# Department of Physics Colloquium

## Speaker: Dr. Wendy Scott Beane

**Presidential Innovation Professor and Associate Professor**
**Department of Biological Sciences, Western Michigan University**

## "Quantum Biology, Magnetic Fields, and the Control of Tissue Growth"

Open to the public, free of charge

## Monday, April 1, 2024 - 4 p.m. – 1110 Rood Hall

**Refreshments:** 3:30-3:50 p.m., Bradley Commons, 2202 Everett Tower

**Abstract:** Several biological processes are known to involve sensing and responding to quantum phenomena, including photon capture during photosynthesis and the avian ability to sense the geomagnetic field during migration. It is not clear, however, whether this capability is restricted to a few highly specialized cell types or is a more basic feature of cell biology. Magnetic fields are known to interact with electron spin states, thus altering chemical reaction rates via changes in radial pair formation (the radical pair mechanism). Radicals such as reactive oxygen species (ROS) are well-established key regulators of cell signaling that control cell behaviors and tissue growth during development, regeneration, and cancer. Specifically, ROS signaling is known to regulate maintenance of the stem cell population and affect the cell fate of stem cell descendants. Our research tests hypotheses based on spin state theory and the radical pair mechanism that suggest *weak* magnetic fields (WMFs, <1 mT) can also influence cellular ROS levels. Our data reveal that depending on field strength, WMFs can be used to either promote (500 µT) or inhibit (200 µT) ROS levels, leading to subsequent changes in ROS-mediated gene expression, stem cell division, and regenerative tissue growth. Using the highly regenerative planarian model system, we have shown that WMF effects at wound sites are largely ROS dependent and have identified superoxide as one specific ROS involved. Together, these data highlight the possibilities of using WMF exposures to control ROS signaling *in vivo* and suggest that stem cells may act as endogenous quantum sensors. Because stem cells are not the only cell population sensitive to ROS signaling, these data further suggest that the cellular ability to respond to quantum phenomena may be more widespread than previously thought.

**Parking:** Metered parking is available in Parking Structure #2, near Miller Auditorium.
**More information:** (269) 387-4941 Department of Physics email Campus map

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