



Welcome to the launch of **BioCY News**, the official newsletter of the Department of Genetics, Development and Cell Biology (GDCB) at Iowa State University (ISU).

The GDCB Department was formed in 2003, as part of the reorganization of the biological sciences at ISU. GDCB has roots in and enduring connections to multiple past and present undergraduate majors, including Biology, Botany, Genetics, and Zoology. The GDCB Department welcomes the alumni of all of these majors, recognizing that our alumni provide great wisdom and encouragement as we look towards the future.

Our faculty, staff and students are at the frontiers of their disciplines. GDCB research provides a foundation for addressing the larger issues of our times - feeding the world, growing sustainably, adapting to changing environments, developing biorenewable resources, ensuring human health, and improving the quality of life.

GDCB faculty are dedicated to preparing our students to meet the challenges of tomorrow's world, and the department has vital and essential roles in biological sciences education at ISU. GDCB co-administers three undergraduate majors: the Biology Program, the Genetics major, and the new Bioinformatics and Computational Biology undergraduate major. Additionally, GDCB faculty members have leadership roles in successful interdepartmental graduate programs, most notably Bioinformatics and Computational Biology, Genetics, Molecular Cellular and Developmental Biology, Neuroscience, and Plant Biology.

These are exciting times for the GDCB Department and for the biological sciences at ISU. The articles in this inaugural BioCY News letter describe a few examples of how the GDCB Community advances the research and teaching missions and translate those accomplishments in ways that benefit society.

Cultivating the Next Crop of Iowa State Scientists



by Carla Mann, Graduate Student

*Bioinformatics and Computational Biology Program,
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Scientists around the world are rising to the challenge of solving an unprecedented array of new problems, from dealing with ocean acidification and mega-drought conditions, to combating the evolution of drug resistant bacteria. Iowa State University contributes to these solutions through both transformative research and through educating and training the next generation of scientists. **Dr. Jo Anne Powell-Coffman** leads the charge for the **Department of Genetics, Development, and Cell Biology**. In addition to leading a research program in the area of stress response, Powell-Coffman has made it a priority to educate and encourage the next crop of young scientists through her involvement as a Partnership for Undergraduate Life Sciences Education (PULSE) Leadership Fellow and as Department Chair of GDCB.



Jo Anne Powell-Coffman, Ph.D. GDCB
Department Chair

Powell-Coffman's involvement with the **PULSE program** began at its inception in 2012, when federal agencies recognized that the old methods of teaching science were no longer working well. As Powell-Coffman states, "The fields of cognitive science and educational research have

provided new insights to how people learn. We need to adapt our teaching strategies to recognize this scholarship and to help students hone the skills needed to succeed in the information age." National reports had outlined necessary changes in science teaching at the undergraduate level, but across the country, departments and programs were struggling to



Proposed [biosciences package](#) including a five-story teaching and research building.

implement these recommendations. The PULSE project focuses on department-level changes that advance student success. PULSE initiatives have enabled educators to share information about what works, and what doesn't, in teaching students in STEM fields. At ISU and in the GDCB Department, faculty have formed communities in which instructors can share information and work together to develop new classroom

innovations or assessments. This pioneering approach at ISU was featured in the national report, "[Vision and Change in Undergraduate Education, Chronicling Change, Inspiring the Future.](#)"

Powell-Coffman is also very excited about the upcoming construction of the [Advanced Teaching and Research Building](#), which will have classroom and teaching lab space in addition to lab space for some GDCB faculty. One of the challenges that the GDCB department has faced with the rapidly increasing enrollment at Iowa State is adjusting how classes are taught. Powell-Coffman explains, "We've been teaching introductory biology courses from 7 in the morning until 10 at night. The addition to Bessey Hall will include new teaching labs for our freshman-level lab courses. Also, the planned Advanced Teaching and Research Building will include additional laboratory space. It's important for students to experience the excitement of discovery and to explore their own ideas about how biological systems work."

This focus on quality research and teaching is GDCB's highest priority. Powell-Coffman points out that "the GDCB Department is really a hub for life sciences here at Iowa State... we truly are committed to both the teaching and the research missions. That is our strength. World-class GDCB faculty teach core courses for multiple key majors here at this university, and we take great pride in our students and their learning." The GDCB Strategic Plan outlines the department's focus succinctly: "We are dedicated to sharing this knowledge with students to prepare them to meet the challenges of tomorrow's world." The GDCB Department is not just getting kids through college; GDCB professors are educating the future leaders and scientists who will be responsible for feeding the world as the climate continues to change, creating new drugs and vaccines to cure and defend against rapidly evolving diseases, and solving problems and challenges that haven't been dreamed of yet. The seeds of future discoveries are growing in the minds of Iowa State students, and the ISU GDCB Department is fertile ground.

Mango: From Tangled Networks to Targeted Solutions



by Zebulun Arendsee, Graduate Student

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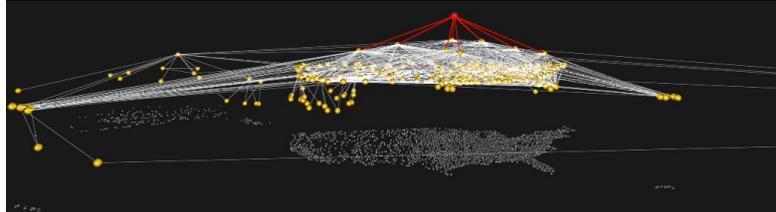
Graduate student Jennifer Chang loads a network of flights between US cities into a computer program she developed called "Mango". A mess of grey spheres and lines fills the screen. With a deftly typed command, she reduces the network to flights to or from Iowan airports. She then executes a script showing how a virus unleashed in Des Moines could spread across America — the most remote Alaskan airport is infected within 4 jumps.

“Networks allow us to summarize complex systems in order to determine key players or emergent behavior,” Chang explains.

Open digital repositories and private databases worldwide are overflowing with interrelated data, but the difficulty of making sense out of this data often prevents its application.

“Mango grew out of the belief that complex does not have to mean difficult,” says Chang, “Using basic principles, complexity can be managed, integrated, and interpreted. A flexible and standardized system to integrate networks aids analysts in serendipitous discoveries and practical applications.”

Mango’s users can write reproducible code to analyze networks, execute it on their datasets, and interactively visualize the results all within one program. The graphical user interface includes a window for executing code, an editor for writing scripts, and a visualization window. This couples writing of scripts with instant visual feedback as the data unfolds on the screen.



Flight data to explore simulated viral dissemination across the United States displayed using the program “[Mango](#)” invented by GDCB graduate student Jennifer Chang and Professor Hui-Hsien Chou.

The strength of Mango is in part due to Gel, a novel programming language that was co-written by Chang’s PhD advisor ISU Professor Hui-Hsien Chou. Gel provides simple statements for integrating and subtracting pairs of different networks. This allows extraction of their common pathways and or unique elements.

While there are other tools for network analysis, Mango is uniquely generalizable and scalable. It can handle any network, from the campaign contributions of corporations to the side effects of drugs, and can visualize huge datasets with millions of edges.

Chou and Chang have big plans for Mango. It is the flagship software of their newly founded company: Complex Computation, LLC.

Kickstarting Startups: PhD to CEO



by Rahul Roy, Graduate Student

Department of Genetics, Development, and Cell Biology

In today’s changing scenarios, non-traditional scientific careers for young graduates are becoming more of a norm than an outlier. Iowa State University is pushing the boundaries of how future scientists can be part of the startup revolution and create jobs, while also furthering science and technology. [Mr. Bill Adamowski](#), who recently joined ISU’s Office of Economic Development and Industry Relations (EDIR) group, is a veteran in the field of entrepreneurship. He started his first company as an undergraduate and went on to setup many more in diverse fields such as financial services, speech recognition and social networking. Mr. Adamowski’s move from the corporate to the university environment is aimed at providing hands-on mentoring and training to a talented pool of scientists who are on the verge of setting up a company that could become the next big player in their niche.



[Bill Adamowski](#), world-class strategist, entrepreneur, and visionary.

Mr. Adamowski, along with a team of advisors, aims to usher in an entrepreneurial ecosystem

in the heart of the Midwest at ISU, translating fantastic research into startups, hence tapping into a large commercial potential. Skilled scientists who have epiphanies to setup companies are usually ill equipped to set about doing it, even though ISU has plenty of resources to help them. Mr. Adamowski foresees a future where ISU's EDIR group will work closely with other such groups such as the ISU BioBased Foundry and create a unifying atmosphere for entrepreneurial success. Experiencing the challenges of a startup can be a steep and rewarding learning curve for postdoctoral researchers and scientists, adding a unique edge to their careers and gearing them for greater success.

To aid their smooth transition the university plans to provide a network of support such as teams of consulting experts in domains including finance and legal advice who play an active role in guiding the startup. This large pool of experiences from experts could help scientists focus on the actual job of delivering the technology or product while helping them navigate the nuances of business within a safety net of university-led incubation. This resource, supplemented with events such as entrepreneurial boot camps, workshops and interactions with consulting teams and alumni, could benefit scientists willing to take risks and enter the startup game. This also increases networking, bringing opportunities for product success along with the ability for scientists to be recruited by major players in their field. The networking could be valuable for scientists struggling to make the academia to non-academia transition too.

With a minimum viable product established and the gears set in motion, the success of one concept can drive funding for others as well as attract investors. This model has tremendous potential to increase funding opportunities that can be funneled into riskier projects. As Mr. Adamowski puts it, "I see future graduates and postdoctoral scholars at ISU playing dual roles as scientists and businesspeople, applying logic and troubleshooting in the dynamic field of entrepreneurial ventures". The future of science in which researchers create intellectual property while generating their own funds is now, and it's happening at ISU.

Investing in the Future

The GDCB and ISU communities are grateful to donors and supporters who enrich and inspire our teaching and research programs. Future BioCY News articles will include descriptions of donor-funded programs and initiatives, including student travel grants and research projects, invited lectures, undergraduate scholarships, and new Biosciences facilities. Related stories are also present on the [GDCB website](#).

To make a donation please click here: www.foundation.iastate.edu/gdcb, or contact the [Iowa State University Foundation](#) at 515-598-2390.

We Welcome Your Feedback

Your comments and inquiries are very important to us. Please contact the department at: gdcnews@iastate.edu.

Thank you very much,

The GDCB Communications Team