Prior to becoming involved in ellipsometry, Dr. Levi's research career ranged from the field of Raman scattering studies of confined phonons in semiconductor quantum wells to ultra-fast laser spectroscopy studies of intersubband electron scattering in semiconductor superlattices to time resolved photoluminescence measurement of carrier lifetimes in solar cells. In 1999 his manager at the National Renewable Energy Laboratory (NREL) asked him to make the switch from laser spectroscopy to ellipsometry and the rest, as they say, is history.

As NREL's primary researcher in ellipsometry, Dr. Levi applies ellipsometry to many different materials used for photovoltaics.

- Transparent conducting oxides such as ZnO, SnO_2, and Cd_2SnO_4
- Crystalline semiconductors such as silicon and ordered GaInP
- Nanostructured InAs quantum dots
- polycrystalline CdS, CdTe and $CuIn_xGa_{1-x}Se_2$
- Amorphous silicon
- Conducting polymers.

One of Dr. Levi's primary areas of interest the past few years has been the application of *in-situ* real time spectroscopic ellipsometry (RTSE) to study the growth of amorphous, nanocrystalline, and epitaxial silicon deposited by hot-wire chemical vapor deposition. The goal of this work is to use RTSE to expedite materials optimization while also gaining a better understanding of the growth process and its correlations with material properties and device performance.

The application of *in-situ* RTSE is also laying the groundwork for a new facility for process integration that is currently under construction at NREL. The goal of the new Science and Technology Facility is to more closely mimic the processing used in the photovoltaics industry so that NREL's R&D can be rapidly and directly transferred to industry. An important part of this transition is the development of *in-situ* diagnostics.

In-situ RTSE is a natural for this work.

In the big picture, Dean hopes his research will help make photovoltaics an affordable and widespread source of non-polluting energy.

When not in the research lab or crusading for renewable energy, Dean likes to travel and spend as much time as possible in the great outdoors of his home state of Colorado. He is pictured with his wife Diane during a backpacking trip to Conundrum hot springs in the Maroon-Snowmass Wilderness area of Colorado.

Photovoltaics provide a clean renewable source of energy by directly converting sunlight into electricity. Development of a thriving photovoltaics industry in the US provides a triple benefit by creating millions of good jobs while protecting the environment and making us more secure by reducing our dependence on imported oil.

Publications:

[1] D.H. Levi, B.P. Nelson, E. Iwanizcko, and C.W. Teplin, "In-Situ Studies of the Growth of Amorphous and Nanocrystalline Silicon Using Real Time Spectroscopic Ellipsometry", *Thin Solid Film*s, **455**, (2004) 679.

[2] D.H. Levi, J.F. Geisz, and B. Johs, "Effects of ordering on the optical properties of $GaInP_2$", *Proceedings of SPIE Vol. 5530, Fourth International Conference on Solid State Lighting,* (2004).

[3] S.H. Han, A.M. Hermann, F.S. Hasoon, H.A. Al-Thani, and D.H. Levi, "Effect of Cu deficiency on the optical properties and electronic structure of $CuInSe_2$ and $CuIn_{0.8}Ga_{0.2}Se_2$ determined by spectroscopic ellipsometry", *Applied Physics Letters* **85**, (2004) 576.

[4] D.H. Levi, B.P. Nelson, and R. Reedy, "Studying Early Time HWCVD growth of a-Si:H by real time spectroscopic ellipsometry", *Thin Solid Films*, **430** (2003) 20.

