# Professor Shuji NAKAMURA

Citation

Prof Shuji Nakamura should be everyone's technology hero. His is the ultimate story of the underdog who succeeded against all odds. Without a PhD, with few resources, and tucked away in an obscure company in a small town, toiling alone as an unknown engineer for ten years, he scored one of the biggest technological breakthroughs of the 20th century — the first successful blue light-emitting diode, or LED. In doing so, he beat the giants of research in Japan, the US, and Europe to the punch, and made possible his subsequent development of green and white LEDs and the blue laser. His is a modern-day David and Goliath tale in the world of science and technology — one to warm all hearts. He has singularly demonstrated that great science does not require great funds.

Prof Nakamura's science is real and applied, not theoretical. His groundbreaking achievements have far-reaching consequences for the life of people and for the health of the planet. The LED is considered by most to be the holy grail of lighting. Generating a lot of light but very little heat, the LED is 10 times more efficient and 40 times longer-lasting than an ordinary light bulb, with a life of 60,000 hours. This translates into huge energy savings and enormous reduction in carbon emissions. This environment-friendly source of light is revolutionizing the lighting industry.

Prof Nakamura's work has significant applications not just for lighting, but in many other industries as well. A couple of examples: His blue laser can be used to sterilize drinking water in less developed countries. With its shorter wavelength, the same blue laser light quadruples the storage capacity of a CD or DVD and gives greater resolution to a laser printer.

Prof Nakamura is an inventor extraordinaire. He is mechanically inventive, imaginative, and resourceful. Working in a small company with limited funds, he could not afford to buy the necessary equipment other scientists take for granted. He had to fall back on his own devices, building his own apparatus based on papers he read and patents he studied. He even had to build his own hydrogen-oxygen-fueled furnace, capable of melting gallium at 1500 degrees Celsius. There were inherent risks in operating this unstable home-made furnace. Explosions were heard from time to time with dense white smoke billowing out of the windows of his laboratory. His co-workers would rush in to see if he was still alive. There is no prize for physical bravery in science. If there were, surely Prof Nakamura would be its first and worthiest recipient.

Prof Nakamura's race against the corporate research giants in a quest that had eluded them all seemed like a hopeless decade-long chase. Perseverance, however, is his middle name. Described as "crazy" at times even by his own R & D manager, Prof Nakamura was ultimately able to silence his critics and doubters. His revolutionary breakthrough was an unlikely accomplishment — unlikely until you consider that this lone scientist in less than ten years wrote or co-wrote 146 technical papers, 6 books and 10 book chapters on the subjects of his research. He received his PhD degree in 1994 from the University of Tokushima, where he had earlier earned his master's and bachelor's degrees.

When his quest ended in triumph, he had put an obscure company, Nichia, on the island of Shikoku, on the world map of science and technology. When news of his intention to leave Japan leaked, he was inundated with offers of professorships from 10 American universities, two European ones and five US companies. On the day he left Japan, his departure was covered by no less than five Japanese TV networks — not bad for this one-time underdog of science!

When he left Japan in 1999, Prof Nakmaura accepted an appointment as Professor of Materials in the College of Engineering at UC Santa Barbara, where he is also the research director of the Solid State Lighting and Energy Center. He became a US citizen in 2005. Prof Nakamura has also held guest professorships at universities in German, Japan, and China.

For his stupendous achievements, and specifically for his significant contribution to global energy saving by developing highly efficient illumination systems, Prof Nakamura was awarded the 2006 Millennium Technology Prize by the government of Finland. Awarded every two years, this prize carries a cash value of one million euros, or nearly US$ 1.36 million. It is considered by many to be the equivalent, for technology, of the Nobel Prize, in both monetary value and prestige.

In 2002, Prof Nakamura achieved the rare feat of winning two major awards. He won *The Economist's* inaugural Innovation Award and was a co-recipient of the Takeda Award, which carried a prize 100 million yen. Honors and awards have continued to come thick and fast to Prof Nakamura — between 1994 and 2008, some 35 other awards were also heaped on him: the Nikkei BP Engineering Award in 1994 and 1996, the Sakura Award in 1995, the Materials Research Society Medal Award in 1997, the Innovation in Real Materials Award in 1998, the British Rank Prize in 1998, the Julius-Springer Prize for Applied Physics in 1999, the Honda Award in 2000, the Asahi Award in 2001, the IEEE/LEOS Quantum Electronics Award in 2002, the Franklin Institute's Medal in Engineering in 2002, the World Technology Award in 2002, The Blue Spectrum Pioneer Award in 2003, the Society for Information Display Karl Ferdinand Braun Prize in 2004, the Global Innovation Leader Award in 2006, the Santa Barbara Chamber of Commerce Innovator of the Year Award in 2007, and, most recently, the 2008 Prince of Asturias Award for Technical and Scientific Research.

What's next for Prof Nakamura? He is aggressively researching zero-energy-loss LEDs, which, as the name suggests, would be virtually 100% energy-efficient. Many of his fellow scientists hold that current LEDs are already nearing the theoretical limit of efficiency. True to his iconoclastic nature, however, Prof Nakamura is determined to once again test the limits of improbability. Given his track record, no one is willing to bet against him this time.

Thanks to Prof Nakamura's brilliance, maverick spirit, perseverance, and inventiveness, our world is a brighter and better place.

Mr Pro-Chancellor, on behalf of the Council of the Hong Kong University of Science and Technology, I have the great honor of presenting to you Prof Shuji Nakamura, Professor of Materials at the University of California, Santa Barbara for the award of Doctor of Engineering *honoris causa*.