A. Bakarr Kanu

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Coaching the Next Generation

It was midway between two coasts and in between two jobs—as a postdoc at Washington State University (WSU) in Pullman, Washington and his current position as an associate professor of Analytical, Environmental, and Forensic Chemistry at Winston-Salem State University (WSSU) in North Carolina—that A. Bakarr Kanu scripted his professional playbook to train young students and scientists.

"One of the students in my chemistry class didn't know how to write, and I had to take special time out of the class to give him passages to write over and over again," says Kanu. "By the time he finished that semester, his writing had improved, and we became real friends. I was the first person he told when he met his girlfriend, and he helped me pack when I moved to North Carolina."

Kanu spent several years teaching at Prairie View A&M and Lone Star College, and it is on the Texas plains that this separation chemistry expert developed a passion for helping struggling students and getting them excited about original research. This passion continues today in his own lab at WSSU where, for the last seven years, students have investigated chemical signatures and published their results.

Kanu was the first member of his large family to attend college. At the University of Sierra Leone's Fourah Bay College, he finished first both on the track field and at the top of his class. From there, he hopscotched to the University of Manchester (United Kingdom) where he was awarded his Ph.D. under the supervion of Paul Thomas (2003), to work as a post doc in Prof. Herbert Hill's lab at Washington State University, and to his current position in North Carolina.

In addition to his faculty post, Kanu directs the Sierra Leone Chemistry Education project, a study abroad program for which he has developed curriculum that encourages students to use their chemistry skills to help others [Sedwick, V., et al., Mobilizing Chemistry Expertise to Solve Humanitarian Problems Volume 2, Chapter 2: Developing Microchemistry Education Kits for Sierra Leone, ACS e-book Series, **1268**, *5-19 (2017)].*

How did you start in analytical chemistry?

Looking back, I realize that my career path was already set when I was a young kid. I was blessed with an enquiring mind, a passion for building things, and an eagerness to perform inquiry-related studies. This probably came from my parents: my mother was a police officer, and my father was a customs official.

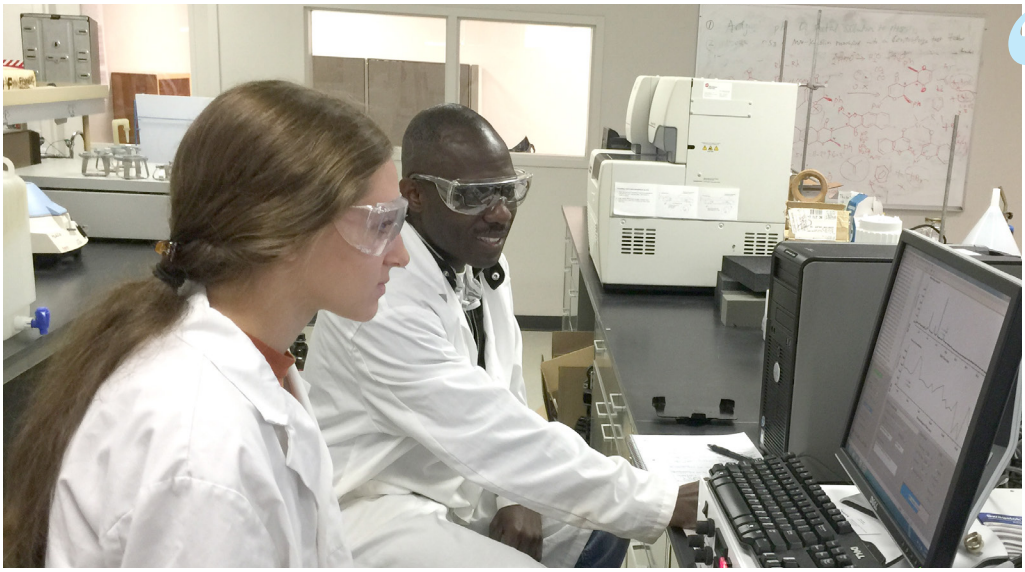
I was in high school when I was introduced to chemistry. I remember that everything came to me naturally; balancing equations just clicked. I ended up at the top of my class in the honors program at university, and I was given a Commonwealth Scholarship to study for a Masters and Ph.D. in the U.K. There, I studied environmental quality assurance monitoring and developed a novel sampling device with "active membranes" that reduced sampling time by 60% and increased sensitivity by 25%.

How did a postdoc change your path?

I moved to Washington State because I wanted to develop my research in ion mobility mass spectrometry with Prof. Hill. We found ways to reduce false positives at airport screenings for drugs, explosives, and chemical warfare agents [Kanu, A.B., et. al., *Analytica Chimica Acta*, **610**, 125-134, (2008)], and used drift gas capabilities on a field IMS system to pull apart two drugs that had previously been inseparable, heroin and tetrahydrocannabinol [Kanu, A.B. and Hill, H.H., *Talanta*, **73**, 692-699, (2007)]. I also worked on another project that developed and evaluated a miniaturized IMS to monitor environmental soil-gas contaminants in the vadose zone [Kanu, A.B., *et al., J. Environ. Monitor.*, **9**, 51-60, (2007)].

What research is happening in your lab right now?

We recently developed a parameter with an IMS unit we called conditional reduced mobility [Kanu, A.B. and Leal, A., *Anal. Chem.*, **88**, 3058-66 (2016)]. We combined the idea



Dr. Kanu coaching Annie Leal to operate ion mobility equipment.

> *My real passion is to contribute to the education of under-represented students and to increase the number of minority students in STEM disciplines.*

of reduced mobility and the width-at-half-height of a peak to develop something new that differentiates between two things and further reduces false-positive responses when drugs and explosives are detected in the field.

A couple of years ago, I started on a new path, using mass spectrometry as an important tool. The first project my lab has been working on is development of a membrane unit to see if we can get high-resolution separation before we send a contaminant or pollutant into an instrument. We are also looking to extract secondary metabolites from medicinal plants to identify drugs to fight diseases like cancer and leukemia. We already have preliminary data on this work. Finally, we are looking to develop next-generation polymers for military-type applications.

What right now really excites you?

My real passion is to contribute to the education of underrepresented students and to increase the number of minority students in STEM disciplines. Since joining WSSU, I have probably mentored over 30 or 40 students in research. Many have presented results at regional and national conferences. I am so proud of the fact that in 2016, one of my mentees won the best poster award at the Annual Biomedical Research Conference for Minority Students. She also co-authored four research papers before starting her graduate studies at Albert Einstein School of Medicine.

What research are you doing to mentor undergraduates?

In the last couple of years, students have been extracting metabolites from plant samples and analyzing them on the mass spectrometer. We have that data now, so we have to write this up for publication.

We have also been doing quality-assurance "mini projects" that students come up with. Back in 2015, for instance, a student came to me and said, "Dr. Kanu, I read that aluminum in deodorant samples can be harmful to the human body. Is that something we can do?" I introduced this project in my quatitative analysis class as a guided-inquiry approach, and we generated a lot of data [Sedwick, V., *et al., J. Chem. Edu*., **95**, 451-455 (2018)]. My undergraduate students have also developed method validation parameters to detect drugs and explosives [Sedwick, *et al., Int. J. Ion Mobility Spect*. **20**, 75-86, (2017)] and are writing up a paper on the chemical content of 13 different accelerants commonly encountered during arson investigations. In this work, we combine GC-MS instrumentation with principle component analysis to develop unique signatures for the fire accelerants.

What do you enjoy outside of the lab?

Number one, I am a sportsperson. I watch all track and field events, from the Olympics to the world championships, most European soccer matches, and I have even gotten hooked on football and basketball. I also like mixed martial arts and did kickboxing in England; right now, I teach kickboxing at the university's gym. I also like to hike in the mountains around Winston-Salem.

I volunteer in the community and in a garden at the university. I also have a huge backyard garden at home that has flourished. With several hundred cucumbers last year … even after giving to neighbors, I had to remove them to keep them from taking over [laughs].

What challenges have you faced in your career?

By moving from Sierra Leone to Manchester, I realized that the setting and cultural differences were completely—and I mean completely—different. It took me several years to adjust to the British way of life, and, just about the time that I had finally adjusted, I moved to my third continent to start all over again! Being a minority in science can have its challenges; it is sometimes very difficult to stay motivated and confident, especially when it comes to funding. A third challenge is motivating students to be successful. Most don't see what you do for them when they are not in front of you—like developing curriculum to address deficiencies in reading and writing—but they often thank you later after they move on to their next career and recognize they are encountering all the advice you had been giving them.