

## W. E. Moerner, WN6I, Nobel Prize 2014

"My early years as a ham in high school eventually led to study of electrical engineering, physics, and mathematics in college and optical studies of vibrations of molecules in graduate school. All of these experiences built upon themselves throughout my career, eventually leading to the optical detection of a single molecule in a solid in 1989 at IBM Research. This was achieved with laser FM spectroscopy (invented by Stanford alum Gary Bjorklund in 1980), which involves frequency modulating a light beam at low modulation index to detect narrow spectral features with quantum-limited sensitivity. Effectively, the single molecule acts as a demodulator of the FM signal, converting the FM to AM, much like good old FM radio, but at 560 THz. This was the beginning of single-molecule optical studies which are having a broad impact on imaging in chemistry, physics, and biology today. I will talk about science in my youth, and mostly concentrate on the original experiment as a signal detection problem similar to FM in ham radio, and briefly mention some of the current work."<sup>1</sup>

"William Moerner, WN6I, of Los Altos, a chemistry professor at Stanford University, will share the prestigious award ... [for] work in high-resolution microscopy or nanoscopy. For many years scientists had believed that an optical microscope could never yield better than 0.2 micrometer resolution."<sup>2</sup>



Prof. Moerner has long been associated with the Stanford Amateur Radio Club. We learn, "My future interest in electronics began ... when my parents gave me a diode or transistor radio kit in the first grade." In high school, "My outside scientific interests in electronics grew even more with Heathkit shortwave radios, and my father and I (WN5ARM) got our amateur radio licenses in 1970 with the help of the Radio and Electronics Club ... run by the physics teacher, Mr. Greenburg. Although I got distracted by other interests in college, amateur radio formed a foundation for my later work with lasers and it is still one of my favorite hobbies."<sup>3</sup>

<sup>1</sup> "FM Radio at 560 THz Enables Single-Molecule Detection and Spectroscopy, Paving the Way to the Nobel Prize," Special Lecture, Stanford Amateur Radio Club W6YX, Stanford, California, June 2, 2015.

<sup>2</sup> "Radio Amateur is Among Nobel Prize in Chemistry Winners," *QST* 10/08/2014, see <http://www.arrl.org/news/radio-amateur-is-among-nobel-prize-in-chemistry-winners>; see also B. Carey, "Nobel Prize for Stanford chemist W.E. Moerner," Stanford Report, October 8, 2014, see <https://news.stanford.edu/news/2014/october/moerner-nobel-prize-100814.html>

<sup>3</sup> "William E. Moerner, Biographical," The Nobel Prize, <https://www.nobelprize.org/prizes/chemistry/2014/moerner/facts/>