UPRM Professor Receives Million-Dollar Grant to Study Venom Diversification in Spiders from Africa and India [1]

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An **associate professor in the Department of Biology** at the **University of Puerto Rico–Mayagüez (UPRM)** has received a **$1.2 million grant** from the **National Science Foundation (NSF)**, in collaboration with a researcher from the **University of Florida (UF)**. The project aims to study how the **evolution of social behavior** has influenced the **diversification of venom and the microbiome** in spiders from **Africa and India**.

The laboratory of **Dr. Timothy J. Colston**, who also directs the **Genomic Resources Collection at UPRM**, was awarded **$501,107**, while his UF colleague, **Dr. Carl Nick Keiser**, received **$698,893**. Both researchers will collaborate over the next **three years**, during which they will have access to the NSF funding.

“I am extremely excited and honored to have received this grant. The outcome of this work will undoubtedly be fundamental not only for my career but also for that of my students and collaborators. Students at UPR–Mayagüez will receive support, training, and opportunities for international fieldwork,” said Colston in a press release.

According to the NSF, the study — **“Social Predators and the Parallel Evolution of Weapon Complexity: Venom Toxins and Microbial Arsenals”** — is significant because it integrates tools from **evolutionary biology**, **toxinology** (the study of toxic substances produced by living organisms), and **microbiome science** to explore how cooperation evolves in nature and whether such evolution is repeatable. The project also has **practical implications**, as spider venom and

their associated microbes may offer insights for the development of **new natural products or medicines**, including **treatments for chronic pain and infections**.

“This grant represents a fascinating opportunity to explore the interactions between venom diversification, social feeding behavior, and host microbiome dynamics. I don’t think any other system is as well suited to answer these questions,” emphasized Colston, who began his tenure as a faculty member at UPRM in **July 2021**.

Similarly, Keiser stated that the research will provide insights into how **two key evolutionary innovations — venom and sociality — have co-evolved**.

“Do social predators possess more or less complex weapons compared to solitary predators? Beyond these fundamental scientific questions, we will study the venom toxins and their associated microbes, which could yield a wealth of biological molecules for exploration with potential **pharmaceutical applications**,” he added.

In its project summary, the **NSF** highlighted that the research will reveal how **venom complexity has evolved in relation to sociality in spiders**. This evolution is associated with the redistribution of effort among group members to perform collective tasks. However, it remains unclear how social predator groups optimize the distribution of weapons used to subdue their prey. Venomous predatory spiders offer an effective model to address this gap in knowledge, as both **social and solitary species** use venom for **defense and prey capture**.

“We are deeply honored that our institution has received this grant, which will further strengthen research development and collaboration with other academic institutions. My congratulations to Dr. Colston and the entire Biology faculty at UPR–Mayagüez,” said **Zayira Jordán Conde**, president of the **University of Puerto Rico**.
