INTERVIEW: JOHN LUMKES

Dr. John Lumkes is an associate professor in agricultural and biological engineering at Purdue University. He earned a BS in engineering from Calvin College, an MS in engineering from the University of Michigan, and a PhD in mechanical engineering from the University of Wisconsin-Madison. His research focus is in the area of machine systems and fluid power. He is the advisor of a Global Design Team operating in Bangang, Cameroon, concentrating on affordable, sustainable utility transportation for rural villages in Africa.

Could you explain what the Global Engineering Program (GEP) is?

The GEP is a broader umbrella for various international activities in the college of engineering. Other colleges also have a program to oversee international activities, and we all work with Purdue's International Programs

office. I have two roles in GEP, working with Global Design Teams, and serving as an associate director for building international collaborations. GEP also supports departmental study abroad courses, exchange programs, and various other partnerships. GEP would like to provide engineering students with the opportunity to have an international experience before they leave Purdue, and to provide faculty with opportunities to be globally engaged.

Let's narrow it down to the Global Design Teams. Can you walk us through a typical semester?

In the fall, there will be symposiums where we set up posters and give announcements of callouts for the current year design teams. The fall semester is when we're actively recruiting students for various teams. As a staff, we're

focusing on what countries we have opportunities in, what partnerships are available, where funding is available, and what faculty members are interested in mentoring students. We make the selection process in the semester prior to the project and identify the teams so that the students can start preparing for the project. Most projects typically take place during the spring semester, but there is flexibility. I meet and work with my teams both semesters since they involve a lot more building and construction on a larger scale.

I have three typical groups of students in my projects. Sometimes a student is doing the Global Design Team and taking GEP course credits, sometimes they're doing it for their senior design project, and sometimes they're doing it as a club activity. There are also different course and curriculum requirements depending on how they sign up. If freshmen are interested but not ready to work in a team, I ask them to join us and work in the shop to learn their way around fabrication, which is something that we don't cover in the curriculum. It really complements what they learn in classes because it's one of the first times that they actually build, test, and break things.

So the end of the spring semester is when you get opportunities to visit other countries?

For spring projects, yes. A few teams work in the fall semester and may travel during winter or spring breaks.

For all students the travel portion is optional and depends on both funds and interests. Where it's a little different from Maymester is that you get the academic credit for doing the project and traveling is a bonus. You can actually go and meet the people you've been doing all these Skype and conference calls with. Many of the projects have run for multiple years, and we have a great relationship with our international partners. We've got students on the team who have been to the country once or twice and will suggest things to do when we go back again. It's not a "one class and you're done" situation, but it builds upon a long-term and effective relationship with the partner.

Could you specifically talk about the basic utility vehicle (BUV) that the teams built in Cameroon?

That was one of those things that had unintended consequences, meaning I started working on the BUV long before I had any intention of ever going to Africa. At my prior school before I came to Purdue, we participated in a student design competition, sponsored by the Institute for Affordable Transportation (IAT) in Indianapolis where students bring BUVs and compete against each other. The IAT locally produces these BUVs and then different NGOs from around the world will buy them. The NGO that we now work with in Cameroon, the African Centre for Renewable Energy and Sustainable Technology (ACREST), bought one of those stock BUVs but wanted some modifications to make it suitable for local use. The request came back to the group in Indianapolis, but they don't directly do redesigns for each application, so they contacted me and asked if I could do it with a group of group of students for their design project in fall 2008. I advertised and got a group of students interested in working on the redesign, and halfway through that year the group started calling the NGO in Cameroon for feedback. The NGO invited us to come visit after we were done, so I went there in May 2009. Since then, we've sent students every year, and it's been one of the most incredible opportunities I've had. The partnership is great, we've developed long-term friendships, and I think every student who has come back was glad he or she went because it changed his or her personal perspective on life.

What exactly did the community use the BUV for?

This particular NGO uses it to haul water, people, construction equipment, and supplies. The way that it's designed, it can carry twice its own weight, so it's very efficient. It's got a small engine but manages very well. Now they're renting it out to farmers who will come in when they're getting ready to harvest. Right now most of the produce in this area is transported by hand, and if they can't get it to a market in time the produce will rot or spoil. Now the farmers can get the BUV and do a couple

of mass trips to the market. It's been proposed for rural ambulances too, so we're trying to build a basic platform. We have agriculture mechanization groups looking at light duty tillage to reduce labor as well as planting and food processing groups. They're all working on attachments for the BUV that would be made locally. If we can empower local farmers, and a lot of the time those are women, it would provide a much more secure source of income.

What do you think undergraduates learn the most from these types of programs?

We're trying to transform this into a transdisciplinary program, where students can get a holistic approach as to what it actually means to live and work in a community and develop products with that community. As for engineers, they're learning to design in a context that's basically foreign. Almost everyone on the team is used to designing with the assumptions that they have machines to make things, that they have electricity all the time, and that they understand the culture they're designing for. Now they really have to get out of their comfort zone and ask what it means to design for countries like Cameroon, Kenya, or Tanzania, or how the women might interact with the devices, because women's roles are very different. Those are some things they wouldn't think about in a design class here. That's part of it from an engineering standpoint—what does it mean to think globally, culturally, and socially about your design and how it influences those areas?

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Interviewer

Gayatri Narayanan is a senior in microbiology from West Lafayette, Indiana, and has been a member of the JPUR student editorial board since 2011. She has done research on cervical cancer biomarkers in Dr. Sulma Mohammed's lab and is currently doing bacterial genetics research in Dr. Daoguo Zhou's lab. Narayanan hopes to attend graduate school in the field of biology next fall.