

Physics team that discovered new lightbulb wins Nobel Prize

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Scientist Shuji Nakamura, a Japanese-born American professor at the University of California, Santa Barbara, demonstrates LED lights during a news conference, Tuesday, Oct. 7, 2014, in Santa Barbara, California. AP Photo/Jae C. Hong

The Nobel Prize is the highest award a scientist can receive. Each year it is given out in different fields of science and the arts — even poetry. A committee in Sweden votes on who deserves the award.

In addition, each winner, or team of winners, receives a \$1.1 million prize.

This year the award in physics went for a discovery of a new lightbulb. It was given to Isamu Akasaki, Hiroshi Amano and Shuji Nakamura. In the 1990s they discovered blue light-emitting diodes — we call them LEDs.

The lights have made possible very bright lamps and screens like the ones used on flat-screen TVs, computers and cellphones. They use very little energy when compared with older types of lightbulbs.

"Something like a fourth of our electricity consumption goes to illumination," Nobel Prize committee member Professor Olle Inganäs of Sweden said. He spoke on Oct. 7 when the award was announced. "Having much more light for much less electricity is really going to have a big impact."

They Never Gave Up

The new Nobel award winners worked for years to achieve blue LEDs. When combined with red and green LEDs, they can create white light. Red and green LEDs have been around since the 1960s. Creating blue LEDs took about another 30 years.

"A lot of big companies really tried to do this and they failed," said Nobel committee member Per Delsing in Sweden. "But these guys persisted and they tried and tried again and eventually they actually succeeded."

The achievement required the growth of high-quality crystals, used as semiconductors. The team grew the crystals from gallium nitride, a semiconductor that produces blue light. Semiconductors allow electricity to flow between a conductor, such as copper, and an insulator, like glass.

Crystals Play A Big Role

Inside semiconductors, electrons and "holes," or spaces without electrons, can move around the crystal structure. Their movement allows electrical current to flow.

When current is applied to the semiconductor, electrons and holes join and give off light. The wavelength of the light — the color — depends on the type of crystals. The gallium nitride crystals create ultraviolet and blue light.

LED bulbs are much brighter, last much longer and use much less energy than old-fashioned incandescent lightbulbs. Incandescent bulbs use electricity to heat a thin metal strand called a filament. It wastes energy by giving off both heat and light. Instead, LEDs change energy into light, without the heat.

LEDs also avoid problems of fluorescent lights. They are the long, thin bulbs that light office ceilings. They rely on mercury, which pollutes the environment when it is thrown away.

LED technology now lights our smart phone screens and phone flashlights, as well as many household lights. Even the twinkling lights put on Christmas trees are LEDs. And because ultraviolet light kills bacteria, blue LEDs could potentially be used to purify drinking water in the future, Delsing said.

The prize is "to be given for inventions that benefited mankind."

"It's Amazing"

Akasaki and Amano worked together at the University of Nagoya to make the discovery. Nakamura worked independently at a chemicals company in Japan and improved upon the discovery by Akasaki and Amano.

Nakamura is now a professor of engineering at the University of California, Santa Barbara. He learned of his award in the middle of the night. "It's unbelievable," Nakamura said. "It's amazing. Unbelievable."

Akasaki was also informed by phone. Yet, the Nobel Prize committee had not yet reached Amano when it made the announcement, because he happened to be flying from Japan to France.

Every year, likely winners wait near their telephones on the day the prize is announced. They're hoping to receive a call notifying them that they're Nobel Prize winners.

"I think actually they were not prepared for it," said Staffan Normark, of the Royal Swedish Academy of Sciences, which runs the Nobel Prize committee. "They had not been waiting all day or all night for this call."