

# 2014



## Science Fair on Capitol Hill

*Sponsored by*



**Now celebrating  
its 22nd year,**

the Toshiba/National Science Teachers Association ExploraVision (EV) science and technology competition challenges K–12 students to work in groups—assisted by a teacher and mentor—to simulate real research and development. Students are asked to choose a technology that is relevant to the world today and then explore what it does, how it works and how, when and why it was invented. The teams imagine their chosen technology 20 years from now and prepare an in-depth report and prototype that conveys their vision to others. Past ExploraVision winners have envisioned technologies ranging from a self-cleaning toilet to a new method of treating diabetes. Since 1992 the ExploraVision program has awarded \$4,680,000 (maturity value) to more than 330,000 participants. Up to \$240,000 (maturity value) in savings bonds and Toshiba products are awarded each year.

**Please stop by the Gold Room Rayburn 2168 on**

**THURSDAY, June 5**

**from 10:30 a.m. to 11:45 a.m. for the 2014 Science Fair**

- Preview the winning projects and meet the students (and parents, teachers and mentors) from the eight teams who were selected from a pool of over 15,000 participating students nationwide (see reverse side for a list of the winning teams).
- Learn more about how the ExploraVision science and technology competition is fostering innovation and inspiring students to pursue STEM and continue in the STEM fields.

# 2014 Toshiba/NSTA ExploraVision National Winners

## First Place

Grades K–3

### Hot Car Safety System

John Ross Elementary — Edmond, OK

The Hot Car Safety system warns when a car gets too hot for people or animals to be in the car by sounding an alarm. Weight sensors placed under the seats of the car ensure that the system turns on to protect all occupants.

Grades 4–6

### Plant Power – Super-hydrophobic Lotus Leaf

Locust Valley Intermediate School — Locust Valley, NY

This project involves the nano-imprinting of the lotus leaf pattern on airplane exteriors so that ice and snow no longer build-up and affect airplane safety. The surface of the lotus leaf is “super-hydrophobic,” and repels water. Currently, the airplane industry has to address ice and snow build-up after it has formed on the exterior of an airplane. The de-icing and anti-icing processes use chemicals that run-off into the water and impact the natural habitat. Our vision is to make airplane flight safer with this preventative measure.

Grades 7–9

### iGlasses - The Eyeglasses of the Future?

Marlboro Middle School — Marlboro, NJ

The eyeglasses of the future will provide improved vision, greater connectivity, and early detection of eye diseases. iGlasses will automatically adjust its lenses based on the object being viewed and the needs of the user's eye to provide perfect vision, eliminating continuous changes in prescriptions, need for bifocals, and eye strain. iGlasses will also provide the user with real-time content directly to the lens and scan the eye for problems.

Grade 10–12

### Quantum Dot Energy Harvesters for Powering Implantable Medical Devices

West Salem High School — Salem, OR

Presently, electronic medical implants such as pacemakers, defibrillators, and neurostimulators rely on batteries that require constant surgical replacement. A convenient and permanent solution will harvest the thermal energy of the human body through a simple heat engine made from quantum dots. Quantum dots are nanocrystals that exhibit special properties, namely their ability to easily morph into efficient semiconductors, which will revolutionize thermoelectric generators and supercapacitors. The Quantum BioEngine system will generate energy through temperature gradients of the body using a solid state chip implanted subcutaneously.

## Second Place

Grade K–3

### S.A.F.E.R. (Saving All Friends Escaping Rip currents)

Waldron Mercy Academy — Merion Station, PA

S.A.F.E.R. is designed to save people that become stuck in a rip current while swimming at the beach. It is a wearable, inflatable belt that stores both pressure and velocity sensors, and GPS technology that will save a swimmer from the dangers of a rip current.

Grades 4–6

### WaterRenew: Wave Power for Clean Water

Countryside Montessori Charter — Land O' Lakes, FL

WaterRenew, has wave wings to harness energy, and a cutting-edge desalination plant to generate drinking water from the ocean. The vacillating hydroelectric forces of the underwater swells provide renewable energy. The wave wings will provide electricity, with no extra carbon dioxide being released. A new reverse osmosis membrane made out of grapheme will trap salt while allowing water molecules to flow through.

Grades 7–9

### Kidney Microfilter Regulation Device (K.M.R.D.)

Northview High School—Duluth, GA

The Kidney Microfilter Regulation Device (K.M.R.D.) is an artificial silicone kidney that can be surgically implanted into a patient's body. It will have scanning nanofilters that will identify and regulate levels of phosphorous and other large particles in the blood that can be harmful in high concentrations as well as figure out what particles to let through the artificial kidney membrane. The K.M.R.D. will have most functions of a healthy kidney such as releasing hormones, balancing particles, and checking substance levels in the blood as well as medical reporting features.

Grades 10–12

### LTCHDTM using P-SOT

W. L. Mackenzie C. I. — Toronto, ON

We propose the use of fully photonic (using light alone) optical transistors to boost optical computing. These “optical transistors” would effectively achieve greater processing power. These optical transistors would use photonic-saturation to saturate a nanocrystal to the point where it stops absorbing light of a specific wavelength, consequently letting excess light pass through. Our optical transistor will be capable of running at multiple wavelengths, allowing each unit to perform the function of multiple transistors simultaneously.