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ENGINEERING NEWS

Tributes pour in for 'legendary' telescope designer Jerry Nelson

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Joseph Flaig



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Astronomer Jerry Nelson (Credit: University of California, Santa Cruz)

Astronomers have paid tribute to a “legendary” colleague, whose revolutionary designs for telescopes let us see deeper into space.

Astrophysics and astronomy professor Jerry Nelson died on Saturday (June 10) at his home in Santa Cruz, California. Nelson, 73, was project scientist for the [W. M. Keck Observatory](http://www.keckobservatory.org/) (<http://www.keckobservatory.org/>) between 1985 and 2012 and the [Thirty Meter Telescope](http://www.tmt.org/) (<http://www.tmt.org/>), both in Hawaii, which will be the most powerful optical telescope on Earth when it turns on.

Nelson conceived the design for segmented mirror telescopes, which replaced large single-disc mirrors. The concept, first proposed in 1977, allowed bigger installations and helped give more detailed images of stars and galaxies. The Keck Observatory used the design for its two 10m telescopes, which had nearly twice the diameter and four times the light-gathering capacity of their predecessors. The same technique is used for nearly all new ground-based telescopes, as well as the next-generation [James Webb Space Telescope](http://www.imeche.org/news/news-article/machine-learning-gives-a-better-glimpse-of-galaxies) (<http://www.imeche.org/news/news-article/machine-learning-gives-a-better-glimpse-of-galaxies>), which will supersede Hubble.

"Jerry's impacts on the field of astronomy and astrophysics are legendary, and we will all benefit from his legacy for many years to come," said Claire Max, director of observatories at the University of California (UC), where Nelson was a professor emeritus. "He was a wonderful colleague and mentor to many of us."

Before Nelson's work, the largest telescopes were made by polishing a single glass to the necessary precision of a small fraction of a wavelength of visible light. The mirrors were very thick, heavy and therefore expensive and difficult to install, and were limited to a maximum size of about 8m.

The Keck Observatory telescopes each used an array of 36 hexagonal segments aligned to act as a single reflective surface, described as a "major turning point" in the study of the universe. Nelson, often working with UC colleagues Terry Mast and Gary Chanan, also developed a technique for ensuring all the mirrors are aligned together.

This technique was the "key thing Jerry Nelson produced," said University College London (UCL) astronomer Peter Doel to *Professional Engineering*. "Of course you can't just put all the segments together, you have to phase up all the segments to a fraction of a wavelength so they act as a single surface. That is the system he built, the whole system of how to align these mirrors."

The segmented mirror system was "quite revolutionary and successful," said Doel, giving more detailed images and allowing cosmologists to study the structure of the universe. Nelson's work for the Keck Observatory and its influence on new telescopes allows humans to start answering the most fundamental questions, said David Brooks from UCL to *PE*.

"We want to know: how did the universe start, where did we come from, where did all the elements come from, why is the universe expanding faster now than when it began?" Nelson's segmented technique "started it all off," he said.