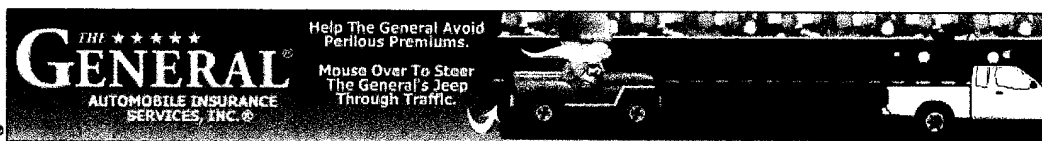


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BUSINESS BOOKSHELF

How one man showed them the light

Brilliant! Shuji Nakamura and the Revolution in Lighting Technology By Bob Johnstone Prometheus Books, \$28, 336 pages

By Robert Matthews
Financial Times

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How many people does it take to change the light bulb? One: Shuji Nakamura, inventor of so-called solid-state white lights made from light-emitting diodes, commonly known as LEDs.

In 1992, while working in the laboratory of an obscure Japanese chemical company, located on the smallest and least populated of the four main Japanese islands, this lone engineer triumphed where multinational research centers had failed. He created an LED that emitted dazzling blue light, the key step to mimicking sunlight itself.

When combined with a simple yellow phosphor coating, the result is a source of white light needing five times less power than the equivalent light bulb, lasting more than 10 times longer, and it produces any tone of white immediately — unlike today's low-energy fluorescent lights.

Nakamura's breakthrough is at the heart of a technological revolution that looks set literally to light up the world. Within a decade, LED-based lighting is likely to be a familiar feature in homes and offices, cutting fuel bills and greenhouse gas emissions.

Its effect on developing nations will be even more significant by bringing light to the 2 billion people for whom the setting of the sun means either being plunged into darkness or having to rely on oil lamps. High-efficiency LEDs running off stored solar power can keep the lights on until dawn.

Nakamura recently was awarded the second Millennium Technology Prize — the first winner being Tim Berners-Lee, inventor of the World Wide Web.

But it could easily have never happened at all, as technology writer Bob Johnstone shows in this compelling account of Nakamura's story, packed with salutary lessons for would-be Edisons.

"Don't follow the pack" is one tip. Nakamura pursued a route no one else thought would work — although his reasons for doing so are instructive.

As Johnstone points out, blue LEDs had first been made in the early 1970s but were hopelessly faint. That prompted researchers to throw their efforts into other approaches.

As a lowly research engineer with Nichia Corp. in Anan, Japan, Nakamura took the view that if those researchers were now on the right track, he didn't have a chance of beating them — so he opted to stay with the material they had abandoned, known as gallium nitride.

It was not an argument that appealed to Nichia's president, who — perhaps understandably — ordered Nakamura to stop wasting the company's money and start work on surefire products.

In the grand tradition of tales of geniuses versus plodders, Nakamura ignored the order from the boss and discovered a means of turning gallium nitride into LEDs emitting blue light 50 times brighter than that achieved by anyone else.

The initial response to Nakamura's claims was skepticism: Few thought so big a breakthrough could come from so small a company.

The first to recover from the shock was Cree Inc., a LED maker in Durham, N.C. Cree quickly sought a collaborative venture with Nichia. The response provides one of the many cultural insights of the story: "They were like, *gaijin* [foreigner] go home," one Cree executive told Johnstone.

Riled by the dismissive attitude, Cree then became the first of many to try poaching Nakamura. The sources of these offers give another intriguing cultural insight.

Whatever initial doubts there had been about Nakamura's brilliance, they soon evaporated as he followed up the blue LED with the first bright green and white LEDs and the blue laser — now at the heart of the Blu-ray video machines. Ten U.S. institutions tried to poach him, but only two offers came from Europe — and none at all from his home country.

In the end, Nakamura took up a professorship at UC Santa Barbara. Nichia responded by trying to sue him, alleging breach of nondisclosure agreements. The case was kicked out in 2002, by which time Nakamura had launched his own action against his former employer. It emerged that he had received just \$200 for each patent granted on his products — whose sales topped \$1.4 billion in 2001. Nakamura sought only about \$17 million. He was ultimately awarded half that amount, which was swallowed up by legal fees.

In the end, Nakamura has something beyond price: a place alongside the likes of Edison as technologists who have changed our world.

But his story suggests that although it took just one person to change the light bulb, there is no shortage of people who came close to stopping him doing it.

Robert Matthews is a science writer for the Financial Times of London, in which this review first appeared.

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