Education & Science Innovation (ESI) Subcommittee Membership and Study Areas

Members:	Role/ Study Areas:
• Jade Morton, Chair • Terry Moore, 1st Vice-Chair • Dorota Grejner-Brzezinska, 2nd Vice-Chair • Penny Axelrad • Renato Filjar • James Geringer • Russ Shields	• STEM & future PNT workforce • GNSS science applications (space weather, radio occultation, surface reflectometry, natural hazards warning, etc.)

ESI Subcommittee Proposed Study Areas

1. US STEM and future PNT workforce education and training; bring in world-wide views into the discussions.
   - Current landscape
   - Recommendations
   - Opportunities
2. Awareness of PNT/GNSS scientific applications

US STEM and Future PNT Workforce Education and Training: Landscape

- A recent open letter authored by a group of academics and former US government employees highlighted the crisis in the field of geodesy. This crisis is also playing out in the broader field of PNT, and generally in STEM education.
- NSF National Science Board (NSB) report on the State of U.S. Science and Engineering 2022: https://ncses.nsf.gov/indicators
- NSB vision to remain the world innovation leader in 2030: https://www.nsf.gov/nsb/publications/2020/nsb202015.pdf
- Dr. Nikki Markiel (NGA): Geodetic Science Shortage of Researchers & Scientists
- Prof. Terry Moore (UK): PNT Skills, Education, and Training Strategy: Findings from a UK Government-Sponsored Study
- Survey on US universities/institutions having PNT programs (# of faculty, students, areas of studies).
- Survey on trends of PNT publications by US and international authors.

US STEM & Future PNT Workforce Education & Training: Recommendation

- Understand different needs, levels of gaps, and size of work force in industry, government, and academics
  - Need PhDs in the field of PNT to teach/work/develop programs in government/industry/academia.
  - MS/BS level workers need to have broad background + training in field-specific certificate programs
  - Goal: get the US back to the leading edge
- Need to invest in the future of US PNT education and training

US STEM & Future PNT Workforce Education & Training: Opportunities

- Develop innovative educational programs that teach essential skills, understanding of systems, and new methods that meet the need of next generation PNT technology and applications. Example: integration of PNT with imagery and big data tools (GEOInt).
- Capitalize on exciting commercial space applications and aerospace interest among young people to attract/educate next generation PNT experts.
- Develop/implement K-12 educational plan to better prepare students for college education.
- Benefit from international partnership.

Scientific Applications

- Objectives:
  - Bring awareness of GNSS-enabled scientific applications to the PNT community
  - Understand the technology limitations
- Presenting at this meeting:
  - Dr. Attila Komjathy, JPL: GDGPS for Natural Hazards Early Warning: Tonga Volcano Tsunami
  - Prof. Delores Knipp, University of Colorado Boulder: Space Weather Impact on Starlink Satellite Launches
- Potential Presentation at the next meeting:
  - Prof Chris Ruf, University of Michigan: GNSS-R for ocean wind retrieval
  - Dr. Clara Chew, UCAR: RFI impact on GNSS-R based soil moisture sensing