Response to Senator Paul's "October 2016 Waste Report"

The National Science Foundation (NSF) has been the backbone of America's science and engineering research enterprise for over 70 years. In fact, NSF is the only federal agency that supports all fields of fundamental science and engineering research and education. NSF supports cutting-edge research projects — many of which serve as bellwethers for solutions to the myriad complex issues facing society. NSF programs also traditionally integrate research and education, fast tracking innovation excellence via hands-on learning to train our next generation of researchers and innovators.

Each year, NSF competitively awards thousands of grants that collectively advance our nation's scientific capabilities and engage the talents of hundreds of thousands of researchers, postdoctoral fellows, technicians, teachers and students in every field of science and engineering.

NSF is the primary source of federal funding for non-medical basic research, providing approximately 12,000 new awards annually. Through its merit review process, NSF ensures that proposals submitted are reviewed in a fair, competitive and in-depth manner. Competition for funding is intense, with only about one out of five proposals ultimately being approved.

Each proposal submitted to NSF is reviewed by science and engineering experts well-versed in their particular discipline or field of expertise. All proposals submitted to NSF are reviewed according to two merit review criteria: *Intellectual Merit* and *Broader Impacts*. NSF's merit review process is widely considered to be the "gold standard" of scientific review. Perhaps the best evidence of NSF's success is the repeated replication of its merit review model for discovery, education and innovation around the globe.

The results of this process — funding the best and brightest ideas through competitive merit review — have been profound. NSF-supported research has underpinned multitudinous discoveries leading to new inventions — the Internet, web browsers, Doppler radar, Magnetic Resonance Imaging, DNA fingerprinting, and bar codes — to name a few. These diverse examples underscore NSF's significant contributions to our nation's prosperity, health and wellbeing. NSF-funded discoveries have expanded our understanding of the world in which we live, led to life-saving medical advances, enhanced our national security, improved our everyday lives and yielded insights into the creation of the universe.

NSF's task of identifying and funding work at the frontiers of science and engineering requires keeping close track of research around the United States and the world; maintaining constant contact with the research community to advance the horizons of inquiry; and choosing the most promising people to conduct the research.

The following grants cited in the "October 2016 Waste Report" illustrate examples of promising NSF-funded research awarded support through the merit review process.

The article referenced in the waste report was only secondarily related to the initial project funded by NSF. The NSF-funded project explored how digital media multitasking is associated with errors, stress, and degraded performance in millennials. This was the first project to look at digital multitasking in social and immersive media for young adults who have grown up as "digital natives." Prior to this project, multitasking had always been studied from an individual perspective—no one had studied multitasking as a collaborative social system.

Multitasking refers to the nearly simultaneous use of more than one system, and how one system may offset the emotional stress caused by another.

The project was based on the hypothesis that those growing up with technology might show different responses to multitasking from those who learned the technology as an adult. The project looked at many factors indicative of information overload and distraction and explored users' emotions as they interacted with social and immersive media. Understanding the impact of information technology on the psychological conditions of its users contributes to design improvements in such technology.

CAREER: The Role of Prosody in Word Segmentation and Lexical Access; and Making words disappear or appear: A neurocognitive and behavioral investigation of effects of speech rate on spoken word perception
NSF Awards 0847653 and 1431063
October 2016 Waste Report: "One small step for waste, one giant leap for wastekind"
Michigan State University

Award 0847653 is a Faculty Early Career Development (CAREER) Program award. CAREER awards support junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education, and the integration of education and research within the context of the mission of their organizations. The issues examined in the work are crucial for improving a variety of speech technologies, including automatic speech recognition and automatic translation.

The award focused on the contributions of voice pitch, loudness, and speech rate to understanding spoken words. The research also holds potential for significant advancements in human health, technology, and science. For example, perception or production of voice pitch, loudness, and/or speech timing are often highly disrupted in many disorders affecting speech and language, including dyslexia, autism, stuttering, Parkinson's disease, aphasia, and dysarthria.

Award 1431063 focused on how and why speech comprehension remains robust despite considerable acoustic variability, especially when caused by speaking at different rates. The research may offer insights into treatment of disorders that involve disruption of speech rate (e.g., dysarthria, stuttering, Parkinson's disease, and aphasia), inform approaches to improve speech technology applications (e.g., enhanced automatic speech recognition, more natural sounding computer-generated speech), and lead to new discoveries related to brain mechanisms involved in understanding spoken language.

The understanding of words and their constituent sounds are rate-dependent. The work explores how top-down knowledge (such as intelligibility and attention) affects rate-dependent speech comprehension. The effort also includes collaborative work with a primarily undergraduate institution, giving those students research experiences that would not otherwise be available.

The earlier award supported research that resulted in well over two dozen peer-reviewed publications, book chapters, and juried conference papers. The second award has already resulted in seven peer-reviewed publications in its first two years. The investigators have also mentored several students from groups traditionally underrepresented in science, including two students from the Ronald E. McNair Post-Baccalaureate Achievement Program, which is a program designed to encourage minority, low-income, and first-generation college students to expand their educational opportunities and pursue graduate studies.