

Balzan Fellowship for a Postdoctoral Researcher

Francis Halzen

**2015 Balzan Prize for Astroparticle Physics
including neutrino and gamma-ray observation**

Balzan GPC Adviser: Bengt Gustafsson, Luciano Maiani

Affiliated Institutions: Wisconsin IceCube Particle Astrophysics Center (WIPAC) at the University of Wisconsin-Madison

Period: 2016-2019

Francis Halzen is Hilldale and Gregory Breit Distinguished Professor at the University of Wisconsin-Madison and Director of its Institute for Elementary Particle Physics.

With the second half of his Balzan Prize, Francis Halzen would like to create a Balzan Fellowship at the Wisconsin IceCube Particle Astrophysics Center (WIPAC) at the University of Wisconsin–Madison for an outstanding postdoctoral candidate to work with the IceCube neutrino experiment. The IceCube Neutrino Observatory is the first detector of its kind, designed to observe the cosmos from deep within the South Pole ice. It does so by recording the interactions of a nearly massless subatomic particle called the neutrino. IceCube is also the world’s largest neutrino detector, encompassing a cubic kilometre of ice. The neutrinos come from the most violent astrophysical sources, like exploding stars, gamma-ray bursts, and cataclysmic phenomena involving black holes and neutron stars. Thus the IceCube telescope is a powerful tool to search for dark matter, and could reveal the physical processes associated with the enigmatic origin of the highest energy particles in nature. Moreover, by exploring the background of neutrinos produced in the atmosphere, IceCube studies the neutrinos themselves; their energies far exceed those produced by accelerator beams.

At WIPAC, the Balzan Fellow would work with the IceCube neutrino experiment, with special emphasis on future technologies and/or multi-wavelength campaigns to advance the future of neutrino astronomy. The fellow should be able to carry out a vigorous independent research program in experimental neutrino physics and astronomy as a member of the IceCube group in Madison. In addition to IceCube, WIPAC is

involved in other experimental and theoretical activities in astroparticle and neutrino physics that have strong connections to IceCube. At present, these include the High-Altitude Water Cherenkov (HAWC) experiment, the Askaryan Radio Array (ARA), and the Cherenkov Telescope Array (CTA). It therefore provides an ideal research environment for the Balzan fellow, who would also have access to the Physical Sciences Laboratory of UW-Madison, which led the construction of IceCube and contributed components of the CMS detector at the Large Hadron Collider.