Title: Gene thieves: how a nudibranch incorporates the stinging cells of the Bluebottle jellyfish

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Project timeline: This project is appropriate for both honours/master (1 year) and PhD students (3.5 years).

Project description: Bluebottle jellyfish (Physalia sp) are a common sight off the coast of Eastern Australia and can sting swimmers when present on popular beaches. Within each individual, specialized cells called cnidocytes are able to inject the toxins into target organisms for defense or feeding purposes. Some species of nudibranches such as the blue sea dragon (*Glaucus atlanticus)* can feed on bluebottles. Remarkably, sea dragons are not only immune to the venom, but they can incorporate cnidocytes into their own bodies, keep them alive for an extended period of time, and eventually activate their toxin release in a controlled manner to sting and capture pray. The genetic circuitry enabling this extreme and fascinating evolutionary adaptation is not understood. This project proposes to combine single cell transcriptomics with microscopy and data analytics to define the gene expression profile of cnidocytes in their original context and after incorporation by nudibranches. Briefly, we will collect bluebottle jellyfish and blue sea dragons from the wild on the beach, dissociate them into single cell suspensions, isolate the cnidocytes using an automated micromanipulator, and perform single cell gene expression profiling to identify what genes are underlying the adaptation of toxin-secreting jellyfish cells to their new host. This project combines field collection, molecular biology, and data science, and will be embedded in multi-disciplinary research on the Bluebottle.

Skills you will learn: This project is a fantastic opportunity to apply cutting-edge molecular techniques and data analysis to understand a key process in marine evolution. The student will be guided in all aspects.

Requirements: The candidate should have a background in biomedicine, marine biology, or data science. We are looking for a motivated student, fast-learning, and passionate about science. Experience in programming (preferably Python) or wet lab experiments are a plus.

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