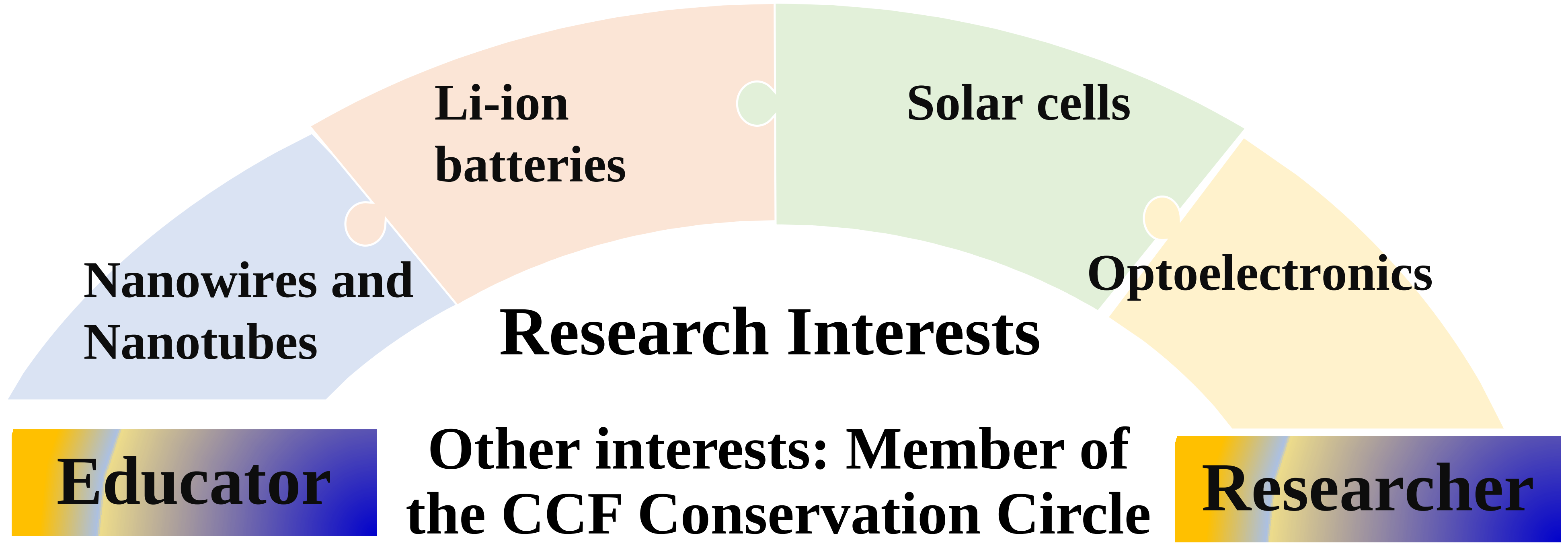
Dr. Amit Verma, The Educator of the Month, December 2022

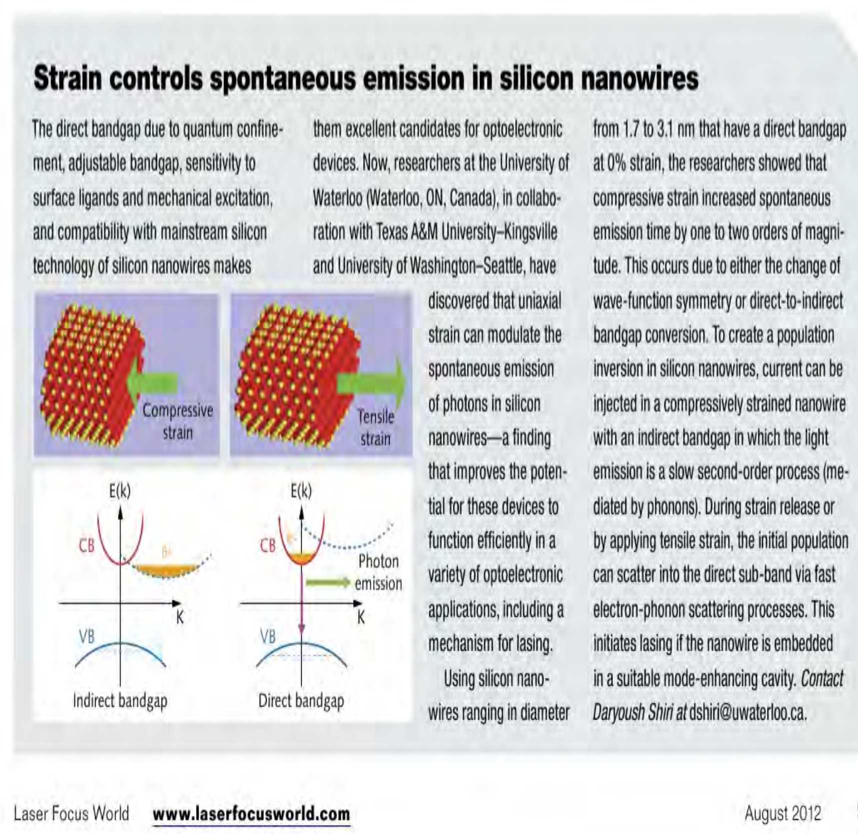


Dr. Amit Verma

- ✓Full Professor of Electrical Engineering;
- ✓Award-winning author of books in literary fiction
- ✓"Professor of the Year" award from the 2015 graduating class
- ✓TAMUK Faculty Senate President 2015
- ✓Co-holder of 7 patents and 1 pending patent
- ✓Notable inventions – a new class of microwave antennas; new power switching device
- ✓Co-authored about 60 peer-reviewed research papers – work has received wide media coverage
- ✓Opinion Contributor for Corpus Christi Caller Times and other news publications

Select Works:

1. Patent: A. Verma, F. Urbani, and D.W. Stollberg, "Integration of an Aperture-Coupled Nanofilm Microstrip Antenna in an Integrated Circuit Chip," United States Patent and Trademark Office, No. 9,679,828, June 2017
2. Patent: A.C.S. Ratcha, A. Verma, R. Nekovei, and M.M. Khader, "Heterojunction Schottky Gate Bipolar Transistor," United States Patent and Trademark Office, No. 9,793,430, October 2017;



Strain controls spontaneous emission in silicon nanowires

The direct bandgap due to quantum confinement, adjustable bandgap, sensitivity to surface ligands and mechanical excitation, and compatibility with mainstream silicon technology of silicon nanowires makes them excellent candidates for optoelectronic devices. Now, researchers at the University of Waterloo (Waterloo, ON, Canada), in collaboration with Texas A&M University–Kingsville and University of Washington–Seattle, have discovered that uniaxial strain can modulate the spontaneous emission of photons in silicon nanowires—a finding that improves the potential for these devices to function efficiently in a variety of optoelectronic applications, including a mechanism for lasing.

Using silicon nanowires ranging in diameter from 1.7 to 3.1 nm that have a direct bandgap at 0% strain, the researchers showed that compressive strain increased spontaneous emission time by one to two orders of magnitude. This occurs due to either the change of wave-function symmetry or direct-to-indirect bandgap conversion. To create a population inversion in silicon nanowires, current can be injected in a compressively strained nanowire with an indirect bandgap in which the light emission is a slow second-order process (mediated by phonons). During strain release or by applying tensile strain, the initial population can scatter into the direct sub-band via fast electron-phonon scattering processes. This initiates lasing if the nanowire is embedded in a suitable mode-enhancing cavity. *Contact Daryoush Shiri at* dshiri@uwaterloo.ca.

Laser Focus World www.laserfocusworld.com August 2012 9

Possibility of spontaneous optical emission in silicon nanowires

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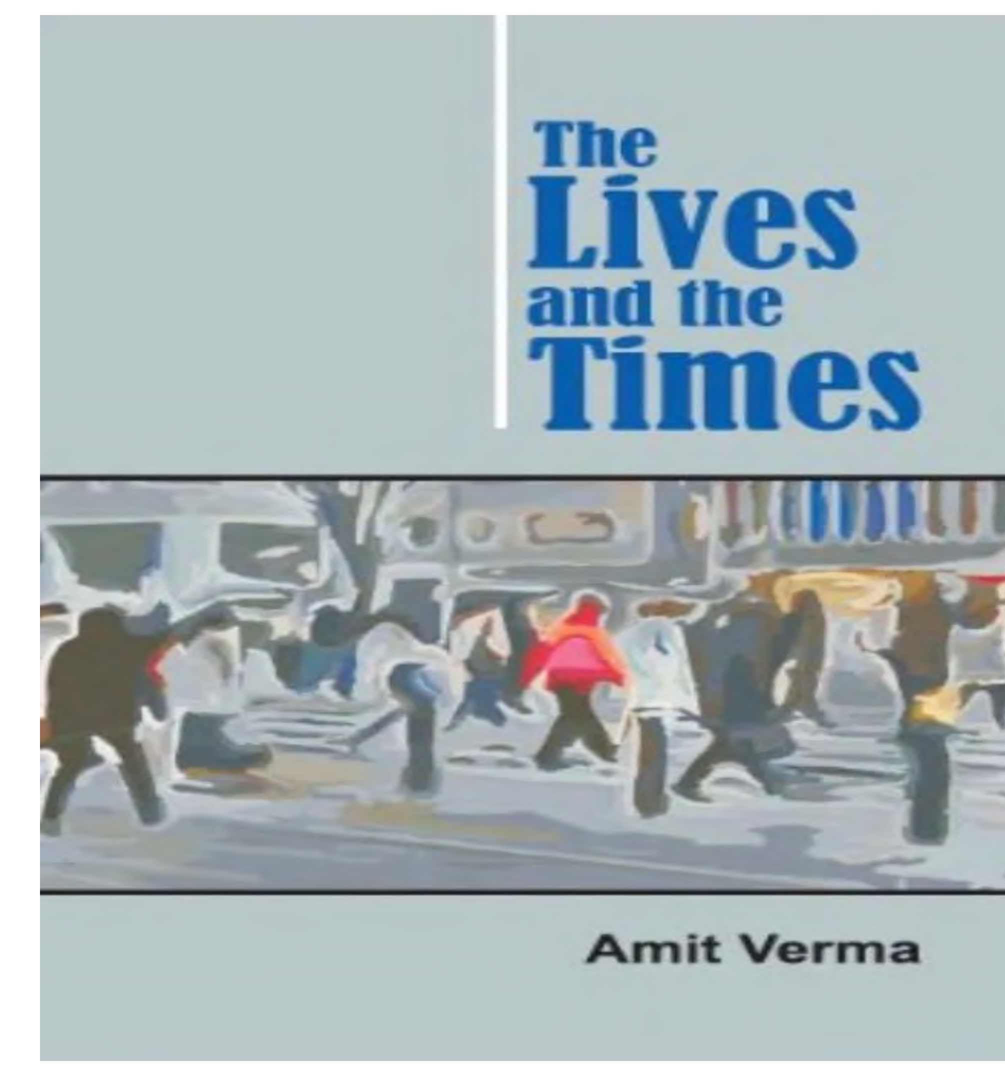
Texas A&M-Kingsville professors may be first to listen for electrons

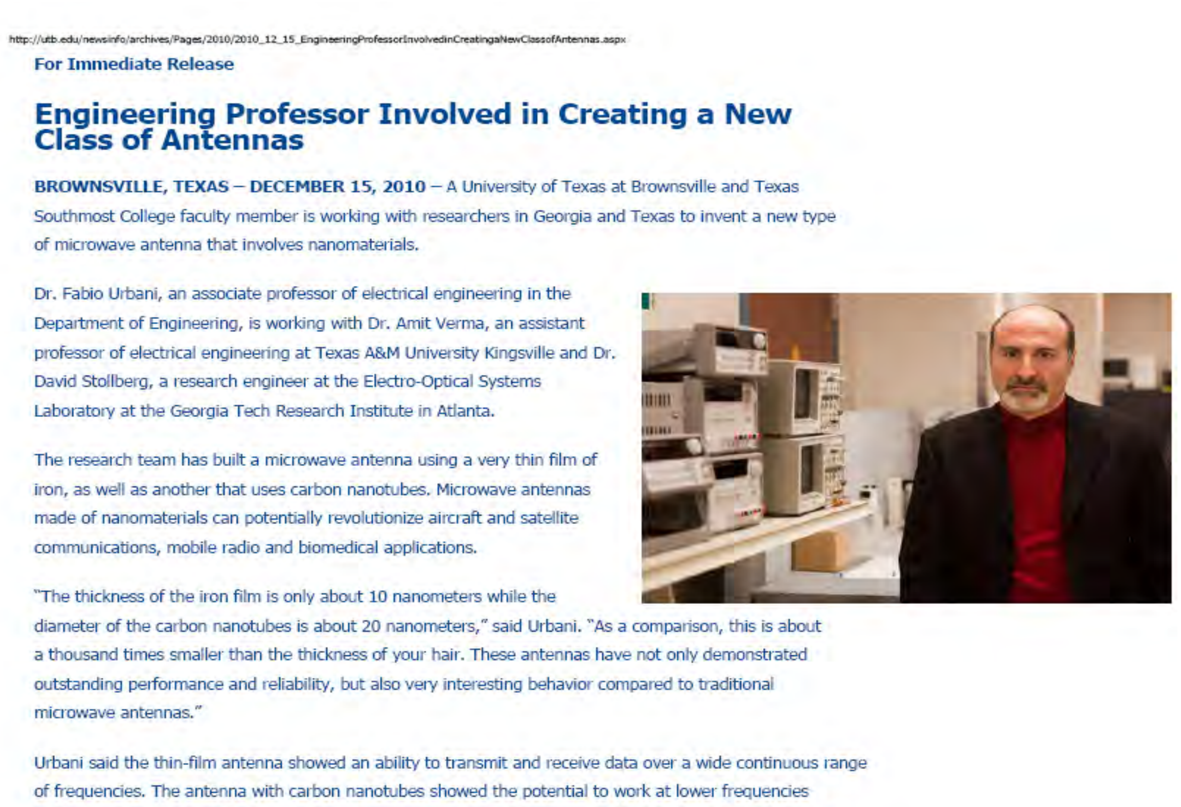
Posted on Friday, April 23, 2021

From left Dr. Reza Nekovei and Dr. Amit Verma, both professors in the electrical engineering and computer science department.

KINGSVILLE (April 23, 2021) — Drs. Amit Verma and Reza Nekovei, professors in the electrical engineering and computer science department at Texas A&M University-Kingsville, are listening. In a new paper, recently published in the Nature journal, *Scientific Reports*, Verma and Nekovei say it is now possible to hear electrons as they travel through a device.

In their paper, *On the feasibility of hearing electrons in a 1D device through emitted phonons*, they claim that electrons traveling through a one-dimensional material like a carbon nanotube, causes vibrations in the atoms in the carbon nanotubes with sufficient power to be detected by modern instruments. They were joined in the





http://utb.edu/newsinfo/archives/Pages/2010/2010_12_15_EngineeringProfessorInvolvedinCreatingaNewClassofAntennas.aspx

For Immediate Release

Engineering Professor Involved in Creating a New Class of Antennas

BROWNSVILLE, TEXAS – DECEMBER 15, 2010 – A University of Texas at Brownsville and Texas Southmost College faculty member is working with researchers in Georgia and Texas to invent a new type of microwave antenna that involves nanomaterials.

Dr. Fabio Urbani, an associate professor of electrical engineering in the Department of Engineering, is working with Dr. Amit Verma, an assistant professor of electrical engineering at Texas A&M University Kingsville and Dr. David Stollberg, a research engineer at the Electro-Optical Systems Laboratory at the Georgia Tech Research Institute in Atlanta.

The research team has built a microwave antenna using a very thin film of iron, as well as another that uses carbon nanotubes. Microwave antennas made of nanomaterials can potentially revolutionize aircraft and satellite communications, mobile radio and biomedical applications.

"The thickness of the iron film is only about 10 nanometers while the diameter of the carbon nanotubes is about 20 nanometers," said Urbani. "As a comparison, this is about a thousand times smaller than the thickness of your hair. These antennas have not only demonstrated outstanding performance and reliability, but also very interesting behavior compared to traditional microwave antennas."

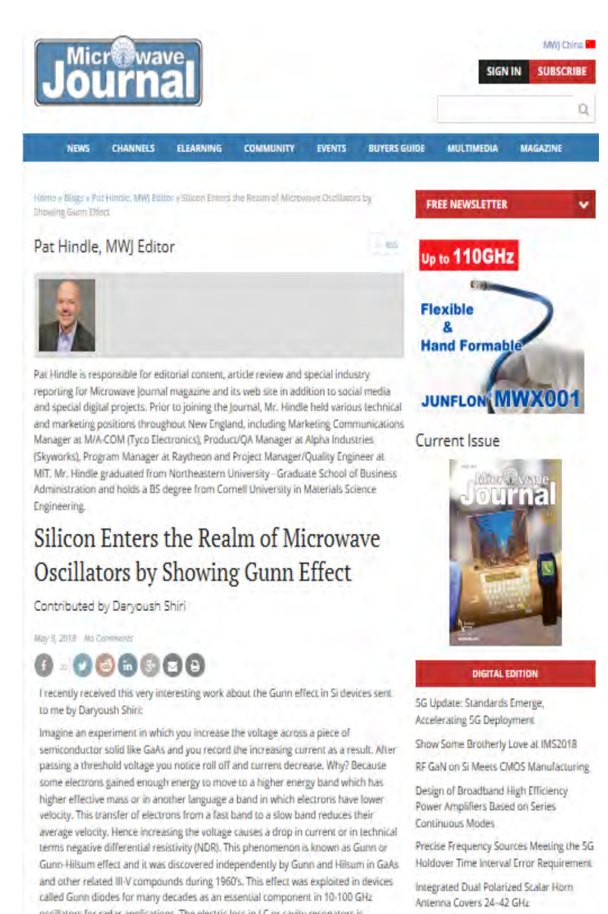
Urbani said the thin-film antenna showed an ability to transmit and receive data over a wide continuous range of frequencies. The antenna with carbon nanotubes showed the potential to work at lower frequencies compared to a traditional antenna, without increasing its size – something that has always been a challenge

Development of the first set of microwave antennas from nanofilms and nanotubes.

EurekAlert! AAAS

Silicon breakthrough could make key microwave technology much cheaper and better

UNIVERSITY OF WATERLOO



Microwave Journal

Silicon Enters the Realm of Microwave Oscillators by Showing Gunn Effect

Possibility of GUNN effect in silicon nanowires