



OTTERBEIN
UNIVERSITY

DEPARTMENT OF PHYSICS

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To:
DUNE IB Chair Robert Wilson,
DUNE Spokespersons (Mark Tomson, Edward Blucher),

Dear colleagues,

I send this letter to petition for membership in the DUNE collaboration on behalf of Otterbein University. I believe that DUNE is the most important next-generation neutrino experiment, and I believe that we can make substantive contributions to it.

Otterbein University is a small 4-year undergraduate liberal arts college in Westerville, Ohio.¹ We have a small physics department with four faculty, graduating fewer than 10 physics undergraduate students per year. Our neutrino group consists of **one faculty member** (myself, Nathaniel Tagg) usually assisted by **1-3 undergraduate students**.

Research Background

Our group at Otterbein has been involved in multiple Fermilab experiments over the last 9 years. On MINOS and MINOS+, we have maintained legacy support for the intra-detector timing systems and important long-term calibrations and calibration studies important for reconciling two distant detectors. We have carried this legacy support for MINOS systems into the MINERvA collaboration (which uses the MINOS near detector as a muon ranger). For MINERvA, our most significant contribution was the development of an online web-based event display called Arachne. This technology has proven hugely valuable in many ways, including hand-scanning studies of reconstruction efficiency, online monitoring of detector data, plots for presentations and papers, and for outreach and education initiatives².

This work continued on MicroBooNE, where the next generation web-based event display, Argo, is used to look at both live data from from the TPC and reconstructed data from LarSoft. (I invite you to look at the tool here: <http://argo-microboone.fnal.gov>.) This technology is clearly applicable to DUNE. Our other main contribution to MicroBooNE is the development of the Online Monitor technology, which interfaces with the DAQ to sample the data stream and provide detailed histograms tracking detector performance. Other technical work includes DAQ work, debugging and development of the code that

¹ Westerville is a suburb of Columbus, Ohio, and is about a 6-hour drive from Fermilab.

² Arachne has been used in a high-school teacher program (<http://neutrino-classroom.org>) and in the MasterClass program.

transcribes raw data into Larsoft objects, and tools for data quality management and configuration tracking, as well as work on MicroBooNE's supernova data stream. We have also done studies on Michel electrons.

Interests on DUNE

I continue to be interested in the low-level data analysis (calibration, monitoring) and development of visualization tools, all of which are clear needs on DUNE and which provide tractable and understandable projects for undergraduate students. I find we can offer a special mixture of technical expertise combined with long-term institutional memory (because we have no postdocs or graduate students that leave the experiment).

My scientific interests tend to gravitate toward support for main analyses (neutrino oscillations), but also to secondary analyses: examples include the MINOS neutrino time-of-flight measurement and detection of supernova neutrinos on MicroBooNE. These analyses are well-suited to a small school because they typically involve smaller working groups and more flexible schedules.

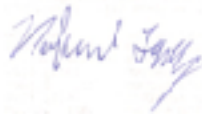
Resources

Otterbein is primarily a teaching institution; most of my research time is during the summer. My primary experiment will continue to be MicroBooNE for the next 1-2 years, but I can offer about 20% of my time to DUNE during this period.

Funding

I am currently in the second year of a three-year NSF physics grant (under the Research at Undergraduate Institutions program), which supports me and two undergraduate research assistants each summer, provides travel funds and pays for some computing infrastructure. This is my third consecutive NSF grant, and I have every hope of being able to maintain this level of funding, with effort shifting from MicroBooNE to DUNE in the next iteration of the grant.

Sincerely,



Nathaniel Tagg
Associate Professor
Physics Department Chair
Otterbein University