BREAKING NEWS!

SCIENTISTS MAKE SHRIMP EXERCISE TO HELP SAVE FISHING JOBS IN THE GULF

ROBOT DEMONSTRATES TOWEL FOLDING ABILITIES

MAY HELP IMPROVE THE QUALITY OF LIFE FOR SICK AND ELDERLY

FEDERAL MONEY GOES TO RESEARCHING WHY BOYS LIKE TRUCKS

COULD IMPROVE UNDERSTANDING OF AUTISM

ALSO IN THIS EDITION: A SHORT HISTORY OF ATTACKS ON SCIENTIFIC RESEARCH
Golden Fleece, or Golden Goose?
A History of Targeting Silly Sounding Science

Scientific research grants have often been a target for those hoping to gain quick political points by exposing “wasteful” government spending. With their sometimes obscure subjects (e.g., fruit flies, worms, zebrafish, rats, yeast) and odd-sounding titles, research projects are easy to pick on. Often, critics don’t take the time to understand the purpose of the research. If they did, they might be slower to call it wasteful.

Senator William Proxmire of Wisconsin was one such critic. In 1975, he began issuing the “Golden Fleece Award” to agencies responsible for what he considered to be “the most outrageous examples of federal waste.” The Golden Fleece Awards received a great deal of media attention. Unfortunately, Senator Proxmire sometimes misfired, and this was particularly true when it came to scientific research, one of his favorite targets. To portray research as silly or pointless, he often took the criticized project out of context or focused on a very small, funny-sounding portion of it. He would then imply that all of the grant funds were going towards that small, “funny” piece of the research, without ever explaining the broader context of the research project or its potential greater significance. Moreover, he usually raised these criticisms without having spoken directly to the researchers whose projects he targeted.

For example, one Golden Fleece Award was given to the National Science Foundation (NSF), NASA, and the Office of Naval Research in 1975 for a grant to determine why rats, monkeys, and humans clench their jaws. Senator Proxmire claimed that the researchers had “made a monkey out of the American taxpayer,” but the purpose of the project was to understand the biological causes of aggression and to develop a way of objectively measuring it by concentrating on behavioral patterns, such as jaw clenching, that arise from exposure to stress. This research was of particular interest to both NASA and the Navy, both of which needed to address problems associated with confining humans to small spaces for extended periods in space and underwater. The researcher ended up filing a lawsuit against Senator Proxmire for libel that reached the Supreme Court, and the Senator ultimately made a far-reaching apology to the researcher on the Senate floor.

Another Golden Fleece Award went to the National Institute on Alcohol Abuse and Alcoholism for a study on alcohol and aggression in fish and rats. The purpose of the research was to obtain a better understanding of the relationship between alcohol and aggression in humans. Senator Proxmire asserted that the most effective way to understand human conditions was to study humans. However, conducting certain research on humans is difficult and raises ethical and moral issues. Therefore, much of the scientific research designed to obtain a better understanding of humans is done through the use of “model organisms.” [See Scientific Enquirer, Vol. 2, for other examples.] This was a clear case of politics getting in the way of important science.

Finally, Senator Proxmire famously apologized to researchers for the Golden Fleece Award he gave to the Department of Agriculture for a project it sponsored to develop environmentally sound alternatives to insecticides. Researchers studied the mating habits of the screwworm, an agricultural pest that had become a major problem by the 1950s because of its deadly effects on cattle. The project, having originally cost about $250,000, ultimately saved the U.S. cattle industry over $20 billion. Senator Proxmire, who had decried scientists for studying “the sex life of the screwworm,” apologized to them and retracted the Golden Fleece award. [See Scientific Enquirer, Vol. 1, for a more complete account of this episode.]

Imagine if we stopped funding research just because it sounded strange. Consider, for example, “The Excretion of Urine in the Dog,” a paper written by a National Medal of Science recipient. His research ultimately led to vital information on the function of the human kidney and widened our understanding of diabetes. Another example is a study entitled “Acoustic Trauma in the Guinea Pig,” which led to treatment for early hearing loss in infants. And a study of the blood pressure of pregnant seals when they dove to find food in Antarctica gave us clues to the causes of Sudden Infant Death Syndrome (SIDS).

There are many examples of federally sponsored (and other) research that, despite sounding funny, not only further our understanding of important scientific concepts and phenomena, but also lead to tangible improvements in standards of living and quality of life here and around the world. So, the next time you hear someone labeling scientific research as silly or wasteful, think of the studies of aggression in monkeys, alcohol in fish, or the screwworm. And remember, if we choose to stop funding such research, we may kill the very goose that is destined to lay a golden egg.
Shrimp on Treadmills: Racing to Save Marine Life and Support the U.S. Fishing Industry

When videos of shrimp running on treadmills went viral across the Internet in 2008, viewers laughed. Then they wondered what the purpose of such research might be, particularly when they learned that this research was funded by NSF. Today, with budgetary pressures growing, this research has been targeted as wasteful and frivolous.

We all can agree that a video of shrimp on a treadmill put to music is pretty funny. And taxpayers deserve an explanation when federally funded research seems to produce more giggling than useful information.

It turns out that, outside of the video, there is nothing funny about this research. In fact, this is a serious, peer-reviewed project aimed at understanding marine ecology and protecting the livelihoods of fishermen who depend upon the ocean’s bounty. Many crustaceans, such as shrimp and crabs, live in coastal waters like the Gulf of Mexico, where they are important sources of income to entire communities…as well as important (not to mention delicious!) sources of nutrition for all.

In many places, including the Gulf, shrimp and other shellfish are subject to significant environmental stresses, potentially threatening both the marine ecosystem and key elements of the fishing industry. Oxygen depletion, also known as hypoxia, is a primary concern for these crustaceans. Researchers at the College of Charleston aimed to find out how they cope with increased environmental stress. In their natural ocean environments, shrimp live in moving water, which requires them to move constantly in order to survive. So these scientists wanted to know how hypoxia, in combination with a decline in the shrimp’s immune defense against bacteria, interferes with their ability to move.

Of course, it is much easier to study shrimp in tanks, so researchers developed a “treadmill” to imitate flowing water and get shrimp to move the way they move in the ocean. It may look funny, but it’s actually pretty smart. We don’t laugh when doctors get their patients on treadmills for stress tests to measure heart health. This isn’t much different.

This research is also extremely important in predicting the present and future effects of increased pollution and other environmental changes on marine life, and in protecting the fishing industry from natural and man-made disasters. The 2010 Gulf oil spill, and the large amounts of farm runoff that flow annually into the Gulf from Mississippi River floodwaters, affected oxygen levels and harmed shrimp and other marine life in the Gulf. For shrimpers and fishermen in the Gulf region, proposing to cut research that could help to mitigate the impact of these disasters on shrimp populations is no laughing matter.

Understanding Toy Preferences: Understanding Autism

Do boys like trucks and girls like dolls? If so, why? Do we really need research into these questions? Are studies that ask questions like this — many of them in the social and behavioral sciences — merely...childish?

Gender research often comes under attack. Why spend federal money on something which is seemingly obvious to any parent? Yet, scientific investigations of this nature often produce important discoveries that aid our understanding of the development of human behavior, and in turn aid our understanding of psychological and behavioral disorders.

What is the connection between this research and these illnesses? Here’s one example: Researchers at Texas A&M University have been studying toy preferences in infants in order to better understand behavior development and disorders, such as autism. In their NSF-funded research, these researchers used eye-tracking methods to figure out toy preferences. They first studied toy preferences in monkeys, which exhibited the same gender preferences as humans do; that is, female monkeys were attracted to "feminine" toys, such as dolls, and male monkeys were attracted to "masculine" ones, such as trucks. Until recently, numerous experts believed human babies develop such preferences only through culture and learning, influences monkeys do not face. Further study found that human babies exhibit these preferences as early as three months old — too early, scientists say, to have been caused by learning. Gender preferences in toys, the researchers found, must be due chiefly to a child's biological makeup and hormonal levels in early development. This discovery has changed the way we understand the effects of both biological and social influences on young children.

These same hormones affect more than just gender differences; they can affect behavior more broadly, including temperament, verbal development, and activity levels. Indeed, some
behavioral disorders, like attention deficit hyperactivity disorder (ADHD) and autism, may be triggered by abnormally altered levels of hormones like testosterone. Autism is diagnosed much more frequently in boys than girls, and by looking at and connecting toy preferences to hormonal changes in early infants, these researchers are helping to develop a better understanding of how disruptions in hormonal levels may affect behavioral development.

This type of research could also lead to a better understanding of how behavioral disorders associated with altered hormone levels, such as autism and ADHD, originate and develop in young children. However, much more study needs to be done in these fields to perfect our understanding of the connections between hormones and behavior. Such fundamental understanding of what causes behavioral disorders may also ultimately further our understanding of how to better address and treat such disorders. This is another example of research that looks simple, but actually addresses important societal issues and can also have a significant impact on human health.

**Robots Folding Towels: Waste of Taxpayer Money, or Key to Safer Surgery?**

Funding research dedicated to making a robot that can fold laundry: what could be a sillier use of taxpayer dollars? And can’t they do that already? Until recently, the answer was no! It’s true that robots, once the stuff of science fiction and entertainment from “The Jetsons” to “Star Wars,” are being used more and more in the real world: they are sent into space, help build cars, and defuse bombs. Robots are starting to perform highly complex tasks.

Folding malleable objects, like towels, is actually a challenging, complex task for a robot. Researchers at the University of California, Berkeley, funded by NSF, have indeed succeeded at engineering a robot that can fold towels. This type of progress is actually very important to robotic science. The larger goal of this research is to develop new mathematical algorithms that permit robots to perform much more complex tasks than they already do. Part of the research involves teaching robots to manipulate different materials in novel ways. It may not seem impressive, but it is actually an important breakthrough in robotic technology. And manipulating malleable objects will be essential for some of the missions and tasks that we assign to robots in the future.

Robots that do standardized tasks, such as picking up bolts and assembling cars, are designed to work with precision and repeatability in highly controlled environments. But if the object in question is something the robot has never “seen,” it is much more difficult for the robot to perform the task. If we want robots to be useful beyond the factory floor, they must be far more sophisticated in terms of their ability to operate in unpredictable situations and to effectively deal with complexity.

Where can these more sophisticated robots be useful? Among the practical applications of such research is giving robots the ability to perform tasks that significantly increase the independence of elderly and sick people, such as folding clothes, cooking meals, cleaning, and other tasks that may be physically straining. This would allow people to remain living at home, rather than moving to nursing care facilities.

Such robots could also protect our soldiers in combat, carry out cleaning and repair missions in dangerous environments, or perform mobile search and rescue after disasters such as the recent earthquakes in Japan. They could also help enhance the manufacturing sector, and in doing so might return some overseas manufacturing operations to the United States.

Robots that can perform complex tasks could also be used in medicine. For example, robots could perform delicate surgical tasks, such as the placement and movement of needles. Robots that can perform such tasks may even allow for remote surgery, where a doctor could perform surgery on a patient located across an ocean by manipulating the robot through a computer.

The Berkeley researchers succeeded in developing robots that can fold laundry within the first six months of a four-year project, using only a small portion of their grant money. With more time, who knows what they will accomplish? While these robots may not have the complete skill set of the Jetsons’ maid Rosie, or of C-3PO or R2-D2, this research on robots has the potential to make us safer and healthier, and to revolutionize our lives in ways we can’t yet imagine.