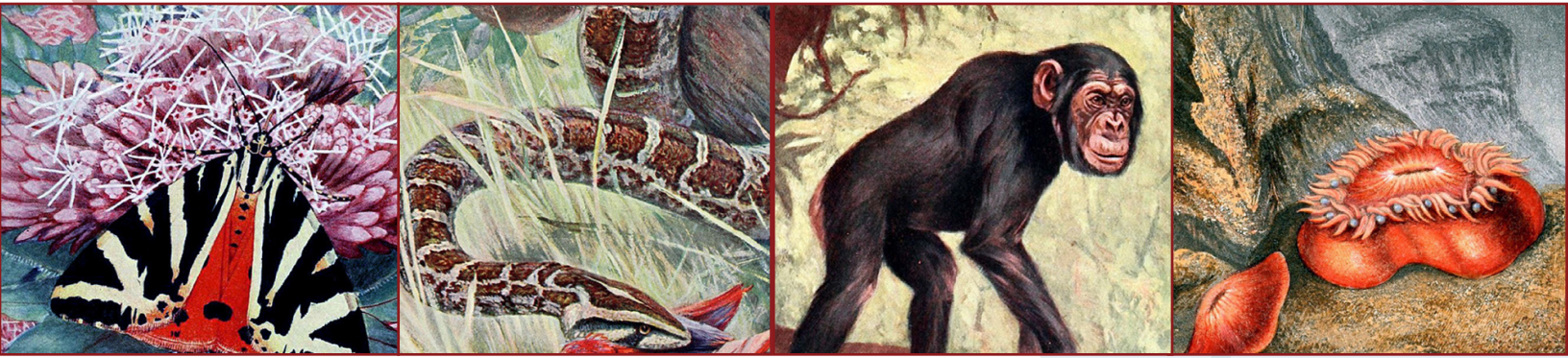
The BHL consortium works with the international taxonomic community, rights holders, and other interested parties to ensure that this biodiversity heritage is made available to a global audience through open access principles. Today, in partnership with the Internet Archive and through local digitization efforts, BHL has digitized over 40.5 million pages of taxonomic literature, representing over 59,000 titles and 112,000 volumes (March 2013).

The published literature on biological diversity has limited global distribution; much of it is available in only a few select libraries in the developed world. Biologists have long considered that access to the published literature is one of the chief impediments to the efficiency of research in the field. Among other results, free global access to digitized versions of the literature would repatriate information about the earth's species to all parts of the world.

Since 2009, the BHL has expanded globally. The European Commission's eContentPlus program has funded the BHL-Europe project, with 28 institutions, to assemble the European language literature. Additionally, the Chinese Academy of Sciences, the Atlas of Living Australia, Brazil (through SciELO and BIREME), and the Bibliotheca Alexandrina have created regional BHL nodes. The newest global node, BHL-Africa, officially launched in April, 2013. These projects will work together to share content, protocols, services, and digital preservation practices.

### **Awards Received by the Biodiversity Heritage Library**

- Charles Robert Long Award of Extraordinary Merit. Council on Botanical and Horticultural Libraries. 2013.
- Laureate. IDG's Computerworld Honors Program. 2013.
- (BHL-Australia) Victorian Government Arts Leadership Recognition Award. 2012.
- Outstanding Collaboration Award. Association for Library Collections & Technical Services (ALCTS). 2010.
- John Thackray Medal. The Society for the History of Natural History. 2010.



## Five Recent Publications that Highlight the Biodiversity Heritage Library

- Marhold K, Stuessy, T (2013) *The Future of Botanical Monography: Report from an International Workshop, 12-15 March 2012, Smolenice, Slovak Republic*. *Taxon*. 62 (1): 4-20.
- Seltmann KC, Péntzes Z, Yoder MJ, Bertone MA, Deans AR (2013) *Utilizing Descriptive Statements from the Biodiversity Heritage Library to Expand the Hymenoptera Anatomy Ontology*. *PLoS ONE* 8(2): e55674. doi:10.1371/journal.pone.0055674.
- Ang Y, Puniamoorthy J, Pont AC, Bartak M, Blanckenhorn WU, Eberhard WG, Puniamoorthy N, Silva VC, Munari L, Meier R (2013) *A Plea for Digital Reference Collections and Other Science-based Digitization Initiatives in Taxonomy: Sepsidnet as Exemplar*. *Systematic Entomology*. doi: 10.1111/syen.12015.
- Robert JR, Drost, CA (2012) *Biodiversity Heritage Library*. *College & Research Libraries News*. 73 (10): 626-627.
- Bieler R, Petit RE (2012) *Molluscan Taxa in the Publications of the Museum Godeffroy of Hamburg, with a Discussion of the Godeffroy Sales Catalogs (1864-1884), the Journals des Museum Godeffroy (1873-1910), and a History of the Museum*. *Zootaxa* 3511: 1-80.

## BHL Staff & Member Institutions

### Secretariat:

Program Director: Martin Kalfatovic  
 Program Manager: Grace Costantino  
 Collections Coordinator: Bianca Crowley

### Technical Team:

Technical Director: William Ulate  
 Lead Developer: Mike Lichtenberg  
 Data Analyst: Trish Rose-Sandler

### BHL Executive Committee:

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 Vice-Chair: Connie Rinaldo (MCZ Harvard)  
 Secretary: Susan Fraser (The New York Botanical Garden)

### Global-BHL Executive Committee:

Chair: Ely Wallis (BHL-Australia)  
 Secretary: Nancy Gwinn (BHL)

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 California Academy of Sciences  
 Cornell University  
 Harvard University Botany Libraries  
 Harvard University, Ernst Mayr Library, MCZ  
 Library of Congress  
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 Missouri Botanical Garden  
 Natural History Museum, London  
 The New York Botanical Garden  
 Smithsonian Libraries  
 United States Geological Survey

### Institutional Council:

Academy of Natural Sciences, Philadelphia  
 The Field Museum

