The Role of Basic Research at AASCU Institutions

When it comes to recognition for basic research, the spotlight always seems to shine on the same handful of large, high-profile universities. But scores of other institutions also create basic knowledge, and although their contributions may not be as well known (or as well funded), they are no less significant.

Across the AASCU membership, for example, many institutions maintain a bedrock commitment to basic research—and have accomplishments to prove it. Consider these examples:

- Jennifer Gray, an undergraduate student at UNC Asheville, researches original 13th and 14th century manuscripts of Henry of Ghent’s Quodlibet IV. Pursuing what she calls “humanistic research at the highest level,” she views her work as a window into the mind of that significant medieval philosopher.

- In a finding that experts dubbed quite rare for North America, a doctoral candidate at Northern Arizona University recently discovered a new genus of cave cricket. With a colleague, NAU graduate student J. Judson Wynne, a cave research scientist with U.S. Geological Survey’s Southwest Biological Science Center, made the
discovery in Grand Canyon-Parashant National Monument in northwestern Arizona.

- Bowling Green State University is one of 12 institutions nationwide to pilot the U.S. Department of Energy’s Microbial Genome Annotation research program. The first genome they’ll analyze is a microbe found in Indonesian volcanic hot springs. “If we can learn how life can survive in these environments, it can help us address some of our environmental and energy challenges today,” says Dr. Zhaohui Xu, an assistant professor of biological sciences.

- In a study published last October in the preeminent journal Nature, a multi-national team led by Jerome Orosz, an associate professor of astronomy at San Diego State University, reported the discovery of the black hole M33 X-7—at 15.7 times the size of our sun, M33 is the most massive and the most distant stellar black hole known to man.

Basic research is pure research—investigation for the sake of knowledge. Driven by intellectual curiosity, it’s typically not motivated by commercial concerns. By its very nature, basic research typically doesn’t offer a return that can be measured in dollars.

Because we live in a world that tends to measure value according to return on investment, however, basic research raises a few salient questions. For one, in a profit-oriented world, what role is there for knowledge-for-knowledge’s-sake? And specific to AASCU institutions—on which there are multiple pressures to conduct applied research—how can such colleges and universities also maintain a commitment to the pursuit of knowledge via basic research? For such institutions, what constitutes a good mix between basic and applied?

**Distinguished findings**

Northern Arizona University is an example of an AASCU institution that balances a pronounced interest in scholarship with its role in teaching undergraduates. Based in Flagstaff, the university also operates in 35 sites around the state. While almost three quarters of NAU’s 20,000 students are undergraduates, the university offers nearly 50 master’s degrees and eight doctoral programs.

In terms of research, NAU is sometimes overshadowed by larger Arizona institutions to its south. Yet NAU researchers consistently announce findings that are distinguished, important additions to basic knowledge. The new-found cricket genus is one. And last September, two Northern Arizona University geologists were part of an international team that published much-cited evidence that a comet or asteroid caused mass extinctions of humans and animals at the end of the Ice Age. In yet a different discipline,

“We have found undergraduate research to be a very effective way . . . of introducing our students to intellectual inquiry . . .”

—Laura Huenneke

Eric Frost is Director of the SDSU Visualization Center, which tracks disasters such as the tsunami in the Indian Ocean and the recent wildfires in Southern California.
NAU anthropologist Kelley Hays-Gilpin is an expert on the meaning of Hopi petroglyphs.

“Our mandate is to be one of the research universities in the state, even though we’re not one of the flagship institutions,” says Laura Huenneke, vice president for research at NAU. In that context, Huenneke suggests, basic research plays a vital role. For one thing, she says, “The opportunity to pursue basic research is crucial to the kinds of faculty that we want to attract and retain.”

At an even more fundamental level, Huenneke believes basic research is implicitly important to the educational mission. “Without any basic research being done on your campus,” she says, “one is relying entirely on other people’s work or secondary sources to illustrate to students where our foundations of knowledge are derived. And that is more second-hand than a research university ought to be presenting.”

NAU actively engages undergraduate students in basic research—and views that engagement as a fundamental cog in its mission. “We have found undergraduate research to be a very effective way of providing research groups and the excitement of collaboration, even in disciplines where there’s not funding for enormous teams of PhD students or post-docs,” Huenneke says. “We’ve also found it a very effective way of introducing our students to intellectual inquiry and the possibility of graduate school or professional school.”

Engaging undergraduate students in research also helps NAU serve students who are the first in their family to go to college. “We have a fair number of first generation students and they don’t really know where these disciplines have come from, or the pleasures of intellectual primary work,” Huenneke says. “So undergraduate research is a very effective tool for acquainting them with the basics of these disciplines.”

Research continuum

At another AASCU institution, Bowling Green State University, basic research is also a critical element in the educational mission.

BGSU was established in 1910 to train educators. Today, with some 21,000 students, BGSU bills itself as the country’s 14th largest producer of teachers. Like many other state universities, BGSU feels some pressure to conduct applied research. “Universities are increasingly asked to play a role in regional and state economic development,” says Deanne Snavely, a professor of chemistry and acting dean of BGSU’s Graduate College. For instance, she says, “the state of Ohio is asking us to do more applied research, because many of the funding opportunities that come through

“Applied research that goes on at SDSU has as its foundation a whole host of basic research that gets less noticed by the community here.”

—Thomas R. Scott

Bowling Green State University’s Dr. Zhaohui Xu (right) and biology colleague Dr. Paul Morris. BGSU is one of 12 institutions nationwide to pilot the U.S. Department of Energy’s Microbial Genome Annotation research program.
public purpose

the state have to do with economic development.” Ohio is certainly not unique in that regard.

Snively suggests that one role for basic research at BGSU is as part of a continuum, with pure research laying the groundwork for applied research that might follow, and for the eventual translation of knowledge into practice. She cites an example in the context of BGSU’s commitment to prepare future teachers. BGSU researchers study how people learn, she observes, considering such questions as “how can we structure learning environments that will increase K-12 learning and higher education learning.” At its heart, she says, such questions fall in the realm of basic research, but they lead eventually to applications that can improve classroom learning.

As another example of the basic/applied continuum, Snively points to BGSU’s Center for Photochemical Sciences. As part of its work, Snively says, the Center explores the interaction of light with matter, “looking at fundamental processes that occur in chemical and physical systems.” While that work is basic research, she says, it has the potential to quickly translate into applications-focused research projects.

In campus conversations, Snively says, BGSU draws from Ernest Boyer’s work in thinking about applied research as part of the “scholarship of engagement.” But those conversations are also informed, she suggests, by an underlying recognition of what Boyer called the “scholarship of discovery”—or “what we would call basic research,” Snively says.

Blurring distinctions

In California, basic research traditionally has been the main focus of members of the University of California system, while schools in the California State University system have traditionally conducted applied research (or no research at all). Increasingly, though, those distinctions are becoming blurred. UC institutions have moved into applied research and CSU members are doing more basic research.

A good case in point is San Diego State University, a CSU institution and an AASCU member. Research has become a very significant part of the mission at SDSU—in fact, the university was recently named first on a list of “Top 20 Small Research Universities” in a study conducted by Academic Analytics, a research group based at SUNY’s Stony Brook University that looks at papers published, funding, and other measures of productivity.

Thomas R. Scott, vice president for research at SDSU, says that in part because it is in the CSU system, his institution’s contributions to basic research may not be as well known as, say, those at the University of California-San Diego. “Applied research that goes on at SDSU has as its foundation a whole host of basic research that gets less noticed by the community here,” Scott says.

Like Deanna Snively, Scott also views research as a continuum between basic and applied. Assuming that most faculty are conducting some level of research, he says, SDSU has as many as 800 different research programs going on at any one time. “If you picture a big, three-dimensional space, a cube, with 800 points in it, and look for where the densities are, it would be in a crescent that begins on a very basic level and ends on a very applied level.”

Scott outlines one example of a basic/applied continuum as follows: “It would start with biochemistry and then it would move through molecular biology—we’re still purely basic research at this point. Then it would move into behavioral neuroscience, where you start to get some applications, because the people in behavioral neuroscience are using the discoveries from molecular biologists to look at things like fetal alcohol syndrome, autism, language disorders, and so on, but they are looking at it from a neural point of view. Then you continue on to clinical psychology, where the treatment of the individual becomes the primary goal. There’s still a lot of research surrounding that treatment, but it’s considerably more applied. Then, you finish that continuum in the graduate school of public health, where the discoveries that are being made at the basic level are being taken out to the community to try to address obesity, smoking, alcoholism, drug use, and the many things that plague a community like ours, which has such a diversity of cultures.”

In view of such a progression, Scott says, “I wouldn’t know where to draw a line, exactly, between basic and applied research, but I would say we do an awful lot of both. It’s the applied that gets more high profile recognition in the community, but it wouldn’t exist without the basic research that underlies it.”

As specific examples of basic research at SDSU, Scott cites work by university geographers to map the surface of the world (research that was applied to pinpoint likely locations...
of survivors of the Banda Aceh tsunami and to guide rescue missions after Hurricane Katrina); literature studies by a professor who heads the International Virginia Woolf Society; and investigations of bone density by researchers in the exercise and nutrition sciences.

“We are in a city that reveres us, San Diego State University, for our commitment to the citizens of San Diego and for our teaching mission, that doesn’t yet fully recognize what a research university we have become,” Scott says.

If there is a takeaway message in the discussion of basic research at AASCU institutions, it is perhaps that the pure development of new knowledge is woven into the fabric of what constitutes many AASCU institutions today. It may not be as public or prominent as applied research, but basic research clearly helps AASCU colleges and universities fulfill their fundamental commitment as educational institutions to discovery at the highest levels. Beyond that, basic research goes hand-in-glove with applied research—it is a fundamental building block for the development of translational applications for which AASCU institutions are arguably more well known. Without basic, in other words, there would be no applied.

Important, too, is the role that basic research plays for undergraduates, drawing students into the excitement of intellectual inquiry and opening doors for further study and career choices. The process of conducting basic research opens students’ eyes to some of the most fundamental questions they will ever face, and invests them with ways of knowing and learning that they will carry for the rest of their lives.

Finally, another part of the takeaway message is that AASCU institutions can and do produce breakthrough findings on a par with any other institution of higher learning. As just the few examples in this article show, basic research at AASCU institutions leads to important new knowledge every day. Consequently, the message to the research community might be this: If you’re looking for the next big thing, you better make sure AASCU institutions are on your radar.

Talking specifically about Northern Arizona University, Laura Huenneke could be describing many other AASCU institutions. “Research is crucial to who we are,” she says. “Sometimes it’s frustrating to be the smallest of the research institutions in the state. It’s easy for people to forget about you in comparison to the giants. Yet [research] is just absolutely essential to our identity and our effectiveness.”

Writer/editor Stephen Pelletier is based in Rockville, Maryland.