

EUROPLANET Exchange Visit Report
Dr. Mark Hofstadter
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Dr. Hofstadter, from NASA's Jet Propulsion Laboratory, visited the Wigner Research Center for Physics the week of 15 April 2019. This report summarizes the discussions held, the early results, and plans for continuing collaborations. It was a productive visit during which valuable information was exchanged, setting up future work.

DISCUSSIONS:

The original Exchange Proposal identified two areas of discussion: Investigating interactions between the neutral gases and ions in the coma of Comet 67P near the comet's magnetopause, and a possible joint NASA-ESA mission to Uranus or Neptune in the 2030 time-frame. In addition to those planned activities, we also discussed new magnetometers developed at the Wigner Institute and how they might be used in future space applications.

RESULTS:

Neutral-ion interactions in the coma of Comet 67P

Using in situ data from the RPC-MIP and ROSINA instruments on board the Rosetta spacecraft, scientists at Wigner had identified unusual fluctuations in the magnetic field, electron abundances and energies, and neutral gas densities near the magnetopause of the comet. It was speculated that the neutral gases, if moving near the local speed of sound, could be the driver of the observed changes. Under this collaboration, data from the Rosetta/MIRO instrument (Dr. Hofstadter is the PI of that instrument) was used to determine that the neutral gas velocity was too high for the originally proposed mechanism to be valid. The team still believes neutral-ion interactions may be the driver of the observed variations, and they have identified specific data sets to explore in more detail, looking for clues as to the nature of the coupling.

Future missions to Uranus or Neptune

The scientific community in both Europe and the U.S. has long expressed interest in flying a mission to study one of the so-called Ice Giant planets, Uranus and Neptune. NASA and ESA have recently conducted preliminary studies of such missions, and have discussed how ESA might contribute to a NASA-led mission. Dr. Hofstadter presented details of the types of missions being considered, the likely science objectives, and the instruments likely needed to address the science objectives. The group discussed how Wigner personnel might position themselves to participate in science investigations and instrument teams related to the magnetosphere and plasma environment of an Ice Giant. Various ways to increase interactions between Wigner and U.S. scientists were discussed.

FluxSet Magnetometers

Wigner engineers have developed an extremely small, low-mass, and low-power magnetometer, which they call a FluxSet magnetometer. They routinely use it on the ground, but would like to see it developed for space applications. During the Exchange Visit, they

presented the specifications of these magnetometers and we discussed how it compares to current flight-qualified instruments and the potential for using it on small satellites.

CONTINUING COLLABORATIONS:

Actions were identified for continued and expanded collaborations between the Wigner RCP in Hungary and scientists/engineers in the U.S.

- The MIRO team will identify specific times in May of 2015 when MIRO's observing geometry was best suited to study neutral gases near the spacecraft. Wigner will identify which of those times seems most closely associated with fluctuations observed in their ion data, and the groups will jointly investigate coma conditions in an effort to understand the underlying physical processes controlling neutral-ion interactions.
- U.S. scientists studying outer planet magnetospheres have been contacted about undertaking further exchanges with scientists at Wigner, including the possibility of U.S. researchers co-Advising Hungarian graduate students. These discussions are on-going.
- The specifications of the FluxSet magnetometer are being made available to scientists at various U.S. institutions, in the hopes of triggering interest within the U.S. of flight-qualifying these new sensors.

In summary, this EUROPLANET grant resulted in a valuable exchange that has the potential of leading to continuing collaborations which are beneficial to personnel in both Hungary and the United States. All of us involved would like to thank EUROPLANET for enabling this effort and managing the Exchange program.