Lourdes Jansuy Cruz (chemist and biochemist)

May 19, 1942 (age 84)

Lourdes Jansuy Cruz is a Filipino biochemist known for her research in the biochemistry of toxic peptides from the venom of fish-hunting Conus marine snails. She is known as the *Sea Snail Venom Specialist* in the Philippines. She also helped develop the use of conotoxins as tools for examining the activity of the human brain. She has earned several awards and in 2006 was named a National Scientist of the Philippines.

Her science journey began when Lourdes Jansuy Cruz was born on May 19,1942 in Tanza, Cavite, Philippines. Her father Ramon Arao Cruz was a chemist while her mother Julita Tolentino Jansuy was a dentist. Known as Luly, she grew up in an environment where scientific inquiry was encouraged. Her father's career as a chemist had a great influence on her choice of college major and her future career. She received her Bachelor of Science degree in chemistry from the University of the Philippines in Diliman, Quezon City, Philippines in 1962. Her undergraduate research was about trypsin inhibitors. After passing the board examination for chemists, she worked at the Chemistry Laboratory of the International Rice Research Institute (IRRI) in Los Baños, Laguna, Philippines. IRRI is an independent, nonprofit, research and educational institute, founded in 1960 by the Ford and Rockefeller foundations with support from the Philippine government. IRRI aims to improve livelihoods and nutrition, abolishing poverty, hunger,

and malnutrition among those who depend on rice-based agri-food systems. The institute is the world's premier research organization dedicated to reducing poverty and hunger by improving rice science, farming, and consumption. At the Chemistry Laboratory she learned from other scientists working at IRRI, most notably, from the laboratory head, Dr. Bienvenido O. Juliano, then the youngest senior scientist at IRRI and now a National Scientist.

After working at IRRI for two years, Lourdes enrolled at the University of Iowa where she received her Master of Science degree in Biochemistry in 1966 and her PhD in Biochemistry in 1968. After completing her graduate studies abroad, she returned to IRRI and worked as an Assistant Scientist. Her research was about the biochemical factors affecting the accumulation of protein in the developing rice grain to help understand the basis for increasing the protein content of rice. The study, which was the first of its kind, found that only the level of the free amino nitrogen and the developing grain's capacity for amino acid incorporation were consistently correlated with the protein content of the grain. Understanding these biochemical factors soon helped develop rice varieties with higher protein content.

In 1970, she accepted a postdoctoral position at Kansas State University and started a new phase in her career. After a short stint at Kansas State University, she returned to Manila and worked as an Assistant Professor in the Department of Biochemistry at the University of the Philippines College of Medicine. The department had three other young biochemists who had also come back from studies abroad. One of them, Dr. Baldomero "Toto" Olivera received a Rockefeller grant to research DNA synthesis and pyridine nucleotide metabolism. Lourdes joined Dr. Olivera's research in the metabolism of pyridine nucleotide. After a while, they realized that it would be hard to compete with other first world

countries like the US because of lack of resources and the difficulty of getting supplies and reagents. They thought that to be successful they needed to do research on something that no one else was doing. Dr. Olivera was an avid seashell collector and in one of his talks with a fisherman, he heard about cone snails that cause sickness and even death to those that are stung by them. He and Lourdes decided to switch their research to *Conus geographus,* a venomous fish-hunting cone snail found in the waters of Marinduque and Mindoro in the Philippines.

Their research focused on the isolation of peptides from the conotoxins in the snail's venom. At the time, their effects were still unknown. Her research found that conotoxin peptides affect the central nervous system and that they result in muscular paralysis, drowsiness, involuntary motion and motor function. Conotoxin peptides are now used extensively in biochemical probes. Two classes of conotoxins are used as analytical agents: ω-conotoxin has been widely used for studying neuronal calcium channels and μ-conotoxin has been used when controlling muscular activity to observe events at the synapse.

The research on Conus toxins attracted a lot of attention among scientists. So, to expedite the work Lourdes accepted the invitation of Dr. Olivera to continue the research at his laboratory in the Department of Biology of the University of Utah at Salt Lake City, Utah. Lourdes would go back and forth between Manila and Utah, working 3-7 months at Utah and then going back to the University of the Philippines. In 1978, they purified a myotoxin from *Conus geographus*: this myotoxin is a peptide composed of only 13 amino acids with a disulfide linkage. In 1981, they isolated three highly toxic peptides from the same Conus species. These were found to cause their effects by inhibiting the postsynaptic terminus of the vertebrae neuromuscular injection.

In their 1990 article in *Science*, they reported that there is a great diversity of pharmacologically active small peptides in *Conus* venoms and that their targets are ion channels and receptors in the neuromuscular system. By 2006, seven therapeutic products based on six different *Conu*s venom peptides had reached phase I and preclinical trials. They treated pain, epilepsy, and myocardial infarction.

CONNECTING SCIENCE AND TECHNOLOGY TO POOR AND INDIGENOUS RURAL COMMUNITIES

Lourdes established the Rural Livelihood Incubator (*Rural LINC*) in 2001 to generate employment opportunities and establish sustainable means of livelihood in rural areas, especially among the Aetas, upland farmers, and fisherfolk. This program provides training and support to rural communities, to help them develop and implement livelihood projects that are based on their local resources and skills. The program also helps to link communities with markets and sources of financing. It has been successful in helping several rural communities to develop sustainable livelihoods. For example, in the town of Morong in Bataan, it helped the Pasama-Anahao farmers to develop a successful goat-raising project. The project has provided the farmers with a steady source of income and has helped to improve their quality of life.

FUTURE EARTH PHILIPPINES PROGRAM (FEPP)

The Future Earth Philippines Program (FEPP), a national structure in the form of Government-funded project, was officially launched on November 19, 2018, at an international symposium in Manila. The inaugural event was attended by high-profile dignitaries and scientists from the Philippines and abroad and attracted more than 200 representatives of the government, civil society, academe, and non-government organizations (NGOs). The Future Earth Philippines Program (FEPP)

is a scientific endeavor aimed at strengthening the country's resilience and national sustainability through the creation of Philippine Knowledge-Action Programs for Sustainability (PKAPS). It also seeks to link the country with regional and global initiatives on sustainability.

The FEPP is led by Dr. Lourdes Cruz is an inclusive and transdisciplinary initiative that aims to improve the country's overall capability to achieve the Sustainable Development Goals (SDGs). The main strategy to achieve its goal is to establish different PKAPS focusing on relevant sustainability issues of the country in collaboration with relevant government agencies and other societal stakeholders including academe, civil society and industry.

Funded by the Department of Science and Technology of the Philippines, the Program will provide a concrete framework for scientists across the country to improve the national resilience and sustainability.

MENTORING YOUNG SCIENTISTS

Lourdes has also been actively promoting science careers among young students and mentoring them. Her advice to her young students is that there are many research problems that one can work on and it does not matter whether they perform basic or applied research if the science is good. She told them that they should focus on a subject matter which they can study in depth and try to find a support group with which they can discuss science freely.

HER LEGACY

Lourdes Cruz will always be known as the *Sea Snail Venom Specialist.* Her research in the biochemistry of toxic peptides from the venom of fish-hunting Conus marine snails will always be her legacy.

Her Rural Livelihood Incubator *(Rural LINC)* has been successful in helping several rural communities develop sustainable livelihoods.

The Future Earth Philippines Program is a scientific endeavor aimed at strengthening the Philippines resilience and national sustainability through the creation of Philippine Knowledge-Action Programs for Sustainability (PKAPS)

She has mentored many graduate students in biochemistry who have gone on to stellar careers of their own.

She also organized several biochemical education workshops for teachers all over the Philippines.

She has received the following awards:

- NAST Outstanding Young Scientist Award, (1981)
- NRCP Achievement Award in Chemistry (1982)
- L'Oréal-UNESCO Award for Women in Science (2010)
- Outstanding Women in the Nation's Services Award - TOWNS Foundation and Lions Club (1986)
- Academician - National Academy of Science and Technology (1987)
- Professional Achievement Award in Biochemistry - University of the Philippines Alumni Association (1991)
- Sven Brohult Award - International Foundation Science (1993)
- Medal of Distinction (research) - Philippine Society for Biochemistry and Molecular Biology (1994)
- Outstanding Alumnus - University of the Philippines Chemistry Alumni Foundation (1996)
- Gregorio Y. Zara Award in Basic Science - Philippine Association for Advancement of Science (2000)
- Service Award - Philippine Society for Biochemistry and Molecular Biology (2001)
- Outstanding ASEAN Scientist and Technologist Award (2001)
- Gawad Chancellor Award for Research (2002)
- Proclaimed as National Scientists - President of the Republic of the Philippines

On September 14, 2022, the American Association for the Advancement of Science (AAAS) gave the Golden Goose Award to University of Utah for research on a non-opioid pain reliever, hidden in the venom of tiny cone snails, which greatly decreases pain for patients with chronic illnesses; while helping scientists develop new ways to map the body's nervous system. As undergraduates, the late

Craig Clark and J. Michael McIntosh, now a professor of psychiatry at the University of Utah, isolated a compound that eventually led to an approved non-opioid pain killer. Baldomero M. Olivera, Distinguished Professor in the School of Biological Sciences, and Lourdes J. Cruz, then faculty of biology at the University of Utah and now Professor Emeritus at the University of the Philippines, supervised the research. The Golden Goose Award is given to federally funded research that unexpectedly benefits society.

HER SCIENCE JOURNEY

1942 - Lourdes Jansuy Cruz was born in Tanza, Cavite, Philippines

1962 - Received her Bachelor of Science degree in Chemistry from the University of the Philippines in Diliman, Quezon City, Philippines

- Passed the licensure examination for chemists and started working at the International Rice Research Institute (IRRI)

1966 - Received her Master of Science degree in Biochemistry from the University of Iowa in Iowa City, Iowa

1968 - Received her PhD in Biochemistry from the University of Iowa

- Returned to Manila and worked at IRRI as an Assistant Scientist

1970 - Did postdoctoral work at Kansas State University in Manhattan, Kansas

- Returned to Manila and worked as an Assistant Professor at the Department of Biochemistry at the University of the Philippines College of Medicine

- Worked with Dr. Baldomero "Toto" Olivera on research DNA synthesis and pyridine nucleotide metabolism.

1971 - Switched to researching the isolation of peptides from the conotoxins in the *Conus Geographus* snail

1976 - The first paper on the protein toxin in the *Conus* venom was published in Veliger, a peer-reviewed scientific journal covering malacology (the study of mollusks). The journal was established in 1958 and published its last issue in September, 2014

1981 - Awarded the Outstanding Young Scientist Award by the National Academy of Science and Technology in the Philippines

1982 - Received the Achievement Award in Chemistry given by the National Research Council of the Philippines

1985 - Discovered the μ-conotoxins in *Conus geographus*

1987 - Elected Academician to the National Academy of Science and Technology

1990 - Published a second article in Science about the great diversity of pharmacologically active small peptides present in Conus venoms whose targets are ion channels and receptors in the neuromuscular system

1993 - Received the Sven Brohult Award from the International Foundation for Science (IFS) for her outstanding accomplishments resulting from her IFS-funded research project on the *Conus* venom toxins.

2001 - Awarded the Outstanding ASEAN Scientist and Technologist Award in Brunei Darussalam.

- Established the Rural Livelihood Incubator (Rural LINC) in Morong, Bataan

2006 - Became a National Scientist by virtue of Proclamation No. 1167 by President Gloria Macapagal Arroyo

2010 - One of five women scientists who received the L'Oreal-UNESCO Awards in the Life Sciences at UNESCO Headquarters in Paris, France

2018 - Launched the Future Earth Philippines Program (FEPP), a national structure in the form of Government-funded project

2022 - Received the Golden Goose Award from the American Association for the Advancement of Science (AAAS)

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Most of the photos and information were taken from these websites.

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