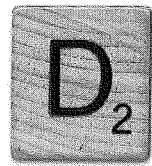


Dr. Richard Grant

The “WOW” Factor



Dr. Richard Grant has launched the world's biggest science project. An assistant professor of physics at Roanoke College, he's engaged in nothing less than trying to change the way science is taught.

To Dr. Grant, experiential learning is synonymous with active learning, and he goes to great lengths to actively involve students in the learning process, even playing bagpipes in class to illustrate a point about sound. But increasingly, he's concerned about the way students seem turned off by science.

"Every year it seems to get worse," he muses. "Incoming freshmen come in and announce: 'I can't do science.' It's a dislike, almost a fear, and I think it starts at a very young age, in elementary school. Yet we're all born with intellectual curiosity, a fascination with the

world around us. We've got to feed that or it goes dormant."

Dr. Grant is trying to feed it by training the teachers who train the students. It all started six years ago when he was working with teachers in science workshops conducted through the University of Virginia. "I got to know a lot of school teachers," he says. "Some were excited about teaching science but they just didn't have the background, and some dreaded the whole idea of teaching science. I started thinking about how to develop workshops for teachers with no science background to give them information in easily understandable form and also provide kits with materials they'd need."

Magnets to Matter

The first kits were developed from scratch last May in a Roanoke

College Intensive Learning course enrolling 15 students. One important consideration: the material developed meets the requirements of the Virginia Standards of Learning (SOL) and each activity lists a level of difficulty, per the SOLs. The subjects covered were matter, electricity, magnetism, sound, and light and optics. The kits contain everything the teacher needs: basic background information on the subject, suggested experiments, exam forms, ideas for homework. It's all in a thick binder accompanied by the materials needed for each experiment.

The kit on matter, for example, included an experimental material nicknamed "Glurp" and made of cornstarch and water. "It's a material that has the properties of both a liquid and a solid," Dr. Grant explains. "It pours like a liquid, but if you hit it hard enough, it acts like a solid and breaks into pieces. The kids are fascinated, but it's not all fun and games—they're learning a scientific fact, that things can have dual properties."

That was the start of something big—workshops for teachers across the Roanoke Valley. Staff from the Science Museum of Western Virginia in downtown Roanoke approached Dr. Grant, funding in hand, about doing workshops for the museum. Result: three physical science workshops to be held at the museum next spring for fifth grade teachers from Roanoke City, Roanoke County, and Botetourt County, 20 teachers to a workshop. The workshops will cover light and optics, sound, and electricity. Each teacher will get the binder plus appropriate materials, including lenses and flashlights for the light and optics workshop, tuning forks and containers out of which to make drums for the one on sound, and batteries, wires, and light bulbs for the electricity workshop.

Teacher Training Institute

Even bigger things may be in the offing. The Science Museum, in col-

laboration with Roanoke College, Virginia Tech, and Hollins University, is seeking funding to expand this kind of "inquiry-based" science teaching. Dr. Grant authored the institutions' proposal to the Howard Hughes Medical Institute seeking nearly \$300,000 to establish a Teacher Training Institute for elementary, middle, and high school educators, with the aim of enhancing their skills in teaching science. If successful, some of the funding will go to Roanoke College to develop additional physical science workshops and some will go to the other schools for projects like biotechnology and earth science workshops. The group hopes to have an answer by June of 2001.

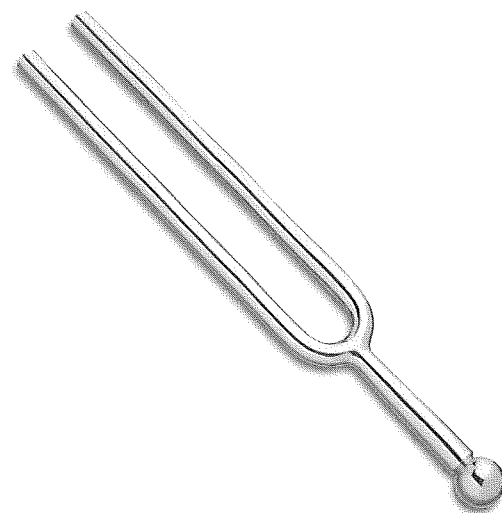
Understandably, helping revolutionize science teaching absorbs plenty of Dr. Grant's time but he's also engaged in "bench top" research, traditional laboratory research. In layman's terms, he explains: "What I do is applied research; I study materials, particularly galvaneal steel, which is steel that has a corrosion resistant material added to it." He calls himself a "blue collar experimentalist" but in fact he already has received one patent on galvaneal calibration standards, has authored a chapter of a book on the subject and has a number of professional publications on galvaneal steel and zinc-iron alloys to his credit.

Keeping Fine-Tuned

"Research is important; we need to keep active and on the leading edge of our discipline. It keeps us fine-tuned and interacting with other physicists out there in the physics world. That's one part of my professional development, but the other is trying to do something about the way science is taught," he notes.

A native of Canada, Dr. Grant earned a B.S. in physics at the University of Toronto, an M.S. in physics at the Florida Institute of Technology, and an M.S. in applied physics and his Ph.D. in physics at Old Dominion University in Norfolk. He joined Roanoke College in 1996 after a year teaching physics at Hollins.

At Roanoke College, he's already earned a college Faculty Starter Grant, helped write a proposal to the Alden Trust that won \$75,000 for integration of lab and lecture in introductory science courses, and



has been named a Faculty Scholar for the years 2000-2003.

About the College, Dr. Grant observes: "There's a lot of positive energy here. Overall, the faculty and the administration seem to be conscious of where they want Roanoke College to be in the future and they're moving things in that direction. Of course there will be bumps in the road, but we seem to have a clear focus on where we want to go.

"What students get here and not at a big school is personal attention from professors, a broad background, the whole liberal arts experience. At

Toronto, I only had to take one humanities and one social science course. That didn't prepare me to write papers or read the literature or communicate. I never once sat down one-on-one with my professor.

"Here students come in to chat about whatever happens to be on their mind, cosmology, or something they read. Even if I don't know the answer we can bat it back and forth and talk about it. I wouldn't want to be stuck in a lab."

He describes his teaching style as "relaxed and laid back. It's two way; I want students to ask questions, to

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start a dialogue. I'll work in fun stories or anecdotes that help students understand the concept. I like to use demonstrations because if you can visualize what's going on, you'll remember it a lot better than just hearing somebody talk about it."

Dr. Grant developed the physics course for non-science majors, Physics 101, that integrates lab and lecture. He also teaches Fundamentals of Physics to students majoring in other sciences as well as many of the courses for physics majors. His goals differ depending on the course.

The Big Picture

"For physics majors, besides trying to give them what they'll need in their next course or in grad school, I try to get them to understand the big picture. It's fairly common for students to look at courses as discrete chunks of knowledge rather than integrating them into a total package, a working knowledge of the world around them. When they can do that, when they can pull it all together, they'll have a much better appreciation of what it means to be a physicist."

He says he gives science majors the physics they'll need as biologists or veterinarians, but also tries to give them a different perspective. "They get so focused on their own science that it's difficult for them to view a problem from a different perspective," he says. "That's true for all of us—it's hard to pull ourselves out of our comfort zone."

Poetry to Physics

"I once had a professor who told the class if they'd read more poetry, they'd be better physicists.

I thought he was nuts at the time, but I've learned over the years that it's true."

Non-science majors, he says, need a "wow factor," something that makes them understand what's happening, makes them say, "Wow! That's neat." He explains: "On the first day of class, I may ask the students what path a ball will follow when it is thrown off a cliff. I'll put up a transparency that has all the various paths: fall straight down, continue horizontally and then suddenly fall, etc. The students must predict the right path, and then we

do a series of experiments, rolling a ball off a table, for example, so they can observe the phenomenon, called projectile motion.

Road Runner Syndrome

"They're conditioned to think the ball will suddenly freeze in the air and plummet straight down, the way they've seen it happen in Road Runner cartoons. But it doesn't happen that way. I'm trying to make a serious point: that we're biased in the way we view the world by the experiences we've had, or by seeing too many cartoons. So we don't always know what's going on. To be scientific we have to forget those biases, observe what's going on, and draw conclusions from those observations even if they go against expectations, and we then have to modify our view. It's part of the whole scientific process."

In his spare time, Dr. Grant plays guitar and piano. He also plays defense on the College Club ice hockey team. ("What do you expect? I'm a Canadian," he laughs). His wife Jackie is associate executive director for the YMCA of Roanoke Valley.

Above all, he's a man with a mission. "What's more important, writing an article for an obscure science journal or changing the way that science is taught? To me, they're both important. Professional development embraces both."

He adds: "This is the greatest job on earth. You feel like you're making a difference and you can let your creative juices flow as much as you want. The flexibility of what you do, how you do it, how much effort you put into it is totally up to you.

"If you've got an idea of how you might do something differently and you have the energy to do it, you have the freedom to do it here. Not too many jobs out there encourage and reward that kind of effort. This one does."

