

Tec de Monterrey rewards research in its community



A research professor's career, high-impact research leading to a startup, a published scientific paper, and student projects were **honored** with the **2022 Rómulo Garza Award for Research and Innovation**.

This award is given by [Tec de Monterrey](#) and the [Xignux company](#) to recognize the research **work** of the institution's research professors and students at high school, undergraduate, and graduate levels.

*"Thank you all for coming. I want to thank the family of Don Romulo Garza and Xignux for their support over the past decades to make this **boost to research** come true,"* said [David Garza](#), Rector and Executive President of the Tec.

*"Many congratulations to the winners. Without a doubt, **they are sources of inspiration for the Tec community**. (...) They're the ones who inspire us to continue aiming to be even more ambitious with our vision of research,"* added the rector.



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Award winners

This year's awards ceremony included **6 distinctions in 4 categories**:

- *INSIGNIA Award for a Research Professor*
- *High-impact research leading to a startup*
- *Published scientific paper*
- *Research projects from PrepaTec, undergraduate, and graduate students*

Eugenio Garza Herrera, Chairman of the Board of Xignux and the Rómulo Garza Award, congratulated this year's winners.

*"The 2022 Romulo Garza Award for Research and Innovation **recognizes those who dedicate their talent** and put effort into **tackling scientific challenges** with the purpose of finding answers and contributing to a better future for all,"* said Garza.

*"This year's awards are related to making **positive impacts on society** and contributing to solving the great challenges of today, specifically sustainability, which now must be an integral concept of innovation,"* he added.

"This year's awards are related to making positive impacts on society and contributing to solving the great challenges of today." - Eugenio Garza Herrera

INSIGNIA Award: 35 years in research

The INSIGNIA Award was given to [Dr. Alex Elías Zúñiga](#), a research professor with a **35-year career** at Tecnológico de Monterrey.

*“I feel very honored to receive this award. It’s an extraordinary moment in my life and surely the desire of many researchers, which can only be achieved with perseverance, dedication, devotion, honesty, commitment, and focusing on **our work showing the way for future generations.**”*

Dr. Elías Zúñiga is the leader of the **Nanotechnology for Device Design Research Unit** that is part of the [Institute of Advanced Materials for Sustainable Manufacturing](#).

*“I’ve always believed that **innovation** doesn’t come from gender, age, space, or time. It comes from your passion to do things,”* said the winner.

He is a Level 3 member of the **National Research System** and a member of the **Mexican Academy of Sciences**.

He has developed a line of research in which he has published **more than 100 papers in indexed journals**, been awarded nine patents, and participated in international conferences.

His work in the laboratory has been supported by young researchers who have in turn begun to train new researchers. He has **supervised 15 post-doctorate researchers**, more than **40 graduate** theses, and has supervised undergraduate students during their research stays.

Dr. Zúñiga has also been able to **transfer technology** to industry through research and consulting projects and has carried out international collaborations.

*“**A better future could not exist without research,**”* he said. *“Through research, you can find solutions that generate a great deal of value.”*



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Award for their startup in chaotic printing

Dr. Grissel Trujillo and Dr. Mario Moisés Álvarez, from the Monterrey campus School of Engineering and Sciences, received an award in the category of High Impact Research Leading to a Startup, which was **presented for the first time** at the ceremony.

The researchers' startup aims to **fabricate materials with internal microstructure** using an additive manufacturing technology called **Chaotic Printing**.

Dr. Trujillo and Dr. Alvarez named it **Chaotic 3-D Printing** because this fabrication technique uses chaotic flows to create a very fine, organized microstructure in polymeric materials.

Their line of research has generated more than **10 scientific papers** in prestigious international journals and has received recognition from other institutions and research groups.



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Award for paper on water pollution

The winners of the Rómulo Garza Award in the Published Scientific Paper category are **Dr. Abraham Mora**, from the Puebla campus, and **Dr. Juan Antonio Torres, Dr. Nancy Ornelas, and Dr. Jürgen Mahlknecht**, from the Monterrey campus School of Engineering and Sciences.

In September 2020, the researchers published the scientific paper *“Tracking nitrate and sulfate sources in groundwater of an urbanized valley using a multi-tracer approach combined with a Bayesian isotope mixing model”* in the **Water Research Journal**.

Their research aimed to track different sources and transformation processes of **nitrate and sulfate pollution in the water** of the city of Monterrey.

To do so, they used a suite of **chemical and isotopic tracers** combined with a probability isotope mixing model.

The results of this research provide important information that will be useful for establishing **pollution management strategies in the aquifers** of that city.

The paper has 92 citations and is the result of an **international collaboration** with [Texas A&M University](#).



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Award for 3D interior modeling project

Melissa Eugenia Diago, a doctoral student in Engineering Sciences at the Querétaro campus, received an award in the **Graduate Student Research Project** category.

This Colombian student carried out the project *"In-building measurement-based radio propagation modeling using a geostatistical interpolation technique,"* which was supervised by Dr. Alejandro Aragón from the Querétaro campus School of Engineering and Sciences.

The project consists of a **three-dimensional indoor modeling method**, through measurements with low computational effort, which allows the implementation of an algorithm as a software tool for the modeling and design of indoor systems.

This research has resulted in 6 scientific publications in journals indexed in Scopus and Web of Science. The project has also been presented at international conferences.

This winner received the award via videoconference from her native Colombia.

Award for project that promotes the inclusion of deaf people

The winners of the Romulo Garza Award in the Undergraduate Student Research Project category were **Jairo Enrique Ramírez and Arely Anguiano**, from the Monterrey campus.

They carried out the project “*Real-Time Mexican Sign Language Interpretation Using CNN and HMM*,” in which they propose an innovative solution that **facilitates communication for the hearing impaired**.

The project was supervised by Professor Miguel González, from the State of Mexico campus.

The architecture they propose considers the influence of facial features and body position, with the aim of achieving complete, efficient, and quality **interpretation**.

Its objective is to offer communication possibilities to millions of **hearing-impaired** people in Mexico through an accessible option that can be applied in schools, health centers, and institutions to improve inclusion.

Arely is an expert in Mexican Sign Language who has had an extensive relationship with the deaf community for the past four years, while Enrique has technical expertise in neural networks and statistical models.

The results of the project were presented at an international conference and published as a **Conference Paper indexed in Scopus**.



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Award for her project to measure learning impact

Iris Giselle Balderas, a student at the PrepaTec State of Mexico campus, received the award in the High School Student Research Project category.

She carried out the project *“Mathematical modeling to personalize and innovate the learning process,”* under the supervision of Professor Rosalva Villegas, from that campus.

The project is the result of the need to **characterize the understanding of content** and implements an exponential model that characterizes the degree of understanding, exposure time, and level of difficulty of a topic.

Data were obtained **through an experiment** on 50 students, but the project has the potential to be applied to larger groups.

Her research enables the **spaced repetition learning tool** to be tested mathematically.



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An award that celebrates the legacy of Don Rómulo Garza

This award was created in memory of **businessman Rómulo Garza**, who was a driving force behind research in Mexico, to recognize **those who seek solutions to the great problems of humanity** in different categories.

The award has been given annually to researchers since 1974 by **Tec de Monterrey** and the **Xignux** company, of which the businessman was a board member and founder.

The executive committee included **Eugenio Garza Herrera**, Chairman of the Board of the Romulo Garza Award; **David Garza**, Rector and Executive President of the Tec; and Ana Cristina Garza, granddaughter of Don Romulo Garza.

It also included **Guillermo Torre**, Vice President of Research at the Tec; **Humberto Garza**, Xignux board member and grandson of Don Rómulo Garza; **Juan Pablo Murra**, Rector for Higher Education at the Tec; and **Óscar Martínez**, Director of Corporate Development at Xignux.

Also participating were **Alejandro Poiré**, the Tec's Vice President of Relations and Development; **Arturo Molina**, Director of the Institute of Advanced Materials for Sustainable Manufacturing; and **Hugo Garza**, the Tec's Vice President of Strategic Projects,

The award ceremony was held on **March 1** in the Conference Center of the Tec's Monterrey campus as part of the TecScience Summit.

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