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UC San Diego Receives \$7.5 Million to Develop Innovative Uses for Melanin

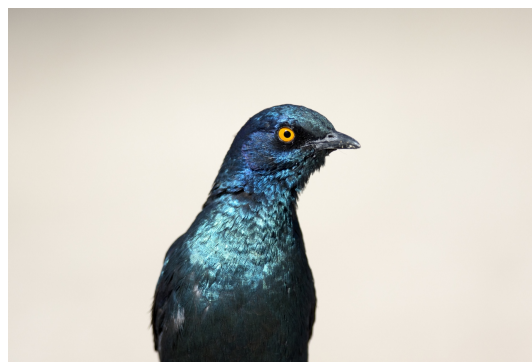
A team of scientists from UC San Diego and two other universities has received a five year, \$7.5 million grant from the U.S. Department of Defense to unravel the fundamental properties of melanins, a family of natural pigments found in skin, hair, eyes and even the plumage of brightly colored birds.

The basic research effort will focus on elucidating the biochemical pathways that lead to the production of melanins in a range of organisms—compounds that efficiently absorb ultraviolet light and protect skin cells in humans—and gain a better understanding of the chemistry and morphology of melanin polymers at the molecular scale, nanoscale, micrometer and at the macroscale.

The project is being funded by the Air Force Office of Scientific Research, under the Defense Department's Multidisciplinary Research Initiative, or MURI program, with the goal of using these natural pigments to develop new kinds of advanced materials.

“Melanin is a ubiquitous natural material that has so far been underutilized in materials science and technological applications,” said Nathan Gianneschi, a professor of chemistry and biochemistry, materials science and engineering and nanoengineering at UC San Diego, who heads the research team. “But this polymer has a unique blend of properties, including strong ultraviolet and gamma radiation absorbance, a high refractive index, material toughness, high conductivity, magnetism and a high metal-binding capacity.”

By unraveling the basic biology, chemistry and structural properties of melanins at multiple length scales, the team plans over the next three years to provide the foundation for the development of melanin-based synthetic materials for a wide range of applications.



Scientists have launched a three-year effort to understand melanins, which are responsible for the iridescent plumage of this glossy starling. istock

“We hope this basic research effort will eventually lead to the establishment of new methods of assembly to create functional arrays and structures that can be integrated into materials, providing them with unprecedented new optical, infrared, magnetic and biochemical properties,” said Gianneschi.

Other melanin-based materials, the researchers added, could include new kinds of adaptive camouflage or detection systems, protective coatings that make structures resistant to ultraviolet and gamma radiation, and bioremediation devices that employ the ability of melanins to bind heavy metals.

Other members of the research team from UC San Diego are Michael Burkart, professor of chemistry and biochemistry; Dimitri Deheyn, a marine biologist at Scripps Institution of Oceanography; and Jeffrey Rinehart, an assistant professor of chemistry and biochemistry. Ali Dhinojwala from the University of Akron and Arthi Jayaraman from the University of Delaware round out the multidisciplinary team.

The research team will collaborate with Wendy Goodson from the Air Force Research Laboratory and Matthew Shawkey, an associate professor of biology at the University of Ghent in Belgium, who were awarded an additional \$1.25 million from the Air Force Office of Scientific Research for a cooperative research project.

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