

APPENDIX III –BOARD & ADVISORY COMMITTEE MEMBER BIOS & REPORTS

Member	Affiliation
Christian Burks Chair, Board of Directors	Former President, Ontario Genomics Institute
Jesse Ausubel Member, Board of Directors	Vice President of Programs, Alfred P. Sloan Foundation
Paul Hebert Member, Board of Directors	Scientific Director of iBOL
Faustino Siñeriz Member, Board of Directors	Professor of Microbiology, National University of Tucumán, Argentina
Karl Tibelius Member, Board of Directors	Vice President, Genomics Programs, Genome Canada
Xian-En Zhang Member, Board of Directors	Director General of the Basic Research Department, Chinese Ministry of Science and Technology
José-Antonio de la Peña Member, Board of Directors	President, Mexican Academy of Sciences
Ivar Myklebust Member, Board of Directors	Director, Norwegian Biodiversity Information Center
Rocky Skeef Member, Board of Directors	Executive Director, New Business Development, National Research Foundation of South Africa
Stephen O'Brien Chair, Science Advisory Board	Chief, Laboratory of Genomic Diversity, National Cancer Institute, U.S.A.
Gary Borisy Member, Science Advisory Board	Director and CEO of the Marine Biological Laboratory, Woods Hole, MA
William Gelbart Member, Science Advisory Board	Professor of Molecular and Cellular Biology, Harvard University
David Haussler Member, Science Advisory Board	Director, Center for Biomolecular Science and Engineering, University of California, Santa Cruz
Paul Thompson Member, Science Advisory Board	W. K. Kellogg Chair in Agricultural, Food and Community Ethics, Michigan State University in East Lansing, Michigan
John McPherson Chair, Technology Development Advisory Group	Director of Genome Technologies, Ontario Institute for Cancer Research
Matthew Bainbridge Member, Technology Development Advisory Group	Research assistant, Human Genome Sequencing Center, Baylor College of Medicine
Barton Slatko Member, Technology Development Advisory Group	Head of DNA Sequencing, New England Biolabs, Inc.
Jay Shendure Member, Technology Development Advisory Group	Assistant Professor of Genome Sciences, University of Washington School of Medicine
Baoli Zhu Member, Technology Development Advisory Group	Professor, Institute of Microbiology, Chinese Academy of Sciences

Reports

Meeting Date	Document Title
Board of Directors meeting, November 12 th 2009	Update on sample sourcing
Board of Directors meeting, April 7 th 2009	Plan for IT infrastructure
Board of Directors meeting, April 7 th 2009	Key funding partners
Technology Development Advisory Group meeting, December 15 th 2009	TDAG report
Board of Directors meeting, November 12 th 2009	iBOL Communications Strategy
Board of Directors meeting, April 7 th 2009	Job descriptions for key positions
iBOL Scientific Steering Committee meeting, September 23-25 2010	iBOL Scientific Steering Committee meeting report

Board of Directors

Christian Burks, Chair



Dr. Christian Burks is a former President and CEO of the Ontario Genomics Institute, where his role drew on his career in basic and applied research institutions and start-up biotechnology companies: creating, developing, and managing database resources for molecular biology; analysing molecular sequence data; generating and managing genomics and proteomics technology and data to support drug discovery; and involvement at the start of the Human Genome Project. Dr. Burks was part of a team that created, and was later Principal Investigator for GenBank.

Jesse Ausubel



Jesse H. Ausubel is Vice President of Programs with the Alfred P. Sloan Foundation where his main area of responsibility is support of basic research in science and technology. His programs include the Census of Marine Life, the Encyclopedia of Life and the Consortium for the Barcode of Life. Concurrently, Mr. Ausubel is Director of the Program for the Human Environment and Senior Research Associate at The Rockefeller University in New York City, where he has served on the faculty since 1989.

Paul Hebert



Dr. Paul D. N. Hebert is the Scientific Director of iBOL and Director of both the Biodiversity Institute of Ontario and the Canadian Barcode of Life Network. A native of Kingston (Ontario), Dr. Hebert completed his undergraduate work at Queen's University, his PhD in genetics at Cambridge University and postdoctoral fellowships at the University of Sydney and at the Natural History Museum in London. He took up a faculty position at the University of Windsor in 1976 where he remained until repositioning to the University of Guelph in 1990 where he holds a Canada Research Chair in Molecular Biodiversity. Over his career, Dr. Hebert has served as Director of the Great Lakes Institute at Windsor, as Chair of the Department of Zoology at Guelph, and as Chairman of the Huntsman Marine Science Centre in St. Andrews. He has published more than 300 papers, has received varied national and international scientific awards and is a Fellow of the Royal Society of Canada. His 2003 research paper proposing a database of DNA barcodes identifying all species is regarded as the beginning of the global barcode enterprise.

Faustino Siñeriz



Dr. Faustino Siñeriz is a Professor of Microbiology at the National University of Tucumán, Argentina. He is principal researcher with the National Council of Scientific and Technical Research (CONICET) and Director of the Argentinean-Brazilian Centre for Biotechnology (CABBIO). His fields of research are biotechnological processes, microbial physiology, microbial enzymes, process optimization and effluent treatment.

Karl Tibelius



Dr. Karl Tibelius joined Genome Canada as Vice President, Genomics Programs, in September, 2009. Previously, he was Director of the Targeted Initiatives Branch at the Canadian Institutes of Health Research (CIHR), where he coordinated program delivery of CIHR initiatives that addressed priority areas such as pandemic preparedness, knowledge translation and commercialization as well as international collaborative research initiatives.

Xian-En Zhang



Dr. Xian-en Zhang is Director General of the Basic Research Department in the Chinese Ministry of Science and Technology where he manages major national programmes for the development of scientific research and leads the working group of China's Scientific Data Sharing Programme. Dr. Zhang has published numerous papers on analytical biotechnology and has written three books on biosensors and biochips.

José-Antonio de la Peña



Dr. José Antonio De la Peña Mena is President of the Mexican Academy of Sciences and head researcher at the Institute of Mathematics at the National Autonomous University of Mexico, specializing in the theory of algebraic representation. His ground-breaking research has been recognized with the National University Prize for Young Researchers (1991) and the Prize of the Mexican Academy of Sciences in 1994.

Ivar Myklebust



Ivar Mykelbust trained as a zoologist at the University of Trondheim. He is a member of the Norwegian delegation to the Global Biodiversity Information Facility governing board. He has also undertaken a number of other international activities including the Norwegian-Russian commission on environmental protection and various working groups under the Nordic Council of Ministers.

Rocky Skeef



Dr. Rocky Skeef completed his PhD in biochemistry at Rhodes University in Grahamstown in 1987 and has worked at the NRF – a statutory body that supports and promotes research through funding, developing human resources and providing facilities – since 2004. As Executive Director of new business development, his primary role is to build the foundation's financial resources.

**Science Advisory Board
Stephen O'Brien (Chair)**



Dr. Stephen J. O'Brien trained in molecular and population genetics at Cornell University. He joined the National Cancer Institute as a post-doc in 1971 and is now chief of the NCI's Laboratory of Genomic Diversity, which he founded in the late 1980s. The Laboratory of Genomic Diversity has assembled over 62,000 animal and 424,000 human tissue/DNA specimens, facilitating wide-ranging studies of disease gene associations, species adaptation and natural history by O'Brien's many colleagues. Dr. O'Brien is also known for documenting the remarkable genetic uniformity of African cheetahs, resolving the taxonomic riddle of the giant panda's evolutionary origins and for describing heretofore unrecognized species of orangutans, African forest elephants and Bornean clouded leopards. He is credited with the discovery of CCR5 delta 32, the first of 20 human AIDS restriction genes, as well as leading the Feline Genome Project, a major player in comparative genomics across the mammalian radiations.

Gary Borisy



Dr. Gary Borisy is Director and Chief Executive Officer of the Marine Biological Laboratory (MBL) in Woods Hole, Massachusetts. Before joining MBL, he was Associate Vice President for Research and the Leslie B. Arey Professor of Cell and Molecular Biology in the Feinberg School of Medicine at Northwestern University in Chicago. He received his B.S. in biochemistry and his Ph.D. in biophysics from the University of Chicago. After a postdoctoral fellowship in H. E. Huxley's Laboratory of Molecular Biology at the MRC in Cambridge, England, he joined the faculty of the University of Wisconsin, Madison where he spent 32 years and rose to become Chair of the Laboratory of Molecular Biology and Perlman-Bascom Professor of Life Sciences. He is a member of the Scientific Advisory Board for CombinatoRx and the Board of Scientific Counselors for the National Heart Lung and Blood Institute.

William Gelbart



William M. Gelbart obtained his Ph.D. in Genetics at the University of Wisconsin in 1971. He has been on the faculty of Harvard University since 1976 and is currently Professor of Molecular and Cellular Biology in the Faculty of Arts and Sciences. His research has focused on gene and genome structure, developmental genetics and bioinformatics and computational biology. He has also made major contributions to the worldwide distribution of scientific information through his role as Principal Investigator for the FlyBase genome database of the major experimental model, the fruit fly *Drosophila* and as co-Principal Investigator on the VectorBase database project for genomic information on insect vectors of disease such as the mosquitoes that carry malaria, yellow fever and dengue fever. Dr. Gelbart has a long history of advisory roles related to large-scale DNA sequencing, genome analysis and bioinformatics for the U.S. National Human Genome Research Institute. In recent years, he has been actively involved in the evaluation of large-scale genome projects for Genome Canada.

David Haussler



Dr. David Haussler is a Howard Hughes Medical Institute Investigator. He is also Professor of Biomolecular Engineering and Director of the Center for Biomolecular Science and Engineering at the University of California, Santa Cruz; scientific co-director of the California Institute for Quantitative Biomedical Research; and a consulting professor at Stanford University School of Medicine and UC San Francisco Biopharmaceutical Sciences Department. Dr. Haussler received his Ph.D. in computer science from University of Colorado at Boulder in 1982. He is member of National Academy of Sciences and member of the American Academy of Arts and Sciences. He was recently profiled by the journal **Proceedings of the National Academy of Sciences**, describing his lab's significant contributions to the Human Genome Project and his work on genome evolution.

Paul Thompson



Paul B. Thompson holds the W. K. Kellogg Chair in Agricultural, Food and Community Ethics at Michigan State University in East Lansing, Michigan. He completed his Ph.D. studies on the philosophy of technology at the State University of New York at Stony Brook and formerly held positions in philosophy at Texas A&M University and Purdue University. His research on ethical and philosophical questions associated with agriculture and food has led him to undertake a series of projects on the application of recombinant DNA techniques to agricultural crops and food animals. His first book-length philosophical treatment of agricultural biotechnology was published in 1997 and revised in 2007, and he has traveled the world speaking on the subject. Dr. Thompson has also published extensively on the environmental and social significance of agriculture and on the philosophical and cultural significance of farming.

Technology Development Advisory Group

John McPherson (Chair)



Dr. McPherson is the Director of Genome Technologies at the Ontario Institute for Cancer Research in Toronto. He received his PhD in Biochemistry from Queen's University in 1989. He then moved to the United States where he contributed to the Human Genome Sequencing Project, first at the National Human Genome Research Center at the University of California, Irvine, then moving to the Genome Sequencing Center at Washington University's School of Medicine. In addition to serving as Chair of iBOL's Technology Development Advisory Group, Dr. McPherson also serves as a member of the Scientific Advisory Board for the U.S. National Science Foundation's **Medicago** Hapmap Project.

Matthew Bainbridge



Matthew Bainbridge is a rising star in the high-throughput genomics field. He received his MSc in Computer Science from the University of Saskatchewan in 2004 where he used pattern discovery to analyze microarray data. From there he moved to the British Columbia Cancer Agency (BCCA) Genome Sciences Centre where he studied under Steve Jones. He is currently pursuing his PhD at the Human Genome Sequencing Center at the Baylor College of Medicine, where he studies under Richard Gibbs.

Barton Slatko



Dr. Slatko is a Senior Scientist in Parasitology and Head of DNA Sequencing at New England Biolabs, Inc., where he studies the evolution and biology of the *Wolbachia* endosymbiont. He has successfully sequenced and annotated the *Wolbachia* genome from **B. malayi** and is now investigating the biochemical basis for the mutually-dependent nature of the endosymbiont with its host. Dr. Slatko serves on the Steering Committee of the *Wolbachia* Consortium, on the Eaton Publishing Advisory Board, and on the ITSI Scientific Board. In addition, he has been the reviewing editor for *BioTechniques* since 1986.

Jay Shendure



Dr. Shendure received his PhD in Genetics from Harvard University in 2005, where he worked under George Church. From there he pursued his MD at Harvard Medical School, which he received in 2007. He is author to more than 35 peer-reviewed publications, and is co-owner of six patents (and patent applications) dealing with the manipulation of nucleic acids. Dr. Shendure has a keen interest in knowledge transfer, and sits on five commercial advisory boards. He is currently Assistant Professor of Genome Sciences at the University of Washington School of Medicine.

Baoli Zhu



Dr. Zhu received his PhD from the Beijing Agricultural University in 1992, where he created an expression vector for porcine growth hormone in *E. coli*. From there he moved on to the study of human genomics, where he successfully isolated the erythropoietin and insulin genes and was able to induce expression of both genes in various mammalian cell lines. He continued his pioneering work in cloning and manipulating expression systems, which eventually led him to a research position at BACPAC, at the Children's Hospital Oakland Research Institute, where he was a contributor to many projects including ENCODE, the Human Genome Project, the Zebrafish Genome Project, and the Chimpanzee Genome Project. In 2005 he moved back to China where he now serves as Professor in comparative genomics and metagenomics at the Institute of Microbiology, Chinese Academy of Sciences, where he studies the relationship between copy number changes in cancer.

Discussion

**Item #7.2
Update on Sample Sourcing**

Update on sample sourcing

As outlined in the Q1 Board Report, the Collections team at BIO, together with the iBOL campaign co-ordinators, aim to enter 300K specimens into the barcoding pipeline each year (64 plates /week). During the 7 week period of Quarter 1.5 (Sept. 1st – Oct. 21st), 407 plates (39K specimens) were entered into the LIMS. This represents a drop in the weekly average of newly submitted plates from 71 in the first quarter to 58 in Q1.5. This reduction was due to the departure of summer students and to a drop in plate submissions from external collaborators who have been occupied by summer field work.

Of the 407 plates submitted during Q1.5, 285 (70%) originated from external collaborators, while 122 (30%) were generated internally. The latter figure represents a slight increase in the proportion of plates generated at BIO (from 26% in Q1). Some week-to-week variability will be inevitable in submissions from external collaborators, so internal capacity is being increased to provide a buffer. A new Collections Technician was hired in October 2009 increasing from 2.5 to 3.5 full-time Collections staff. Two new post-doctoral fellows will join BIO in early November, reinforcing the staff available for campaign co-ordination. As well, two technicians were 'embedded' in major collections - one at the Canadian National Collection and a second at the Smithsonian Institution. Finally, in mid-October, there was major progress towards a formal MOU with the Canadian National Collection that will see the annual flow of specimens from this organization rise ten-fold, from 2.5K to 25K specimens per year.

Figure 1 shows the percentage of the plates processed during Q1.5 among each of the iBOL Working Groups. Figure 2 compares the percentages in Q1.5 with those from Q1. Two WGs (1.5-Pests and Parasitoids; 1.9-Terrestrial Life) that were highly sampled during Q1 saw slightly reduced activity in Q1.5, while four other WGs saw an increase in production (1.4-Human Pathogens and Vectors; 1.6-Pollinators; 1.7-Freshwater Bio-surveillance; and 1.10-Polar Life).

Based upon the BIN report from Q1, most WGs are on track to meet their Q2 targets, the sole exception being Marine Biosurveillance. This WG is being given increased attention (including R&D on primer design) to raise success in barcode recovery for specimens in hand. Additionally, opportunities for BIO staff and students to join collection expeditions and to visit museums with recent collections of marine life are being explored.

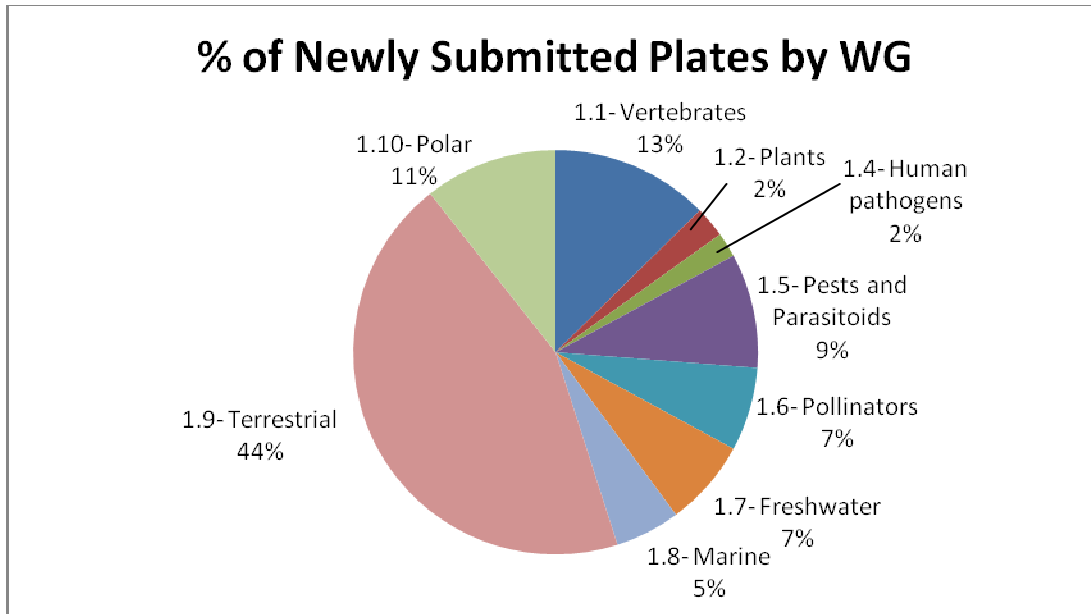


Figure 1. Distribution of newly submitted plates in Q1.5 (Sept. 1st – Oct. 21st 2009) among iBOL Working Groups.

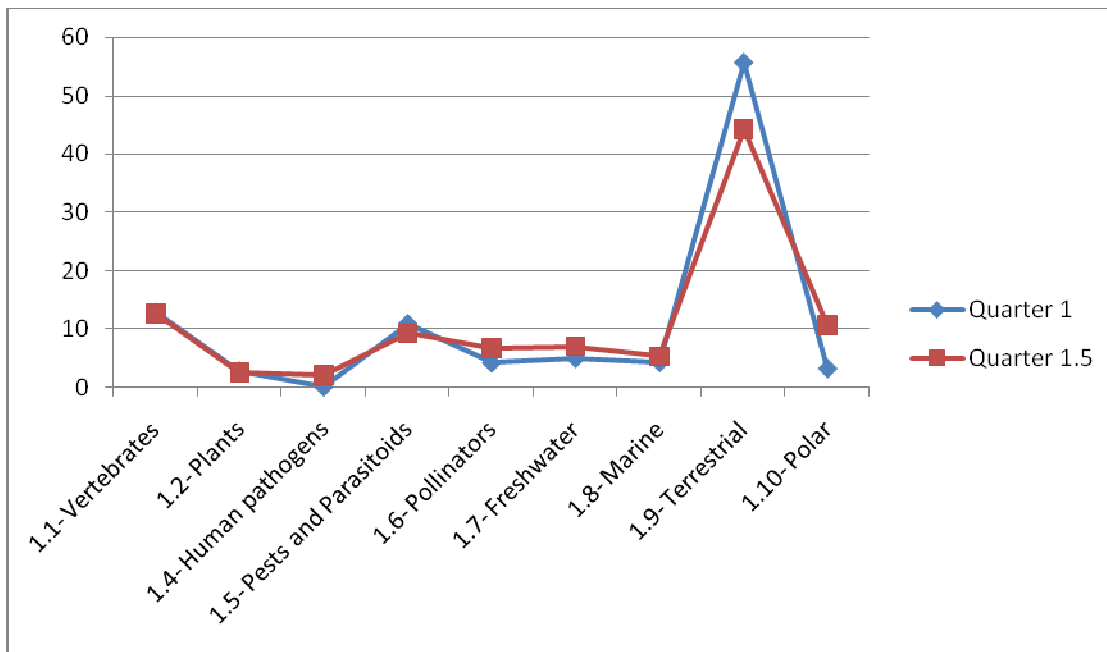


Figure 2. Comparison of the distribution of plates (in %) among iBOL Working Groups in Q1 vs. Q1.5.

iBOL INFORMATICS (WG 3.1 & WG 3.2)

EXECUTIVE SUMMARY:

The Barcode of Life Data System (BOLD) has been in operation for 3 years during which it has accumulated 3K registered users and over 500K barcode records. The system handles 50K transactional requests (new records and updates) and 3M hits per month as of November 2008. It requires regular maintenance of its hardware and software as well as support of its users. The BOLD staff has effectively profiled most user workflows and processes utilized in the barcode community. Development of IT infrastructure to support iBOL is based on projected use cases derived from of user tracking load observations in 2008.

The BOLD architecture is based on multiple application and hardware stacks, each designed to handle specific processes. The system has a web interface, run on Apache web servers, that employ distributed session management. Structured data is stored in two high performance database servers utilizing high performance fiber channel drives in a Storage Array Network (SAN). Chromatograms, specimen photographs, and soon, videos, are stored on media storage drives in a large Network Attach Storage (NAS). Most analysis of barcode data requires the generation of large matrices that place a considerable load on any machines performing the calculations. A substantial compute farm has been assembled to facilitate analytical requests and a custom grid architecture has been developed to distribute analytical work across a series of worker nodes. This design allows for easy expansion of analytical capacity by increasing the number of worker nodes with minimal configuration. Web servers pass jobs to a head node that handles load-balancing and job queuing. A high performance interconnect has been integrated to handle the communications between web servers, database servers, and grid nodes. A by-product of the grid architecture is the utilization of institutional and community contributed CPU time for overflow processing.

To successfully support the iBOL enterprise the BOLD group (WG 3.1 & 3.2) will have to efficiently handle submission of data, provide technical and help-desk support services, and maintain the systems used by the broader iBOL group. The hardware and staffing requirements for these objectives are considerable in light of the 5M barcodes to be captured.

BOLD HARDWARE :

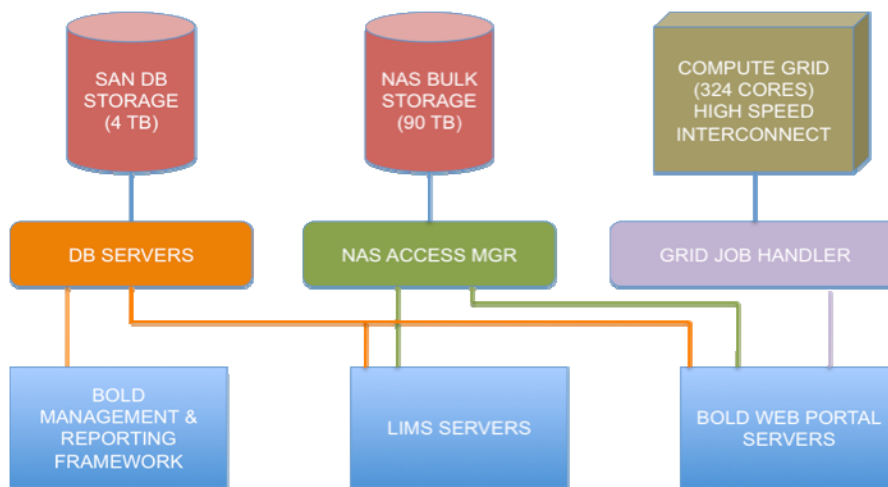
The analysis and validation of records on BOLD utilizes a considerable amount of processing power. The 2008 platform, consisting of 64 standard processors, averaged 30% utilization and peaked frequently. The recently purchased hardware stack, based on benchmarks, is expected to push this load down to 6% due to recent advances in processor performance, 5X increase of processor count, and upgrades to interconnects. Under optimistic conditions the recently purchased platform should be able to handle the average load through to year 5. This hardware stack is designed to handle hundreds of users concurrently accessing data and utilizing analytical capabilities. It has 90TB of fault-tolerant storage for media, 4 TB of high performance redundant storage for database transactions, 312 dedicated processors for analytics, and a Fiber Channel backbone for data access. This level of scalability this solution provides will not likely be

fully utilized until the third year of the iBOL project at the earliest. The recent equipment purchase added to the original equipment, valued at \$2M retail, is listed below:

- **Database server:** 2 x Dedicated server with 8 cores, 16G of ram, and 400G of storage
- **Web server:** 4 x Dedicated server with 4 cores each, 8G of ram and 320G of storage
- **Grid head node:** 2 x Dedicated server with 4 high performance cores, 16G of ram, and 320Gb of storage
- **Grid worker node:** 32 x Shared/Dedicated server with 8 high performance cores, 8G of ram, and 320 Gb of storage
- **Grid worker node:** 14 x Shared/Dedicated server with 4 high performance cores, 6G of ram, and 320 Gb of storage
- **Media Storage Array:** High speed NAS implementing HPC parallel file system with 90TB usable space in RAID 6 configuration
- **Database Storage Array:** High speed SAN with 4TB usable space in RAID 10 configuration on Fiber Channel drives
- **High Speed Backbone:** 10Gb Ethernet interconnect and 4Gb/s Fiber Channel for Storage

Utilized hardware is wrapped with access managers like database servers for storage and job handlers for the compute grid (Figure 1). This approach allows for a great deal of flexibility in managing hardware and simplifies the rollout of new application servers.

Figure 1:



HARDWARE OUTSOURCING OPTION:

The outsourcing of computing and storage hardware for the iBOL project has been considered and rejected due to the lack of benefits found in conventional enterprise outsourcing projects. Amazon's S3 Storage, Elastic Cloud, SimpleDB services, and CloudFront were considered as an alternative option to purchasing hardware. The combination of these services is required to cover the features afforded by in-house hardware. The complexities of refactoring large components of the systems already in use for the Amazon platforms were a major detractor to this option. Beyond this, the lack of high performance interconnects like 10 Gb Ethernet or 4 Gb Fiber Channel between

these separate services would surely limit the ability to utilize multiple servers to tackle a large analysis. More recent developments with the BOLD custom grid allow the leverage of the high performance interconnects to improve load distribution and performance of the overall solution. Most successful hardware outsourcing projects are based on small applications or short transactions. The long transactions found in BOLD are not a good fit for the services available at this date. Also, the Canadian Foundation for Innovation (CFI) provides the funding for BOLD hardware. CFI funds are generally intended for infrastructure development. Substantial roadblocks would need to be overcome to fit hardware services into CFI channels.

PERSONNEL REQUIREMENTS:

Allocating a dedicated group of data managers, who handle submissions and answer user queries, is critical to the success of BOLD. These individuals will also be generating SOPs and documentation for software tools used by the iBOL community. The size of this group will have to scale with the volume of submissions and size of user base. Current trends indicate a need for 1 full time data manager for every 1,000 registered users injecting 20,000 submission/update transactions per month. The current load requires the employment of 4 full time data managers and will have to be doubled in the first year of iBOL. A total of \$2.3M is required to provide submission and help-desk support to the iBOL community (Table 1). The iBOL plans call for a gradual increase in production allowing for a progressive expansion of the BOLD data managers.

Table 1: Estimated monthly transactions on BOLD for the first 5 years of iBOL

	2010	2011	2012	2013	2014
Submissions	41K	62K	83K	83K	104K
Updates	123K	186K	249K	249K	312K
Total Transactions	164K	248K	332K	332K	416K
Data Managers	8.4	12.4	16.6	16.6	20.8
Data Mangers Salary	336K	496K	664K	664K	832K
Database Curators	1.6	2.5	3.3	3.3	4.1
Database Curators Salary	64K	100K	132K	132K	164K

The analysis of barcode data is, as noted in the proposal, a multi-layered process. The fundamental activity in data analysis lies in ensuring that all records entering BOLD encounter vigilant QA/QC to ensure their validity. Without strong and dedicated efforts to quality assurance, BOLD's value as a tool for species identification will be greatly compromised. The centralized curation of records in BOLD is a major task when considering the rate at which data is accumulated. A single database curator has the capacity to parse and correct 100K records per month. Curators must keep up with updates as well as new submissions to ensure that errors do not creep back into entries. A total of 4 curators will be needed by year 5 and will be gradually increased in number as necessary.

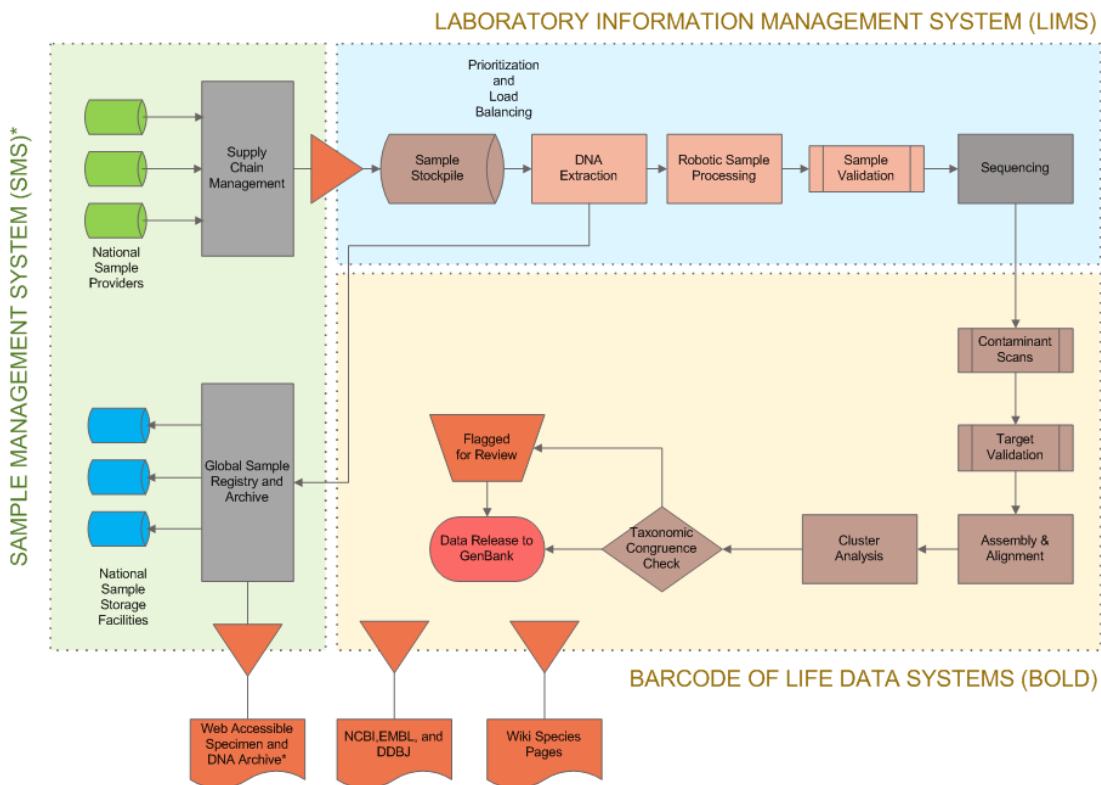
BOLD is a fairly complex system and having a well-trained support staff for hardware and software is important in maintaining high up-time and proper synchronization with future BOLD mirrors. A growing group of programmers and technicians will be necessary to develop new tools and support them. Actively used systems like BOLD and the LIMS require constant attention to ensure optimal performance and quick bug fixes. These two tools alone consume 10% of programming capacity at BOLD. A programming staff of 4-6 will be required during the first 3 years of iBOL to ensure the timely rollout of new tools for supporting barcode generation and monitoring of working group productivity.

With the recent acquisition of high-end enterprise hardware, a new System Administrator role is necessary. The hardware administration role was originally distributed amongst the programming staff and can't be scaled to the new level. The incumbent will require skills in network management, Linux/Unix management, and high performance computing. Professional certification from RedHat, Cisco, and IBM will prove beneficial.

SOFTWARE STACK:

The informatics workflow for most barcode projects to date has consisted of four critical steps: sample and related data gathering, laboratory processing, analysis and validation of data, and data release. Over the past 4 years, the informatics group at the Biodiversity Institute of Ontario has constructed two systems, Barcode of Life Data System (BOLD) and Laboratory Information Management System (LIMS), to support most of the workflow with the final component, Sample Management System (SMS), in development (Figure 2). These systems are based on modular application design to avoid data silos and performance bottlenecks. All but legacy components follow recent application design patterns and implement Service Oriented Architectures (SOA). Since performance and reliability of data storage is critical to the success of this project, all systems utilize IBM's DB2 and the Postgresql open source databases for structured information. IBM's DB2 has been provided as in-kind contribution license-free for use at BOLD core and related sites.

Figure 2:



MIRROR IMPLEMENTATION:

All BOLD software is based on Service Oriented Architectures (SOA), a model of building software that uses services between application stacks. This provides benefit in developing new components but is often an impediment when replicating systems to remote sites because of multiple service dependencies. Due to the transactional nature of BOLD, where users can upload and edit data they manage/own, developing a peer-to-peer mirror poses some challenges in synchronization. A staged approach of hardware install, personnel training, LIMS install, and BOLD install is planned to avoid possible roadblocks. A rough estimate of 8 months is required to properly install and fully load test a mirror node. As with any versioned software package a single code repository is preferred to prevent fracturing of the codebase. The BOLD central node will provide a Subversion repository and versioning system for codebase and distribute stable releases to mirror sites on a quarterly basis. Developers stationed at mirror sites and the community at large would contribute new modules and code revisions directly to the central codebase. A similar governance model to SourceForge (www.sourceforge.net), an online repository for most open-source projects, will be utilized in reviewing and adding or discarding new code into a release.

Phase one of the mirror rollout will be implemented during 2010, a master-slave mirror will be install at the Centraalbureau voor Schimmelcultures (CBS) in the Netherlands and the Chinese Academy of Science (CAS) in China. The second phase, peer to peer mirroring, will be implemented in 2013 due to the amount of software development necessary to support this capability.

Annual meetings are planned to maintain a cohesive knowledge base across the informatics groups at the three central nodes and to prevent fragmentation of agendas. A team of 5 programmers and data managers from each node will meet at rotating sites annually.

MIRROR HARDWARE:

The level of scalability found at the BOLD core node will not be necessary at the start of a mirror installation. A minimal hardware footprint should suffice and can scale with further upgrades or by offloading some analytical features to the core node's compute grid. BOLD mirror hardware can be broken down into six categories with associated minimal requirements:

- **Database server:** 1 x Dedicated server with 8 cores, 16G of ram, and 4Tb high performance storage
- **Web server:** 2 x Dedicated server with 4 cores each, 8G of ram and 320 Gb of storage
- **Grid head node:** 1 x Dedicated server with 4 high performance cores, 16 G of ram, and 320Gb of storage
- **Grid worker node:** 4 x Shared/Dedicated server with 4 high performance cores, 8 G of ram, and 320 Gb of storage
- **Storage Array:** High speed SAN or NAS with 40 TB usable space in RAID 6 configuration
- **High Speed Backbone:** 10Gb Ethernet interconnect

Minimal installation will likely cost anywhere from \$400K to \$600K CAN depending on vendor and time of purchase. It is expected that mirror nodes will require hardware replenishment before year 3.

MIRROR PERSONNEL:

Like the core BOLD node, mirror staff will be required to maintain the system and support users in their region. It is especially important at mirror nodes to have well-trained support staff for hardware and software. Maintaining proper synchronization with the core node is not only critical to the success of mirror but also to the integrity of data. A minimal staff complement should include 2 data managers with some bioinformatics experience, 1 part time IT support staff, and 1 part time software engineer with experience in distributed systems.

Co-funding plan

Eligibility code 1

Sum of Discounted Amount (in \$M)		Status (Short)						
Node	Country	Organisation Name	1 - Held	2 - Under f	3 - Under A	Grand Total		
1 - Central	Belgium	Belgian Science Policy Office	2			2		
	Belgium Total		2			2		
	Canada	Agriculture and Agri-Foods Canada			0.25	0.25		
		Alfred P Sloan Foundation	0.25			0.25		
		Alfred P. Sloan Foundation	0.22			0.22		
		Canada Research Chair Program	1.4			1.4		
		Canadian Food Inspection Agency			0.25	0.25		
		Canadian Foundation for Innovation		2.3		2.3		
		Department of Fisheries and Oceans			0.25	0.25		
		Environment Canada			0.25	0.25		
		Genome BC	0.5			0.5		
		Health Canada			0.5	0.5		
		Natural Resources Canada			0.25	0.25		
		New Brunswick Government		1.35		1.35	1.35	Martin
		Ontario Ministry of Research and Innovation	5			5	5	Martin
		Parks Canada	0.2			0.2		
		Tulsa Foundation	0.25			0.25		
		University of Guelph	1.3	1.3		2.6	2.6	Martin
	Canada Total			9.12	4.95	1.75	15.82	SM\$ from NSERC ? And CFI?
	China	Chinese Academy of Sciences	0.74			0.74		
		China	7		3	10	10	NB+PH
		Natural Science Foundation of China		1.86		1.86	1.86	NB+PH
		TBF			12.4	12.4	12.4	NB+PH
	China Total			7.74	1.86	15.4	25	
	Denmark	European Commission	0.5			0.5		
	Denmark Total			0.5			0.5	
	European Union	European Union	0.564			0.564		
	European Union Total			0.564			0.564	
	France	Agence Nationale pour la Recherche	0.54			0.54		
		Alfred P Sloan Foundation	0.25			0.25		
		Centre national de la recherche scientifique	5.8			5.8	5.8	NB+PH
		Consortium National de Recherche en Génomique	2.9			2.9	2.9	NB+PH
		Genoscope Evry	0.75			0.75	0.75	NB+PH
	France Total			10.24			10.24	also add Musée de Paris
	Germany	Alfred P. Sloan Foundation	0.25			0.25	0.25	NB+PH
		Bavarian State Government	0.657			0.657		
		European Science Foundation (ESF)			0.5	0.5		
		German and Turkish Science Foundation	0.0067			0.0067		

1 - Central	Germany	German Federal Ministry for Research and Technology			0.5	0.5			
		Hessen State			0.282	0.282	0.282	NB+PH	30M\$ Museum zenkinberg
	Germany Total				1.1957	1	2.1957		
	Netherlands	Alfred P. Sloan Foundation			0.22	0.22			
		Centraalbureau voor Schimmelcultures (CBS)			0.801	0.801	0.801	NB+PH	
		European Union FP7			4.8	4.8	4.8	NB+PH	Pedro
		Fons Economische Structuurversterking, Ministry of Economic Affairs			4.3	4.3	4.3	NB+PH	
		Senter Novem Ministry of Economic Affairs			2.2	2.2			
		ZMA Internal funds			0.12	0.12			
	Netherlands Total				12.441		12.441		
	Portugal	Electricidade de Portugal (EDP)			0.885	0.885			
		European Commission FP7 – Marie Curie European Reintegration Grant - FP7-PEOPLE-2007-2-2-ERG			0.068	0.068			
		Fundação para a Ciência e Tecnologia (FCT)			0.831	0.086	0.917		
	Portugal Total				0.899	0.971	1.87		
	United Kingdom	Natural Environment Research Council of the UK			0.228	0.228			
		Science Foundation Ireland			0.27	0.21	0.48		
		Synthesys			0.133	0.133			
	United Kingdom				0.403	0.438	0.841		
	United States	Alfred P Sloan Foundation			0.314	0.314	0.314	NB+PH	
		Alfred P. Sloan Foundation			7.7	7.7	7.7	NB+PH	
		Arkansas Game & Fish Commission			0.019	0.019			
		Brigham Young University				0.126	0.126		
		Florida Fish & Wildlife Commission			0.01	0.01			
		Global Biodiversity Information Facility				0.031	0.031		
		Gordon & Betty Moore Foundation			7.3	7.3	7.3	NB+PH	
		National Geographic Society				0.025	0.025		
		National Marine Fisheries Service			0.207	0.207			
		National Park Service				0.063	0.063		
		National Science Foundation			0.025	0.25	0.275		
		National Science Foundation (NSF)			0.088	0.75	0.913		
		Panthera Foundation			0.503	0.503			
	Richard Lounsbery Foundation			0.251	0.251				
	Robert Goelet Bee Database Fund			0.181	0.181				
	Smithsonian Institution			5	5	5	NB+PH		
	State of Utah				1.26	1.26			
	United States Department of Agriculture			0.063	0.063				
United States Total				16.661	5.75	1.83	24.241		
1 - Central Total				61.7637	13.969	19.98	95.7127		
2 - Regional	Australia	Alfred P Sloan Foundation			0.2	0.2			
		Australian Research Council			1.4	1.4			
		NSW Department of Primary Industry			1.2	1.2	1.2	NB+PH	
		TBF			2.14	2.14			
		Total Foundation			0.06	0.06			
Australia Total				1.46	1.4	2.14	5		
	Brazil	CNPq			0.2	0.2			

2 - Regional	Brazil	Kinross	0.057		0.057			
		TBF			4.74	4.74	4.74	NB+PH February
	Brazil Total		0.057	0.2	4.74	4.997		
	India	Government of India	1		4	5	5	NB+PH January
	India Total		1		4	5		
	Korea	KRIBB	1		4	5		
	Korea Total		1		4	5		
	Mexico	ECOSUR, CIBNOR, IBUNAM, CONACYT and CONABIO	2.5	2.5		5	5	NB+PH
	Mexico Total		2.5	2.5		5		
	New Zealand	Foundation for Science research and Technology	0.3			0.3		
		Foundation for Science Research and Technology (FRST)	0.2			0.2		
		Zealand	0.05			0.05		
		Ministry of Fisheries	0.2			0.2		
		Royal Society of New Zealand	0.18			0.18		
		TEC	0.075			0.075		
		Tertiary Education Commission		0.09		0.09		
	New Zealand Total		1.005	0.09		1.095		
	Norway	NTNU & NHMUO	1		4	5		
	Norway Total		1		4	5		
	South Africa	NRF & SANBI	1		4	5	5	NB+PH
	South Africa Total		1		4	5		
2 - Regional Total			9.022	4.19	22.88	36.092		
3 - National	Argentina	Instituto Nacional De Investigacion de las Ciencias Naturales	1			1		
		Richard Lounsbery Foundation	0.1075			0.1075		
	Argentina Total		1.1075			1.1075		
	Colombia	Universidad de los Andes	0.2		0.8	1		
	Colombia Total		0.2		0.8	1		
	Costa Rica	ACG & INBio	1.5			1.5		
	Costa Rica Total		1.5			1.5		
	Kenya	ICIPE	0.2		0.8	1		
	Kenya Total		0.2		0.8	1		
	Madagascar	Madagascar Biodiversity Center	0.2		0.8	1		
	Madagascar Total		0.2		0.8	1		
	Panama	STRI	0.2		0.8	1		
	Panama Total		0.2		0.8	1		
	Papua New Guinea	CTFS, NGBRC & SI	1			1		
	Papua New Guinea Total		1			1		
3 - National Total			4.4075		3.2	7.6075		
Grand Total			75.1932	18.159	46.06	139.4122	85.397	10 Countries 20 Partners
							94.347	11 Countries 23 Partners including Canada

IBOL Technology Development Advisory Group – December 15, 2009

TDAG Members:

John McPherson (TDAG Chair), Director, Cancer Genomics, Ontario Institute of Cancer Research, Toronto.

Matthew Bainbridge, Baylor College of Medicine.

Jay Shendure, Assistant Professor of Genome Sciences, University of Washington.

Barton Slatko, Director, Applications & Product Development, New England Biolabs.

Baoli Zhu, Head of Genomics, Institute of Microbiology, Chinese Academy of Sciences.

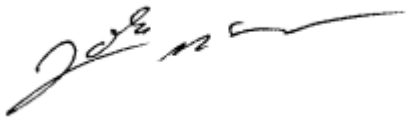
The TDAG Members met with the IBOL Management and Staff December 15, 2009. Members of the University of Guelph IBOL Project presented an overview of the program, progress made to date and future directions and goals. The TDAG appreciated these presentations as it helped put the project in perspective. The TDAG was impressed on all fronts with the IBOL Program and the team members. A tour of the facility was conducted. During the presentations and tour, the TDAG was able to ask questions which were readily answered by the knowledgeable staff. It was clear from the morning program that the IBOL was well run and efficient and that all staff members were engaged and excited to be part of the project. Dr. Mehrdad's able leadership was evident throughout.

The afternoon program was a closed-door session with just the TDAG and a few key members of the IBOL Team. This first meeting was largely a fact gathering exercise for the TDAG. The impact of new sequencing technologies and scale-up of sequencing activities was discussed. Several recommendations were made by the TDAG as outlined below:

1. Approximately 25% of fte time in sequencing is spent manually editing approximately 50bp of frequently low quality sequence. This sequence occurs in a predictable manner and is likely due to the protocols used. Fully automated assembly of the sequences should be a goal set for the future. Clean up of the PCR products prior to sequencing has been minimized to reduce the cost per sample but may in fact be the source of the poor quality region. Cost savings must be looked at in a larger context that includes the potential for saving manual editing time. This is a readily testable hypothesis as a simple clean up could be introduced for a reasonable sample set and the amount of manual editing needed quantified for this cost/benefit analysis.
2. The plans for scale-up are ambitious and the experience of the TDAG in such matters leads to a caution that quality and efficiency metrics must be rigorously monitored and the scale of production increase kept in pace with maintaining the quality.

3. Considerable effort is spent in “cherry-picking” PCR templates for sequencing. A current threshold for this activity is 75%. The fte costs for the rearray must be weighed against the relatively low cost of sequencing a failed template.
4. Discussions concerning whole mitochondrial sequencing were raised but this was seen as a potential mission drift at this time.
5. Considerable discussion was given to incorporating other next-generation sequencing platforms into the program. Read lengths are much shorter than the current 454 platform although using overlapping paired-end reads on the Illumina platform may be feasible. This could readily be piloted through a collaborative endeavor; however, the IBOL sequencing is likely best suited to the platform in hand. Other platforms have enormous throughput that will readily outstrip the IBOL needs. Informatics needs to support alternative platforms need to be considered too as the current informatics pipeline in place would need a great deal of retooling. It is likely prudent to forge ahead with sequencing technology in hand. Perhaps the version of sequencers that will emerge this year and beyond may be more suitable for IBOL. These technologies can be assessed and discussed at future TDAG meetings.
6. It became clear that the funding transfer for the IBOL program was milestone driven with a dependence on GenBank submission. Milestones are important for monitoring projects of this nature but the TDAG encourages some leniency in absolutely connecting GenBank entry as the measure of throughput success. Problems at GenBank are beyond the control of the IBOL Team and could be a source of perceived delay. At the very least the delivery of sequence should be a milestone trigger with independence from final GenBank acceptance.

Overall the TDAG was very impressed with the Guelph University IBOL Team and the progress it has made. There is an air of confidence that milestones and scale-up can be met as planned. The TDAG looks forward to future meetings and further recommendations for increasing capacity as the project moves forward.



John D. McPherson, Ph.D. (On behalf of the IBOL TDAG members)

international
BARCODE
OF LIFE



Communications Strategy

John Chenery

Director of Media & Communications
International Barcode of Life Project
JChenery@uoguelph.ca

1. Introduction

With the imminent end of the preparatory phase of the International Barcode of Life project and the approach of the official launch on July 1, 2010, a detailed re-assessment of the organization's communications objectives and priorities is timely and essential.

Appropriately, the communications focus to date has been on building the network of countries, research institutes and scientists who will constitute the iBOL Consortium and on expanding the funding base that will support the consortium's operations. In other words, the iBOL message has, for the most part, been circulating on a need-to-know basis to an in-the-know audience.

Clearly, facilitating strong lines of communication with and among members of that audience must be a continuing priority once iBOL has been activated. Efforts to promote a sense of community and inclusion will be rewarded with engagement, valuable feedback and a strong commitment to project goals among members of the iBOL "family".

But beyond that, 2010 is a year of much broader communications opportunities for iBOL. The messages are compelling. First, it is about the launch of the biggest ever biodiversity genomics project during the International Year of Biodiversity. On top of that, it is about the advent of an exciting new technology and its promise to: compile a digital reference library for all life on Earth; transform biodiversity science and its impact on human health and well-being; and create a new generation of "citizen taxonomists" monitoring and protecting the planet's endangered plant and animal species and preserving the priceless "ecosystem services" they provide to humanity.

The overarching institutional goal of all communications initiatives is to leverage iBOL's pedigree (founder of DNA barcoding), scientific capacity (world's first and most productive DNA barcode "factory") and international reach (hundreds of collaborating scientists in 25 countries so far) to establish and consolidate its status as the preeminent organization in DNA barcoding globally.

2. Communications Review

Although it was not possible to conduct a complete and detailed audit of iBOL's communications activities to date, certain broad conclusions can be drawn. In general, outreach efforts have been effective, if somewhat intermittent and uncoordinated, reflecting the nascent nature of the iBOL corporation as well as the absence of a detailed strategy and a communications professional to implement it.

Notwithstanding what has been achieved to date, there has been insufficient progress towards clearly defining iBOL's central role in the somewhat confusing mosaic of barcoding initiatives and organizations worldwide.

1. Online Communications

The iBOL website – www.ibolproject.org – provides a comprehensive overview of the project structure and objectives but its static content and institutional appearance make it an ineffective portal into the dynamic and fast-changing

world of DNA barcoding. There has been little or no progress in capitalizing on Web 2.0 opportunities such as YouTube, Facebook, blogs etc.

2. Media Relations

DNA barcoding is a hot topic both in the scientific and mass media and this is reflected in substantial and positive coverage of the work of Dr. Hebert and the Biodiversity Institute of Ontario in journals such as *Canadian Geographic*, *The Economist* and *New Scientist*. There has been little or no coverage of the International Barcode of Life project but this is to be expected. The ongoing media focus on DNA barcoding suggests that there will be many opportunities for events, announcements and scientific developments that will generate print and electronic coverage of iBOL as we ramp up to July launch.

3. Communications with the iBOL network

Contact with international partner institutions and individuals occurs on a regular but ad hoc basis. As iBOL approaches formal activation in July 2010, formal and consistent lines of communication will be needed with and among these entities. Much of this activity will be generated by the new iBOL web site but new listservs will be needed for the Scientific Steering Committee, the Science Advisory Board and Working Groups.

4. Internal Communications

Current protocols for disseminating information among iBOL management and staff are under review. An early, incomplete assessment indicates that progress is being made towards instituting a more timely and effective system for sharing project information and updates among those involved, documents for review and event/calendar information. Uptake of the Sharepoint platform among all iBOL/BIO staff personnel needs to be expedited.

5. Printed Material

A wide range of printed materials has been produced and distributed, covering the spectrum from comprehensive project descriptions aimed at funding agencies and potential collaborators to the "Imagine" brochure for the general public. Many of these products need to be updated, revamped, replaced or, in the case of the iBOL newsletter, reactivated. A new logo has been commissioned and this will be featured on a range of new identity materials such as letterhead, brochure, pocket folders and business cards.

6. Multimedia

iBOL has amassed impressive quantities of high quality photography and video and a diverse array of excellent PowerPoint presentations but these materials need to be annotated, possibly edited and certainly indexed before their communications value can be fully realized.

7. Signage and Display

As with printed materials, the signage and display resources need to be updated and, in some instances, replaced.

8. Integration with CBOL

As iBOL's designated outreach partner, the Consortium for the Barcode of Life (CBOL) has played an important role in building support for DNA barcoding, organizing international conferences and facilitating iBOL's communications with other barcoding projects and with the broader biosciences community. It is vital

that iBOL continues to benefit from CBOL's involvement in these and other important policy-level communications initiatives. Further consultations are needed with the objective of harmonizing the communications activities of the two organizations to promote maximum efficiency and avoid duplication of effort.

3. Organizational Missions and Goals

This Communications Strategy has been designed to serve the overall missions, goals and values of the International Barcode of Life project:

1. To assemble a DNA barcode reference library of all eukaryotic life, beginning with sequence data for five million specimens representing 500,000 species by January 2015, and to develop the technology necessary to identify organisms quickly and inexpensively.
2. To establish and nurture the growth of an international research consortium of biodiversity scientists, geneticists, technologists and ethicists dedicated to the completion of the DNA barcode library, the development of new barcode technologies and the use of DNA barcoding in conservation, environmental monitoring, food safety, disease prevention and other economically and socially beneficial applications.
3. To establish the iBOL Consortium as the foremost international practitioner in the DNA barcoding of animals, plants, fungi and protists as well as in the research and development of sequencing and informatics tools and technologies that will make DNA barcoding a major component of the global biosciences infrastructure.

4. Communications Objectives

1. Enhance the visibility and reputation of iBOL by building awareness of the project among a wide but defined group of audiences and user groups.
2. Generate more positive media coverage of iBOL and DNA barcoding.
3. Encourage participation among researchers and potential partner institutes and organizations.
4. Secure the commitment of various stakeholder groups to the project's goals.
5. Generate public support and a positive public attitude to DNA barcoding in general and iBOL in particular.
6. Enhance fund raising opportunities by building awareness of iBOL and the societal implications of DNA barcoding among government funding agencies and private foundations.
7. Influence policymakers around the issue of DNA barcoding research and development.
8. Develop a detailed crisis management (damage control) plan for iBOL.

5. Key Messages

1. iBOL is the focal point of DNA barcoding globally, an international network of dozens of countries and hundreds of scientists that is driving progress towards a DNA barcode reference library for all life and new technologies to use it.
2. DNA barcoding is a vital tool in the campaign against mass extinction of plant and animal species due to human population growth, agricultural and industrial expansion, pollution and climate change.

3. iBOL, the largest biodiversity genomics initiative ever undertaken, is in the process of transforming biodiversity science and expanding its potential to have beneficial impacts on human health and well-being.

6. Target Audiences

iBOL has two primary target audiences.

1. The expert community

- Individuals and organizations involved in DNA barcoding worldwide, including but not limited to iBOL Consortium members, collaborators and advisors;
- Other biodiversity informatics initiatives such as the Encyclopedia of Life, the Global Biodiversity Information Facility and the Census of Marine Life;
- National research institutes and private sector research and development initiatives;
- National and state/provincial Ministries of Science, Environment and Innovation and National Parks departments;
- Curators of natural history museums and other collections;
- Public and private sector funding agencies specializing in genomics, biodiversity informatics and conservation; and
- Venture capital companies also focusing on these areas.
- Science media, including websites, blogs and science newsfeeds.

2. The lay community

- National and international media
- Policy-makers
- Educators and science students (primary, secondary and tertiary)
- Civil society organizations, e.g. environmental NGOs
- The general public

7. Product Mix

1. Online: web site and other Internet-based communications

Developing and refining iBOL's web presence is a top priority. A complete web site redesign is under way with a target launch date (beta version) of November 30. Blogs, Facebook, Twitter and YouTube and RSS feeds will be features of the new web site. At this early stage, it is not clear exactly how these and the various Web 2.0 applications will be deployed to advance iBOL's communications objectives. However, it is abundantly clear that they must be components of our Internet tool kit, recognizing that the mix will change and grow as new applications appear and older ones fall from favour.

The url www.ibolproject.org will appear on all printed and promotional materials and a traffic-maximization strategy will be instituted when the site has reached an appropriate level of readiness. Listservs will be expanded for communications with and among members of the iBOL consortium including members of working groups, advisory boards and committees.

There is an opportunity for iBOL to work with the Consortium for the Barcode of Life (CBOL) in the creation of a "Collaboration Network" social network of moderated

public and private discussion forums, blogs etc. for the global DNA barcoding community. This will be explored in consultation with CBOL and other members of the Collaboration Network as CBOL's web project moves forward.

2. Media Relations: press releases, backgrounders, media events, press conferences, op-eds

Capitalizing on opportunities to generate news and feature stories in print, TV/radio and online media will be another priority for 2010. Positive and regular coverage in the media is the most cost-effective way of getting key messages to a wide range of target audiences. Crucially, it also strengthens the connection between the iBOL "brand" and DNA barcoding and reinforces the message that iBOL is the preeminent organization in DNA barcoding worldwide.

The coming year – the International Year of Biodiversity – will present many such opportunities, including the official launch of iBOL in July, possible ground-breaking ceremony for the new building in September, production milestones (1M samples/100K species) and stories based on new and interesting barcoding applications. All such opportunities will be pursued aggressively through pitches to national and international newspapers, wire services, TV and radio networks, specialist and general interest magazines and relevant Internet news sites.

The potential use of the BioBus as a traveling media asset – setting up events, photo-ops and interviews with local press, TV and radio in the communities visited by the BioBus team – will also be investigated.

3. Print materials, signage and merchandise

All existing print materials are under review and will be either updated or discontinued. A new brochure for general (non-expert) audiences is being prepared with a target availability date of November 10. A redesigned logo and word-mark have also been commissioned and these will be featured on all identity materials including pocket folders, stationery, business cards etc. as well as on new iBOL-branded signage and promotional merchandise for use at conferences, trade fairs and other public events.

A quarterly newsletter highlighting developments throughout the iBOL global network will be launched in February, with content aimed at the expert audience – consortium members, advisors and collaborators, other barcoding and biodiversity informatics initiatives and research institutes. Personnel from the University of Guelph's Students Promoting Awareness of Research Knowledge (SPARK) program will be involved in designing, researching, writing and editing the newsletter.

4. Multimedia

A start will be made on cataloguing the many hundreds of PowerPoint slides, thousands of photos and hours of video currently stored on various iBOL hard drives. SPARK personnel will be commissioned to edit video into usable b-roll and YouTube clips.

Table 1. Matrix of communications tools and target audiences

Comm. Tool \ Target Audience	Website	Blogs, etc..	Listsevs	Disc. Forums	Facebook etc	Press Release	Press Conf.	Media Event	Newsletters	Video b-roll	Photos	Brochures	Speeches	Op-eds	Signage
Expert Community															
Barcode community	✓	✓	✓	✓					✓				✓		✓
Informatics projects	✓			✓					✓						✓
Research Institutes	✓	✓	✓	✓					✓				✓		✓
Govt. depts. & ministries	✓							✓	✓			✓		✓	
Museums & collections	✓	✓							✓			✓			✓
Funding agencies	✓											✓			
Venture capital firms	✓							✓				✓			
Science media	✓	✓			✓	✓	✓	✓	✓	✓	✓				✓
Lay Community															
National, global media	✓	✓			✓	✓	✓	✓		✓	✓		✓	✓	
Policy-makers	✓							✓	✓			✓	✓	✓	
Educational sector	✓	✓			✓			✓				✓		✓	
CSOs and NGOs	✓				✓			✓	✓			✓		✓	
General Public	✓				✓	✓	✓	✓						✓	✓

9. The iBOL brand

At this early stage, the iBOL brand is amorphous and virtually invisible outside select regions of the world of biodiversity genomics. From now on, all that will begin to change. As we move forward with a strategy that requires all our communications to be consistent or “on-brand” – from big things like sticking to key messages to smaller considerations such as using the same fonts and colours in printed products – the iBOL brand will quickly come to represent who and what we are – the originators of DNA barcoding, the first and still most productive DNA barcoding “factory”, the largest biodiversity genomics project ever undertaken and the global network that is bringing the world together in the cause of barcoding research and development.

The iBOL brand will be represented visually by a new logo and wordmark and its message will resonate in the new slogan/tagline “Making every species count.”

To nurture and protect the iBOL brand, all products will be reviewed before release to ensure that the message has consistency and integrity. Key staff will receive media training to ensure that their interactions with journalists are productive and on message. And a detailed crisis management plan will be developed to ensure that the organization's damage-control procedures are appropriate, decisive and effective.

10. Timeline

A comprehensive timeline of proposed communications activities for the first half of 2010 is presented in Appendix A. It lays out a series of products and activities comprising a staged buildup to the year's keynote event, the official launch of iBOL in July 2010.

11. Resources

Table 2. Principal communications items – 2010 cost estimates

Category	Item	Cost
Online/web	Design and construct new website	35,000
	Set up social networks presence: Facebook, Twitter, YouTube, LinkedIn etc.	1,500
	Wikipedia entry	300
	Biobus blog	1,500
Media & Public Relations	Three story pitches using MR consultants	45,000
	Media management: official launch of iBOL	12,000
	Materials for BioBus media centre	1,500
Print and identity materials	New logo, brochure, pocket folder, business cards, letterhead	35,000
	New signage	4,500
	Merchandise and other identity materials	3,000

12. Evaluating Success

In November 2010, the Director of Media and Communications will complete a detailed evaluation of the ongoing effectiveness of iBOL communications activities. The report will determine whether communications objectives were achieved, target audiences were reached and key messages were delivered and understood.

Three strands of investigation are planned:

1. User survey: In September 2010, all members of the iBOL global network will be surveyed. They will be asked to rate the effectiveness and usefulness of various communications products and channels and to make suggestions on how iBOL's communications activities can be improved.
2. Web metrics: Web site usage statistics – number of page views, browsing patterns etc. – will be closely monitored over time to assess the effectiveness of the iBOL website and to refine web content where necessary. Discussion forum usage will also be monitored.
3. Media Monitoring: The success of media relations activities will be assessed by closely monitoring the appearance of iBOL-related news and feature stories in print, electronic and online media.

4. Impact Log: An in-house Impact Log will create an informal record of how communications products have been received. The log will be open to organization-wide input providing various indicators of which products are working and which need to be reviewed or discontinued. These indicators can include stakeholder feedback (e.g. e-mails from colleagues commenting on the latest newsletter), references or citations in newspaper or television stories, in speeches or on the Internet. The Impact Log also promotes broad ownership of and engagement in communications activities.

APPENDIX A

COMMUNICATIONS TIMELINE

Event/Activity	Date	Audience	Key Message(s)	Media Strategy	Tools/Materials
Royal Agricultural Winter Fair, Toronto	Nov. 6-15	General public	DNA barcoding is a new high-tech tool for conservation,		- Barcode demo - Posters - Video presentation, - Brochures
3 rd International Barcode of Life Conference, Mexico D.F.	Nov. 9-13	- iBOL Consortium members - Barcoding community - Science media	iBOL the key player in DNA barcoding worldwide: - Barcode “factory” - global network - research and development - informatics hub	- Media Release highlighting growth of iBOL international network - Make contact with journalists attending conference to set up interviews with iBOL leaders, arrange future coverage	- Press release - Posters - Brochures - Video display - Merchandise (T-shirts)
New website goes live	November	Global/all audiences	An invitation to learn more about and participate in the iBOL global partnership	Special section for media with information resources, stock photos, contact info.	Internet: - Blogs - Widgets - Multimedia content
New brochure	November	General	Lack of knowledge putting biodiversity in even more danger. DNA barcoding will bridge knowledge gap	Will be key component of media kit	Print
Wikipedia	December	Global/general public	Description of iBOL, DNA barcoding.	Important web resource for media and link to iBOL web site	Internet
Seasonal media pitch (prov.)	December	Global/general public	DNA barcoding and its beneficial impacts on the way we live, work and play	Pitch story on Christmas barcode application (food or topic to be determined)	- Media Release - Interviews - Media Relations Consultant (Collins)
iBOL milestones: e.g. 1M specimens/ 100K species	Various	Global/ - Barcode community - All audiences	iBOL network making rapid progress in assembling barcode ref library for life on earth	- International Press Release - Photo op at BIO with iBOL, U of G, GC, provincial and federal govts etc. - Pitch specialty science media, e.g. Quirks and Quarks	- Special signage - Special handouts - Souvenir merchandise (the million specimen t-shirt/coffee mug)

Event/Activity	Date	Audience	Key Message (s)	Media Strategy	Tools/Materials
Op-ed	January	Global/all audiences	As we enter Intl Year of Biodiversity (2010), DNA barcoding is a vital tool in the campaign to conserve dwindling biodiversity resources	Pitch to major print media worldwide including: - NYT/Washington Post (USA) - Times/Guardian (UK) - IHT (Europe and global) - Globe and Mail (Canada)	MR consultants in London (Heller), Toronto (Collins)
Facebook, Twitter & YouTube	January	Global/general	Stay connected to the fast-changing world of DNA barcoding. Special focus on science media	- Expanding interest in iBOL through social networking - Announce iBOL events, Biobus itinerary	- Internet - SPARK
Advance pitch for media with long lead times	Jan/Feb	Global: General public	Upcoming official launch of iBOL, largest ever BD/genomics project	Pitch feature idea to major mags (eg Nat Geog, Nature), TV docs (eg Nature of Things)	- Personal approach to editors/producers
iBOL Update newsletter	February	- iBOL network - Barcoding community	Launch of quarterly newsletter signals new conduit for news of latest developments in iBOL project worldwide	- Announce newsletter launch on Eurekaalert, science and enviro journalist listservs (SEJ) - Announcement and sign up option also distributed through barcoding listservs, email lists. - Link to newsletter and signup option on iBOL website.	- Newsletter to be available as pdf and hardcopy. - SPARK input
BioBus blog	March	- Public - Barcoding community	- Follow the travels of the BioBus, discovering Nature through DNA - Visit BB in your town	Blog feeds FB, Twitter networks, video to YouTube when possible	Blog updates - text, photos and video uploaded in real time from the road.
IYB event in Cartagena	March 16	UNCBD, NGOs, national governments	TBD	TBD	TBD
BioBus media centre	April	General public in regions visited by BB	Discovering Nature through DNA in your backyard	- Give local/regional press, TV and radio advance warning when BB is coming. - Arrange access to BB, photo ops of collecting, etc. - Provide media training for BB personnel	- Media kits - Stock photos and video - Souvenirs

Event/Activity	Date	Audience	Key Message(s)	Media Strategy	Tools/Materials
International Day of Biological Diversity Media Pitch: Upcoming launch of iBOL	May 22	Global: All audiences	Largest ever biodiversity genomics project set to launch in July. Tie in to International Day of Biodiversity	- Even if coverage limited, this serves as an early alert that generates buzz around the actual launch	- Press Release - MR consultant
<u>Keynote event:</u> official launch of iBOL	July	All audiences	Largest ever biodiversity genomics project will fundamentally change biodiversity science and life as we know it	- Major media campaign around launch event. - Invite selected science journalists to attend (pay expenses?) - Media lunch and “open house” at BIO	- Media Release - Media kits - Video presentation (YouTube) - Merchandise - Celebrity appearance - PSA on CNN International
Turning of 1 st sod on new iBOL building	Sept.	Local/Ontario	Multi-million dollar vote of confidence in the future of iBOL and DNA barcoding	- Media event with govt. and university leaders - Media tour of iBOL facility	- Media Release - Media kits - Merchandise

Project Manager Job Description

Overview

Reporting to the Executive Director, the position's primary responsibilities are to serve as the focal point for the monitoring of projects execution according to budget and timelines.

Key Activities

Management of Draw Request Process

- Create, administrate and execute staffing and facility plans and budgets for the Projects.
- Assist in the development of relevant processes, facilities and staff to support the management and progress of the Project.
- Conduct frequent project reviews to track progress, issues/risks, and capture resource requirements.
- Provide weekly reports of status to the ED/FD.
- Take on new Project planning and administration tasks as assigned by the Executive Director.
- In support of the Activities within the Project:
 - § Co-ordinate communication between the Project Activities;
 - § Co-ordinate, motivate and assist the efforts of Activities in order to meet project milestones;
 - § Facilitate resolution of conflict between/within Activities under the guidance of the Executive Director and Chief Scientific Director;
 - § Identify any risks and resolve project-related issues

Financial Monitoring of Projects

- Prepare monthly reports for ED and Project Management Team to facilitate decision making
- Liaise with institutional groups (such as Lab Management, Administration, Finance, IT and Technology Transfer) to meet reporting requirements for the Project as needed
- Follow-up on financial variances
- Maintain professional working relationship with Funding Partners
- Provide policy interpretation and advice to staff
- Participate in committees and working groups aimed at improving project management and monitoring,
- Provide on-going and as-required financial advice to Projects staff in support of their project management responsibilities
- Conduct on-site monitoring visits of the projects to review compliance to the financial funding agreement
- Identify deficiencies and/or best practices in operations
- Prepare reports there-on and follow up on recommendations and observations
- Provide coaching, on-site training and advice as required

Qualifications:

- Min. 3 years experience as a Business Analyst with a clear understanding of financials, variance reporting, forecasting and budget control processes
- Excellent organizational, time management and interpersonal skills
- Experience in project management, preferably in a technology- or scientific-research focused environment
- Sound understanding of project planning principles and techniques with a proven track record in building and working with cross-functional teams and managing and delivering on project requirements in a fast-paced, change-oriented environment
- Understanding of institutional financial controls and processes

Education/Experience

- Advanced Business Administration education (MBA) degree with a finance major or equivalent combination of education and experience
- Molecular biology or Biochemistry [or related] experience preferred, or ability to learn relevant technologies and sciences rapidly
- Project management certification (PMI) an asset

Required:

- Budget control and risk management skills
- Project management skills
- Verbal and written communication skills
- Adapting to new, unconventional project management methodologies
- Ability to facilitate experts and senior managers
- Interpersonal, organizational, negotiation and influencing skills
- Working well under pressure to meet deadlines, and assist others in meeting their deadlines
- Ability to manage projects, relationships and self in a rapidly changing environment
- Computer skills (Microsoft Excel, Access and Project)

Work style

- Personable
- Team-building
- Collaborator
- Detail-, Goal- and Execution-Oriented
- Decisive

Financial Director Job Description

Overview

Reporting to the Chief Scientific Director, the position's primary responsibilities are in the areas of financial monitoring of funded projects including quarterly reports, monitoring compliance to financial terms of Funding Agreements, provision of financial advisory services in support of project management, provision of account verification services, and, the provision of other supporting activities requested by the Chief Scientific Director.

Key Activities

Financial Monitoring of the Project

- Maintain professional working relationship with Funding Partners and manage the quarterly draw exercise with the Funding partners
- Maintain audit trail and documented due diligence in decision making process
- Control the flow of cash through the organization and maintain the integrity of funds and securities
- Develop and maintain systems and processes for the capture of all relevant financial information emanating from the project
- Provide effective and timely financial information, analyses and reports to IBol Management, appropriate Standing Committees of the Board, and the Board of Directors
- Identify for follow up, any areas of risk in budgets and expenditures
- Direct the preparation and interpretation of all internal and external financial analyses and reports
- Participate in committees and working groups aimed at improving project management and monitoring,
- Provide on-going and as-required financial advice to Project staff in support of their project management responsibilities
- Lead in the design, development, testing and implementation of new reports and functionality features
- Provide financial sign-off on proposed project actions in respect to resolution of issue

Financial Monitoring of Projects

- Prepare monthly reports for Program Director and Project Management Team to facilitate decision making
- Liaise with Lab Management, Administration and Informatics depts. to meet reporting requirements for the Project as needed
- Participate in committees and working groups aimed at improving project management and monitoring,
- Provide on-going and as-required financial advice to Projects staff in support of their project management responsibilities

iBOL Scientific Steering Committee

SECOND MEETING

Guelph, Ontario, Canada

September 23-25, 2010

OVERVIEW

The second SSC meeting, following on from the 2009 assembly in Mexico City, was designed as a two-way consultation between iBOL governance and management, representatives from the project's Central, Regional and National Nodes, leaders of its 20 Working Groups, and members of the GE³LS research team. After a brief overview of the scientific progress and management structure of the iBOL project, most of the meeting was devoted to small group discussions designed to help delegates clarify the goals, challenges and strategies for their working groups and nodes. All discussion groups were provided with a chairperson / facilitator and a rapporteur to capture salient points. Summary presentations from the nodes and working group discussions, and results of the participant survey are presented separately.

In addition to SSC delegates, the meeting was attended by members of iBOL's Board of Directors, Scientific Advisory Board, and Technology Development Advisory Group, and the chairs of the latter groups presented verbal reports to the Board of Directors at its meeting on September 26, 2010. Minutes of this meeting, including the SAB and TDAG reports, will be issued in due course.

At the end of the meeting the Scientific Steering Committee agreed to the formation of a sub-committee of its members to act on its behalf in identifying and acting on priorities that arise between meetings of the full SSC. iBOL management will propose the terms of reference and process to establish this sub-committee.

iBOL management committed to reporting back to the SSC by mid-November 2010, and to integrating the findings and understandings from the discussions into iBOL's ongoing strategic plan.

Summary of Key Discussion Topics

iBOL Vision and Mission

While accepting the importance of iBOL's numerical and taxonomic targets in building the barcode library, delegates at the meeting expressed the need to look beyond these targets and establish a longer term vision and mission for iBOL. Long term success of the International Barcode of Life Project will depend on being able to answer the question: *Why Barcode?* This question, raised by the GE³LS team and pursued across discussion groups, shifts the focus to the socio-economic benefits above and beyond the scientific and technological aspects of barcoding. This suggests a vision around harnessing and linking biodiversity for the benefit of humanity, and a mission that encompasses *Stakeholder Engagement* – from scientists, administrators and funders, to students, amateur taxonomists and the general public.

Matrix of iBOL Nodes and Working Groups

- The need for flexibility in defining and empowering iBOL Nodes, and linking their efforts across working groups, was emphasized in many of the discussions.
- A matrix of iBOL nodes and working groups was envisaged, where nodes represent **capacity** (institutions, funding, facilities, people...) and working groups represent **competencies** (areas of taxonomic focus, research activity, administration...).
- Nodes should be able to scan across working groups to ensure that resources are being applied in existing (or new?) working groups appropriate to their interests.
- In principle, nodes should be independent of their participating institutions so that they can facilitate activities – fundraising, stakeholder engagement, iBOL workgroup participation, etc. – on a national, regional or central basis.

Discussion of iBOL Nodes

National Nodes

- National Nodes are not 'top down', but 'ground up' entities, emerging through activities driven by individuals, groups or institutions that provide a focal point for barcoding in a particular country
- The transition from 'focal point' to 'iBOL National Node' is evidenced by formal coordination of participants. However, each country is unique with respect to its organization and priorities, so there cannot be a "one size fits all" approach to National Nodes.

Regional Nodes

- By definition, Regional Nodes have the capacity to expand partnerships, establish a funding base and develop infrastructure on regional basis.
- iBOL Regional Nodes should act as “mirror “ of iBOL, proactively helping to achieve the aims of the project in the context of their regional priorities.

Central Nodes and Core Facilities

- The transition from Regional to Central node is predicated on the additional capacity of the latter to (a) establish large core facilities that can and will barcode samples from diverse sources and geographies, and (b) act as leaders in knowledge and technology transfer across (other) central, regional and national nodes.
- The discussions highlighted the fact that iBOL’s currently designated Central Nodes (Canada, China, European Union and USA) are not all at the same point in their development, and it is important not to skip the necessary steps in establishing national and /or regional node structures and support, en route to fulfilling the more altruistic roles of Central Nodes

Discussion of iBOL Themes and Working Groups

Theme 1: BarCode Library

- Not surprisingly, participants in Theme 1 focused on the iBOL’s numerical and taxonomic targets in building the barcode library – and there was a high level of optimism that targets could be achieved (vertebrates excepted).
- Most concerns were focused on access to collections and specimens, compliance with policies and rules (of countries and of iBOL), throughput capacity at Guelph and other centres, the balance between groups (e.g., 80% of terrestrial life represented by leps)
- Strategies to increase resource flow to emerging economies, to enhance BOLD functionality, and to improve co-ordination across working groups, were proposed.

Themes 2-4: Methods, Technologies and Informatics

- These working groups identified more challenges of leadership and participation than the Theme 1 groups. Themes 2-4 are cross cutting working groups with milestones and deliverables defined by the work that the barcoding community is doing.
- Strategies reflected the challenges identified, with an intent to engage in frequent “cross talk” to help adjust goals, and form user groups to validate and refocus efforts.
- Echoing other discussions around iBOL’s vision and mission, the need to ‘sell’ barcoding through applications-based research (“why barcoding?”) was recognized.

Theme 5: Administration, Outreach and Collaboration

- As appropriate, this group focused on the need to define the purpose, vision and global perspectives of iBOL, and to build strategies, processes, metrics, templates and reporting structures around its mission.
- Primary strategy for this group is to act as the global knowledge management and communications 'hub' for iBOL nodes and working groups.
- The topic of commercialization of iBOL- generated IP was raised, but not pursued.

Discussion of GE³LS Research

- The GE³LS research plan was presented, with its five main research themes (access and benefits sharing, regulation of international trade, intellectual property and knowledge management, education initiatives for schools and media, governance of knowledge mobilization).
- Integrating GE³LS into the science and technology themes and working groups was stressed; the GE³LS S research team will proactively pursue this.
- International collaborators need to be recruited from the central and regional nodes; the GE³LS team will work with the SSC to achieve this.