Ralph Tanner is a professor in the Department of Botany and Microbiology at the University of Oklahoma, Norman. His research centers around anaerobic bacteria, their diversity, and their phylogeny, and his most recent work has focused on developing bacterial catalysts for biofuels production.

You've been involved in biofuels production, using bacteria to convert switch grass into fuel. What can you tell us about that work?
My job is to find and develop bacteria that are able to convert synthesis gas to bioethanol. We started this almost 10 years ago at a very low level of effort and it's built up over time and we're at a successful end point right now. We got a technology transfer license with a company in Illinois and they're building a $50 million pilot plant in Pennsylvania as we speak.

What is synthesis gas?
We do incomplete pyrolysis and convert biomass to synthesis gas, which is a mixture of carbon monoxide, hydrogen, and carbon dioxide. We do an indirect fermentation process – anything you can burn you can use as a substrate.

It seems like synthesis gas isn't really catching on as a fuel substrate; corn is the top banana. Do you see that changing in the future and if so, why?
I hope it's going to change. Food for fuel may not be the greatest idea in the world. We can't grow enough corn to make the amount of ethanol we'd like to in this country. You can grow switch grass on land that's so poor you couldn't even graze cattle on it.

There are lots of obstacles to making biofuels really widely used in this country. As someone involved in biofuels research, what do you see as the biggest barriers: the science or the policy/public acceptance issues?
It's more the engineering now than the science. We have to demonstrate that we can make these processes work at a commercial scale, ergo the pilot plant being built in Pennsylvania.

You've been involved with bacterial systematics, reclassifying and amending the phylogenies of certain strains. In recent years, research on E. coli and other bacteria has revealed rampant recombination, bacteria losing and taking up genes all the time, processes that can profoundly change the very identity of a bacterium. In light of what we're discovering about promiscuous gene swapping, do you think bacterial systematics will continue on its current trajectory or do you see big changes ahead?
I think systematics based on rRNA still makes a lot of sense. Core housekeeping processes like replication of DNA and transcription/translation, for the most part, those core genes aren't going to be swapped from organism to organism, so they still make useful ways to follow microbial systems. If there was to be a change, it might be nice if we moved from 16S rRNA to 23S rRNA, since more sequence will give us a lot more information, but 16S is still serving its function.

Undergraduate teaching has been a big part of your career at the University of Oklahoma. Do you think microbiology curricula are keeping pace with the times? Are our universities and colleges producing the kind of biologists we need to move research and industry forward?
That's a tough call, and that's one of the reasons we don't have any national standards in microbiology, unlike our colleagues in chemistry. There's one thing we do here at the University of Oklahoma that other universities may not be doing as much of: we've worked hard to keep a strong teaching lab component to our curriculum, rather than all lecture based, and I think that's an important thing for a good undergraduate curriculum. In this business it's not so much what you know as what you can do which differentiates you from another person.

What kind of changes do you see for microbiology education in the future?
Unfortunately for me, because I'm not very good at it, there's going to be a lot more internet and email-based education. The trick there is to make sure some good materials are developed for it.

What do you think is the most understudied microbial system?
All of them. There's an awful lot we don't know about what's out there, and it's still an open book in terms of what's out there in microbial diversity and activities. If you take an environmental sample, dilute it out to extinction, and look for the last bug standing, a lot of the times you find something new.

What is your favorite microbe? Why?
That's like asking who your favorite kid is. I've always enjoyed playing with spirochetes because that's the organism I got my research start with at the University of Massachusetts way back in 1974. Acetogens have been my bread and butter over the years.

If you could name a new microbe right now, would you name it after yourself? If not, how would you name it?
I'd like to name a species after Carl Woese. The trick there is to come up with something interesting enough that he would agree to it.

What advice would you give students about life as a microbiologist working in academia?
Working in any setting: be flexible. If you're going to be in general and applied microbiology, the ability to work in different areas is the key to success.

What is something about you that most people don't know?
In my junior high yearbook I was described as a "fishing scientist." I still fish today.