Dear Colleagues,

This is just a brief note to highlight a couple of important changes in the CMB Program. In response to both student and faculty opinions, the CMB Program Committee re-evaluated the nature and timing of the CMB Retreat and Symposium. The outcome of these deliberations is that the CMB Retreat, which has been held in the Spring, will be moved to the Fall, while the Symposium will be moved to the Spring. Having the Retreat in the fall will provide an opportunity for new CMB students to get to know more senior students in the program early in the academic year. Because new PIBS students and uncommitted MSTP students will also be invited, it will give faculty an opportunity to talk with students who are actively seeking rotation mentors for the Winter semester. The next CMB Retreat will be held Friday, October 21st through Sunday, October 23rd, 2016. The next CMB Symposium will be held in May, 2017, on a date to be determined. The Spring Symposium will retain the Myron Levine Lecture and Program Poster Session and will represent an opportunity to reflect on the progress we have made in the 2016-2017 academic year.

All the best,

Bob Fuller
As a 5th year graduate student in the sciences, I’ve learned from experience that efficiency starts at the level of the individual. Efficient individuals live efficient lives, run efficient labs and perform efficient science. But what is efficiency, and what does it look like in science?

When we think about efficiency, the first things that come to mind are probably related to productivity. When I asked a close friend in the humanities to define “efficiency,” she did not disappoint. She defined it as “the quality of maximizing time, every second, in such a way as to reduce air pockets of unproductive time, in order to achieve a desired goal or outcome.” I was not surprised at my friend’s clear articulation of a definition for “efficiency,” and after looking up the term in a dictionary myself, found her definition to be quite accurate, in addition to concluding that she must be a walking dictionary. I was struck by her phrase “air pockets of unproductive time,” and the sense of urgency that every second was important when thinking about efficiency. It almost seemed to be a machine-like quality that was unattainable—something un-human. After all, humans are biological beings; we need sleep, lunch and things like coffee breaks to refuel, and even leisure time outside of lab to maintain our sanity. I suppose one could argue that these things are necessary and technically do not fall into the “air pocket” category, because they contribute to our ability to be efficient makers of progress and to be productive individuals.

When I began to consider my lab, I realized that I work in a lab with people who are very productive, but none of whom, to my knowledge, appear to be machine-like. They are actually very human and quite healthy. My advisor somehow manages to balance the demands of academia, like advising four graduate students with whom she meets bi-weekly, serving on thesis and qualifying exam committees, writing grants, reviewing papers and teaching, while raising two children, taking care of her family, and even having time to travel or attend things like local concerts. A graduate student in my lab is a mother of two, and between attending soccer practice and music lessons for her children, manages to do great science. I’m also always impressed by the amount of cool new data a post-doc in our lab generates in a short amount of time, and he too has a family of his own and hobbies outside of lab.

When I think of the people in my lab, I do not think of machines, but human beings. People who make progress, while living rich lives, investing in relationships that matter to them, which in turn has a positive feedback on their productivity. Granted, they are very hard workers who do not hesitate to get into machine-mode when necessary, but most certainly they do not stay there. Perhaps I haven’t clarified what I mean exactly by machine-like productivity, so I will attempt to do so. Here, I am reminded of perhaps a most extreme example from “Mr. Artesian’s Conscientiousness,” a poem by Ogden Nash that I remember reading in high school, which for some reason has stuck with me. It’s about a man (Mr. Artesian) who “grudged every minute away from his desk because the importance of his work was so stupendous” and so he made a life goal: “to save simply oodles of time.” He reasoned that by sleeping 8 hours a night, if he lived to be 75, he would have spent 25 years in bed and not at his desk, so he reduced his daily sleeping hours such that he only lost 18 years. He made various calculations on how daily activities like eating breakfast or shaving detracted from his work and modified or gave them up altogether. He even went so far as to subsist on eating boullion cubes at his desk to avoid taking a lunch break. I am in no way advocating that scientists, for the sake of efficiency, take up eating boullion cubes – actually all that sodium is probably very unhealthy. I suppose you could find reduced sodium cubes, but that sounds like...
a nutritiously unbalanced diet. I’m just saying that while productivity and time management matter, we must not forget that we are biological beings with biological needs and that efficiency is a tool, a means to an end and not an end itself. A key component of efficiency is the balance that allows individuals like those in my lab to lead successful scientific careers and live meaningful and fulfilling personal lives.

What might efficiency look like in science, specifically in a lab? I am most familiar with molecular biology labs, but I think it’s safe to say that efficiency has less to do with how many experiments you can do at once because (1) not all experiments work in the first place, no matter how many you do at once, (2) one can be efficient and not make progress for reasons beyond their control (e.g. an unwieldy project) (3) sometimes taking a breather from research can be a good thing – you can take time to think and analyze your data or just read the literature. As I heard Enrique De La Cruz say at a seminar talk, “a day in the library (reading literature) can save you a week’s work in lab.” If maximizing time isn’t sufficiently efficient, then what makes efficiency efficient?

I once kept blocking buffer too long at 4°C, and it grew bacteria that contaminated my fixed staining samples. From there onward I always make fresh blocking buffer. Our lab’s mRNA synthesis protocol requires 2-3 days and each step is critical. I’ve fumbled enough at different steps in the protocol over my 5 years in lab to know that it’s best to toss and start over if I add too much of this or that. Restarting is hard because you know you’ve lost time, but in the larger scheme of things, you’re actually saving time. I’ve shared these experiences with my undergrad so she can avoid repeating my blunders and therefore, be more efficient.

I’d argue that efficient efficiency is acquired through experience, both your own and that of others. Having been in my lab for five years now, I’ve made almost every possible mistake in our lab protocols, and my undergrad will tell you that

One might argue that individuals must learn for themselves by acquiring their own experiences rather than relying on the experiences of others. While this is indeed true, I’ll take my dad’s words out of their original context and place them here where they are befitting, “there are some experiences you’d rather not have.” I tend to agree. I personally would rather not spend 5 days on a fixed staining protocol only to find that my samples are contaminated, only to have to repeat the experiment. Perhaps one might call this wisdom acquired through experience, but our lab just calls these blunders, and we make a point to share and discuss both life and lab blunders during lab meeting.

This culture of learning from blunders is very much a good thing, as others in the scientific community have noticed. Mario Livio calls blunders “an essential part of the scientific process” 1 and says that “truly innovative ideas require a willingness to embrace risks, and acceptance of the fact that errors can be portals to progress.” 2 I’d take it a step further – the sharing of blunders and wisdom acquired through experience is essential for scientific progress and a portal to efficient progress. It requires vulnerability to admit, but sharing blunders can help cultivate a lab culture of efficiency, where one person’s mistakes can be avoided by others.

So what can we do to improve scientific efficiency? I think one way we can start is by sharing our blunders or the little wisdoms we acquire through experience, with people in our labs. Designating a time for blunder-sharing during lab meeting, could be a good place to start. Try it. My lab does this, my advisor participates, and it is both fun and relaxed. Maybe then we can begin to think about efficiency just a little differently. Efficiency: the practice of living a balanced life, learning from your own experimental/life mistakes, listening to experimental/life wisdom from others, in addition to sharing your own.

Can you tell me a little about what you work on, and how you decided you needed a new technology to do it?

I wanted to know how the Drosophila nervous system develops feeding behavior, specifically how fasted flies choose a protein rich food source. There were already several feeding assays available which use a colored, indigestible material. You give the flies a choice between eating from two capillaries, one that has protein and a red dye, one that has no protein and a blue dye, then look at the flies’ belly to see if it is red or blue or purple, or reddish purple, or bluish purple. Obviously this was very limited; there isn’t any temporal resolution (you don’t know when they were eating which food) and the dye can measure the size of the gut rather than how much they are eating. Also, what color of purple the fly is can be very subjective: Scott (Pletcher) and I could score the same set of flies and get quite different results.

What is the device you invented for measuring feeding behavior and how does it work?
The device is called “FLIC” which stands for “Fly-Liquid food-Interaction-Counter”. It consists of chambers which contain a fly, a pad for the fly to stand on, and liquid food. Each chamber is a small electric circuit, and the fly acts as the switch. When the fly puts its foot in the liquid to taste, or puts its proboscis in the liquid to eat, it completes a circuit. By measuring the electrical resistance across the circuit we can tell whether the fly is just tasting, or drinking, as well as when and how often the fly eats. We also developed an R package for analyzing the data.

I understand that the FLIC is now available for purchase from Sable Systems. How did that happen?
We originally made the design for FLIC open source, and published a paper on it. A lot of people asked us to make them a FLIC, and we started distributing a demonstration unit. We sent out 120 units before deciding that we couldn’t keep up with demand. The CEO of Sable Systems had shown some interest in the FLIC at conferences, and so I approached him and asked if they would be interested in distributing it and they said yes.

Do you have any advice for scientists who want to commercialize something that they’ve invented?

Yes. When we started thinking about commercializing the FLIC technology we went to the University of Michigan tech transfer office. We found out that, since we had already published on FLIC, it wouldn’t be patentable. They estimated that the technology had a market value of a couple million dollars, which was too low for the University to be interested in investing in it—once they finished paying lawyers, they wouldn’t make any money. Which was frustrating, because I’d like a million dollars! So I decided to start a company, called Flidea, which will help academic scientists commercialize their ideas. We will focus on scientists with technologies, like FLIC, whose market value is below the threshold universities set for investing, and help them through the process of developing their invention into a product and finding suppliers that are interested in bringing it to market.

You can learn more about the FLIC at [http://www.wikiflic.com](http://www.wikiflic.com).
Through the Looking Glass

"To develop a complete mind: Study the science of art; Study the art of science."

- Leonardo da Vinci

Rodent primary cortical neurons.

APEX2 & BirA*-Clc fusion proteins localizing to clathrin-coated pits.

APEX2 fusion proteins retaining biotinylation activity.

GFP-tagged Anillin in Xenopus embryos.

Bovine endothelial cell between telophase and cytokinesis stages.

GFP-tagged Septin 7 in Xenopus embryos.
Where are they now?

Catching up with CMB graduates

Interview with CMB alumna and Director of the Elijah J. McCoy Midwest Regional Office of the United States Patent and Trademark Office (USPTO):

Christal Sheppard, Ph.D., J.D.

How did you first become interested in the sciences? What was your early science career like?

When I was in high school, we started hearing a lot about cloning and genetic engineering. I remember being fascinated. Initially, chemical or biological engineering made more sense for my interests, but molecular biology spoke to me. After receiving my undergraduate degree in biology from the University of Delaware, I took some time to work. It is invaluable to get hands on experience and see if you actually like doing something before taking on a lifelong commitment. It is one thing to hear about a job and what it entails, and another to actually do it. So, I got some experience and used the time to start paying off undergraduate loans. I worked between undergraduate and graduate school. I decided to go to graduate school because I felt a higher degree was necessary to climb higher in this field. I enjoyed what I was doing. Whether I wish to or not, I learn new things every day, and generally enjoy doing so. Going into a PhD program was about opening up opportunities, and figuring out what more I could do with the degree I was pursuing.

Tell us about your experience getting your PhD in the CMB graduate program.

It was one of the most challenging things I have ever done in my life. There were definitely times during my PhD when I thought I was going to quit, I would ask myself, should I continue doing this? Should I drop out and get a master's? Everyone thinks like this, I certainly thought that way. Looking back however, I wouldn't be where I am now had I given up and not seen it through. The people around me that supported and encouraged me to keep going were incredibly important to completing my degree. In the end, my PhD work went well, it was a very complete project and I graduated in 5.5 years.

Can you speak to your career interests during graduate school?

Like everyone, I contemplated academic jobs, it seemed to be the expected path for when we finished graduate school. Yet my interests were broad, and academia was (and is) incredibly competitive. I was at a fork in the road, but everyone was focused solely on well-traveled paths. One of my interests was policy matter, and at the time molecular biology was important. I started thinking that the people making decisions about science would be much better informed if the individuals advising them were with more experience scientists. So I asked myself, how do I place myself in that milieu? How do I speak policymakers' language? You
go to law school. It’s 3 years, I told myself, how bad can it be? And it wasn’t easy, but getting a PhD was much more challenging.

On that vein, how was going to law school different from attending graduate school?
Getting a PhD is emotionally and mentally challenging. Law school was challenging in that you have to massively study, constantly... Law school felt like school, while graduate school felt like a job. Anyone can take a test, but not everyone has the technical skills to get bacteria to grow on a plate for example, or the ability to problem solve, and get work peer reviewed by experts in the field for publication. Getting your PhD is more of an apprenticeship; you have to prove your worth. If you can get a PhD, you can get a JD. Getting your PhD will make you more confident in your abilities. Looking back at my PhD dissertation now I think, whoever wrote this is so smart! [laughs]. It is a grueling process that will shape you as a person. It prepared me to look below the surface of a problem, dissect it myriad different ways and get to the core of what we’re looking for. That’s what scientists do. Graduate school is great preparation for law school. On the other hand, scientists deal with facts, while in law there are no hard facts. You deal with guidelines rather than facts, guidelines that can change depending on context. I had to become more flexible in my thinking upon entering law school. Understanding both nuances, hard facts versus guidelines, is valuable in my field, and it is what I try to do for everything.

Tell us a bit about the USPTO, and your work as Director of the Midwest Regional Office?
While the USPTO has been open for 225 years, patenting everything ever patented, from the light bulb to the steam engine, for 222 of those years the office was located within 5 miles of the capital. What other business that has such breadth of constituencies has an office in only one place? Although still one office, 3 years ago the USPTO opened regional offices to move closer to its constituencies. We are essentially a patent office targeted to the Midwest, we review and assess if an invention will be granted a patent, ‘inventions in and patents out’. We foster innovation and economic growth through education, outreach, and patenting. At the Midwest Regional Office we’ve trained over 130 examiners and have space for 20 judges. We have patent court cases, we do a lot of outreach, and we work with K through 12, businesses from large, small to micro companies. We promote economic competition and try to bring awareness to its importance.

What does a typical day look like for you?
My typical day is atypical. While Monday I was at a top-level management meeting in D.C., Saturday I was at the office helping law students become better in their chosen field of IP. Last week I spoke at the Michigan Science Center about partnering to educate the next generation in STEM, gave a speech in Chicago to the bar association with lawyers and spoke to undergraduates in engineering. I also consult with other regional offices, so that we can be better informed and work in unity. In brief, I do production and management, and interact with constituencies.

Any advice for graduate students contemplating careers post-graduation?
Find out what interests you. Build your career on that. The path well-traveled is harder, you are on that path with 10,000 other people. A lot of people are on the path of tech transfer, IP law and such. Is it a great career option now? Absolutely. But it is also a common career path, and so it is competitive. My advice is to think broader. What combination of skills do you have that you could bring to a field, or job, in which the only person that comes to mind is you? In my career, I’ve set myself up so that when a job comes up, they think of me. What is it about you that makes you unique, what is your niche? Identify that and follow that path. It will get you there. You will figure it out! ☀️
CMB Retreat Alternative: SciPhD Workshop
by Sara Wong

This past year, it was decided that the annual CMB retreat would be moved to the fall of 2016, and the CMB symposium moved to the spring starting in 2017. As such, Friday May 6th, the date originally reserved for the retreat was replaced with a professional development workshop to benefit all CMB students irrespective of seniority. Here is a sneak peek at what you can expect out of the SciPhD professional development workshop.

The SciPhD half-day workshop is focused on preparing graduate students for professional careers.

◊ Developing a targeted resume
◊ Building and developing your network
◊ Leveraging your network
  » Obtaining job intelligence
  » Obtaining company intelligence
  » Getting your targeted resume to the hiring manager’s desk
◊ Career Development Planning:
  Students will learn to complete the following checklist:
  » Identify critical skills for jobs that fit their career objectives
  » Identify skills that need improvement
  » Identify opportunities and resources to gain those skills
  » Develop a timeline to complete the above goals

Students still in their graduate training period have a unique opportunity to acquire experiences that demonstrate their mastery of skills that are highly valued by hiring companies. Identifying these required skills early on provides an opportunity to implement a career development program as part of completing your thesis work. Mentoring students, developing and managing collaborations, developing and managing budgets, and applying project management methods in the execution of your science are all conceivably possible as part of your graduate experience, and provide the experience that many companies look for in competitive candidates. By understanding early on what skills are valued you can take maximum advantage of the opportunities your current program presents to gain these skills.

For more information, please contact cmb.careers@umich.edu.

Photograph from sciphd.com
Spot the difference: lab bench edition
by Sara Wong

Can you spot the 6 differences between these two photographs?

Key
1. pipette box labels moved from orange-green-orange to orange-orange-green
2. big orange capped bottle is rotated so label faces right
3. binder clip near pipette holder is removed
4. pipette is moved to the left holder
5. bunsen burner is moved back
6. plates near right corner removed

Upcoming CMB Events
by Arlee Mesler

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<td>Friday April 15th,</td>
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<td>Ciara Reyes</td>
<td>Friday May 6th,</td>
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<td>1:00 PM</td>
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