

NASA, Nobel Prize Winners, and the “Normalization of Deviancy”

On Wednesday, November 10, 2010, Nobel laureate Dr. Douglas D. Osheroff was hosted by Howard University's physics department in Washington, D.C., via a program sponsored by the American Institute of Physics and funded by the Research Corporation. While there, he met with faculty and administrators, and also engaged about a dozen Howard graduate students in discussions of their research. He also gave a vibrant lunchtime seminar to a packed classroom on his involvement with the Columbia Accident Investigation Board (CAIB) following the Columbia shuttle crash. Later, after lunch and conversation, he presented a public lecture and answered questions for an appreciative audience about how scientific discoveries are made, highlighting his work with superfluid Helium-3.



Douglas Osheroff, 1996 Nobel Prize winner in physics, mingles with Howard University graduate students (Tulu Bacha shown), listening to their descriptions of their research, asking questions, and offering pointers.

It was an exhilarating day, especially for the students in attendance, including visiting undergraduates from University of the District of Columbia and Northern Virginia Community College (NVCC). Phoebe White, a sophomore at NVCC ventured to downtown DC for a chance to hear Professor Osheroff speak about his role in determining the causes of the shuttle break-up, and relayed the following report.

I remember hearing about the Columbia accident when it happened (I was twelve), but getting to listen to a firsthand account from a member of the CAIB was fascinating. Dr. Osheroff started by describing the Board and indicated that, despite initial reservations about the time commitment involved in serving on the CAIB, he could not resist the temptation to follow in his former professor's footsteps, namely, one Richard Feynman. Feynman served on the board that examined the Challenger shuttle disaster, famously and dramatically showing that the O-rings were the main problem in that catastrophe, but also pointing out that there were communications problems between NASA management and technical staff--something Dr. Osheroff

saw as well. Most people now know that the reason behind the Columbia disaster was a piece of foam falling off of the external fuel tank and hitting the leading edge of the left wing. During his talk, Osheroff explained the steps leading up to this discovery and discussed the dangers of something he called the “normalization of deviance.”



Phoebe White, sophomore at Northern Virginia Community College, looks on as Douglas Osheroff prepares for his presentation about the Columbia shuttle disaster.

This rigid foam has fallen off of the external fuel tank on nearly every mission. NASA declared this occurrence “normal” rather than trying to figure out how to prevent it because up until Columbia, they had been able to ignore the problem without any serious repercussions. What happened with Columbia, however, was that a 0.5 kg piece of foam hit a recrystallized carbon (RCC) panel on the leading edge of Columbia’s left wing at about 800 feet per second (the velocity was comparable to that of a 22 caliber bullet, Osheroff says!). The RCC panels protect the shuttle during reentry, but one panel now had a gaping hole in it.

Although this fact was not known at the time, NASA engineers were gravely concerned that the foam may have damaged the wing. Management dismissed the risk. Even during the accident investigation, when CAIB suggested the foam may have damaged the wing, NASA *refused* to believe it, because the foam they use has a density 1/30th that of water. To test their hypothesis, CAIB re-created the scenario. Sure enough, the foam left a hole in the RCC panel approximately 10 inches wide.

Had NASA management listened to their engineers when this concern was initially brought up, Osheroff says, there were options. The crew of Columbia could have done an emergency spacewalk to attempt to repair the left wing, or a rescue of the crew could have been made by space shuttle Atlantis. However, because management is a “risk-noisy” environment under lots of cost and schedule pressures, where risk is not clear to them, management often chooses to ignore engineers and say “that’s normal; that’s what’s supposed to happen.” As Osheroff demonstrates, the normalization of deviance, as “normal” as it has become, can be deadly and needs to be guarded against.

Phoebe White,
Northern Virginia Community College



Douglas Osheroff converses at the closing reception with Howard University Physics Department Chair Prabhakar Misra and AIP Vice President of Physics Resources, Cathy O' Riordan.



Participants pose with Douglas Osheroff (kneeling, far left) outside of the Howard University Blackburn Center.



Howard students and faculty discuss physics and life and long-term prospects for US Helium supplies with Douglas Osheroff after lunch (above: graduate students Daniel Casimir and Monique Calhoun; at left, clockwise: Physics Lecturer Dr. Kayode Ogungbemi, along with graduate students Daniel Casimir, Julius Grant and Philip Kurian).

Pictures by Gary White