You can't teach old materials new tricks

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A graphic timeline of key radiation detection material discoveries. Credit: Pacific Northwest National Laboratory

A more sensitive, more selective and easily deployable radiation detection material is necessary to meet complex 21st century challenges. In the AAAS symposium “Radiation Detectors for Global Security: The Need for Science-Driven Discovery,” researchers addressed some of the technical challenges and gaps and proposed a science-driven approach to uncovering novel materials that will benefit national security and medicine.

“Until now, it can be argued that we’ve approached the challenge in an

Edisonian-style; I think it's time to make a drastic change in how we pursue solutions to radiation detection," said Anthony Peurrung, director of the Physical and Chemical Sciences division at Pacific Northwest National Laboratory.

"In order for us to make new discoveries, we need to improve our understanding of radiation physics so that we make educated choices about which materials will and will not perform as we need them to, thus working more efficiently toward a solution."

Five primary materials are used for radiation detection, but they all have limitations, such as small size, challenges in manufacturing, poor discrimination of radionuclides and poor sensitivity. For example, single crystalline materials, used as semiconductors or scintillators, generally provide the highest sensitivity and best energy resolution. But, it can take a decade or more to develop high-quality, single crystals that are of sufficient size for use as radiation detectors, and there are a limited number of manufacturing facilities to produce the crystals.

Peurrung leads PNNL's Radiation Detection and Material Discovery Initiative, which is a three-year, $4.5 million research effort aimed at discovering new materials for radionuclide identification, accelerating discovery processes and improving our fundamental understanding of radiation detection.

Bill Weber, a Laboratory Fellow, organized the symposium. He is a AAAS fellow and is internationally recognized for his seminal scientific contributions on the interaction of radiation with solids and radiation effects in materials.

Source: Pacific Northwest National Laboratory