



The RTNN: A Regionally Networked *Site*

Jacob Jones (NC State)
Nan Jokerst (Duke)
Jim Cahoon (UNC)
David Berube (NC State)
Nina Balke (NC State)
Mark Walters (Duke)
Phil Barletta (NC State)
Bob Geil (UNC)
Phillip Strader (NC State)

“What successful examples of programs, activities, and relationships in the current NNCI could be adapted or expanded for multiple sites in a future network?”:

- 1. Successful Regional Relationships**
- 2. Workforce Development Leverages Regional Strengths**
- 3. Assessment Yields Success**

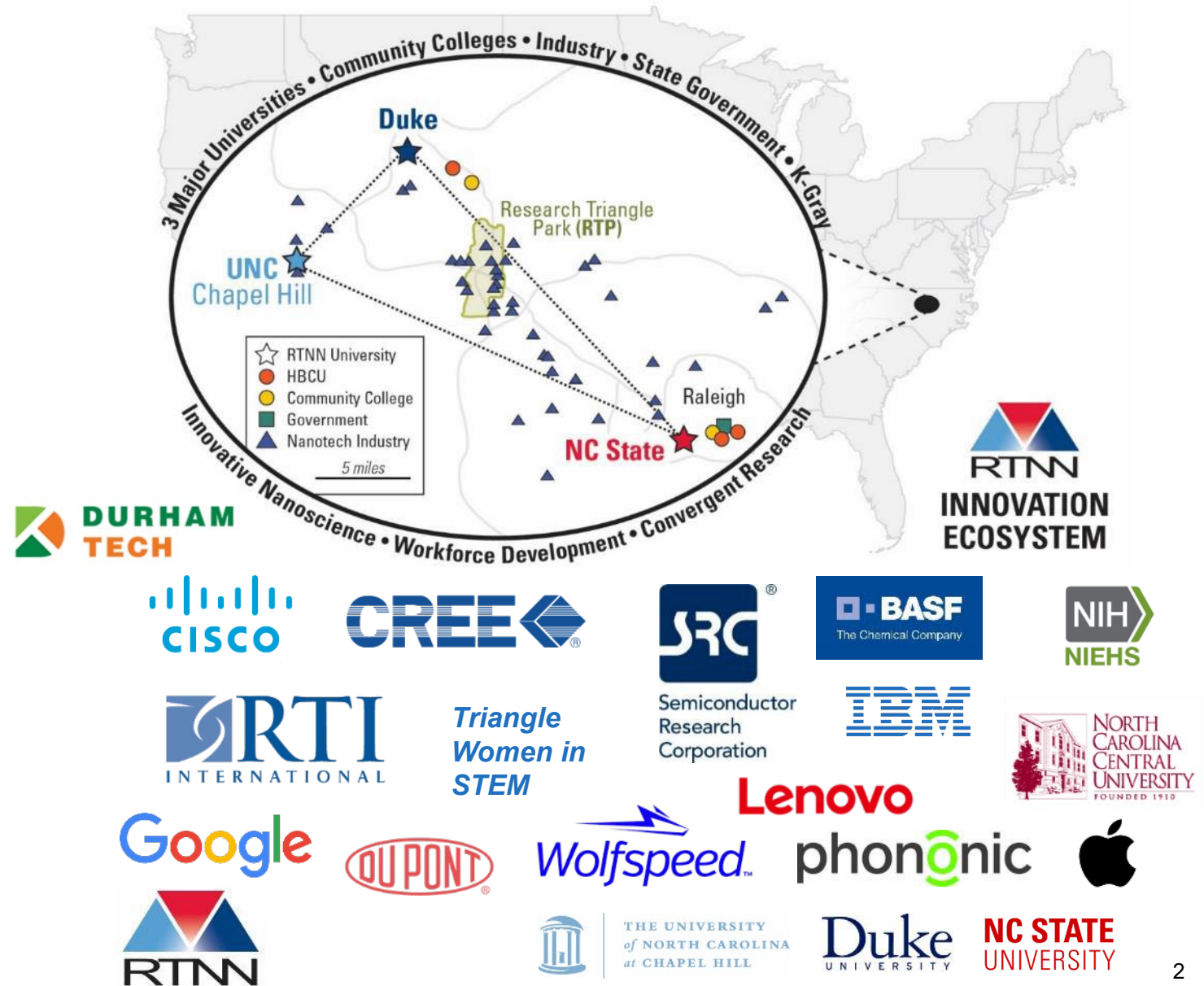
1. Successful *Regional Relationships*

RTNN builds on an ecosystem anchored by 3 Research-1 Universities, 2 Community Colleges, and 3 HBCUs, producing large number of STEM graduates

Significant number of high-tech, nano-tech, and start-up companies

Research Triangle Park (RTP) is the largest and the most prominent research park in the U.S., currently hosting **over 300 companies** and institutes with **~50,000 employees**

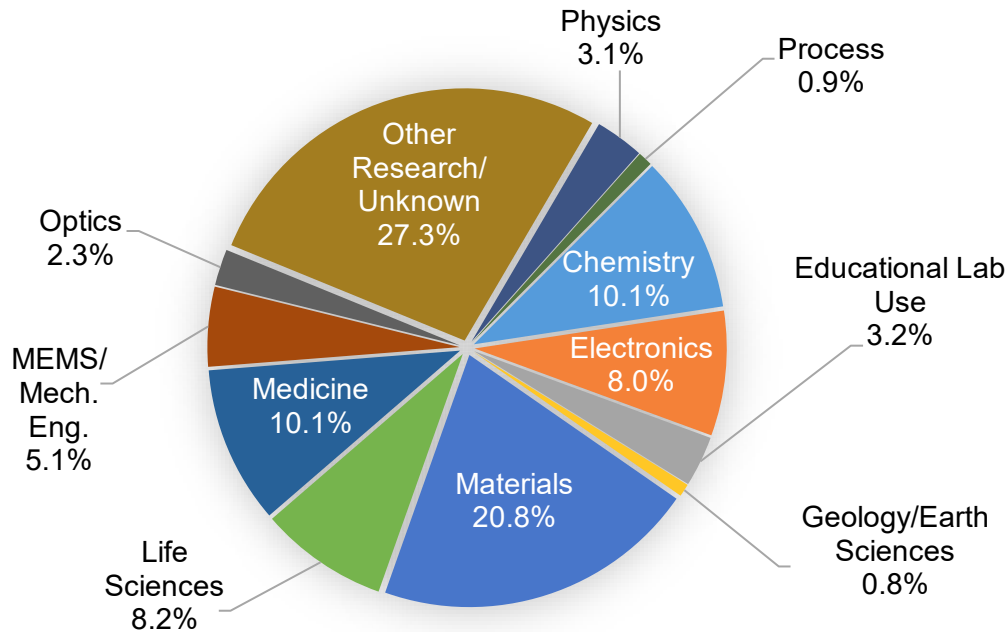
As a **Site that is a funded regional network**, RTNN can reach broader audiences, e.g. disciplines and industries



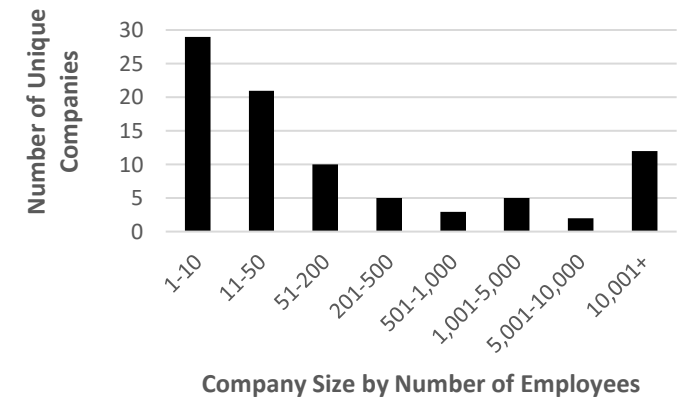
1. Successful *Regional Relationships*

Diverse usage: Involvement of multiple universities brings in substantially differentiated disciplines, expertise, and impacts (e.g., medicine, life sciences, textiles, biology, anthropology, agriculture)

A robust regional ecosystem fosters entrepreneurship, technology transfer and economic development:



Both small and large companies in the ecosystem rely on RTNN facilities:



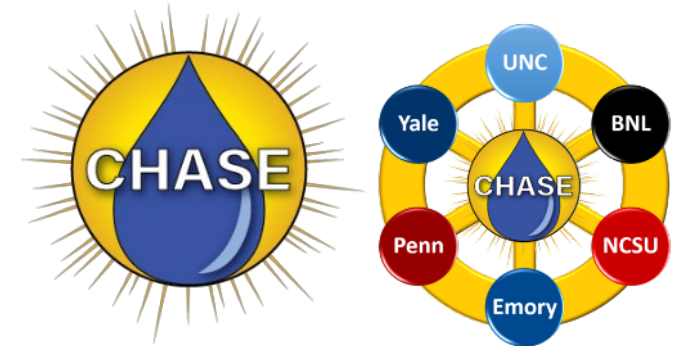
1. Successful *Regional Relationships*

The RTNN ecosystem of individuals, facilities, and programs has fostered the creation of additional projects that, in turn, utilize RTNN facilities, e.g.:

NSF ERC - Precision Microbiome Engineering (PreMiEr)



DOE Energy Innovation Hub - Center for Hybrid Approaches in Solar Energy to Liquid Fuels (CHASE Center)



NSF STC - Science and Technologies for Phosphorus Sustainability (STEPS) Center



NSF Research Experience for Undergraduates (REU) - Elucidating the Structure and Dynamics of Hybrid Perovskite Systems

NSF Research Experience for Teachers (RET) – Atomic Scale Design and Engineering



2. Workforce Development Leverages Regional Strengths

Workforce Development Programs and Relationships Impact New Communities and Engage New Users

Diversity in RTNN Leadership and Programs provides a *welcoming environment* for all, and helps make connections with new communities

Enhancing diversity in leadership and staff in Year 8:

E. Moreno-Hernandez (Duke), L. Skolrood (Duke), S. Pathirirage (NC State), F. Olatunde (NC State), C. Obrero (NC State), I. Shuro (UNC)

REU participants:

2022 Cohort of 12: 5 UR/AAPI; 7 women

2023 Cohort of 12: 5 UR/AAPI, 5 women

Outreach programs engage directly with diverse communities (*URM, women, indigenous*) and Title-I schools with socioeconomically disadvantaged students



2. Workforce Development Leverages Regional Strengths

Large format public events, Year 8 examples:

Girl Scouts STEM Day @ Duke (~500 participants, parents, volunteers)

NC Science Olympiad (>3k participants)

Greensboro Science Center *Science Extravaganza!* (>3.6k participants)

NC Museum of Life and Science *Rocktober* (>1k participants)

STEM Day at the Waccamaw-Siouan Tribal Community (>95 participants)

Virtual Outreach and Online Content options remain available and valuable in reaching larger audiences, especially rural communities (e.g. remote SEM sessions)



Greensboro Science Center *Science Extravaganza!* (3.6k participants; joint event with SENIC/JSNN) April 15, 2023



Rocktober at NC Museum of Life and Science (National Nanotechnology Day) October 9, 2022



Girl Scouts STEM Day 2022



Waccamaw-Siouan Community STEM Day September 17, 2022

2. Workforce Development Leverages Regional Strengths

Developed collaboratively by all three RTNN universities,
leveraging Coursera@Duke as a local (regional) resource

“Nanotechnology: A Maker’s Course” (Launched 2017)

Massive Open Online Course on Coursera, providing education
in nanofabrication and nano-characterization

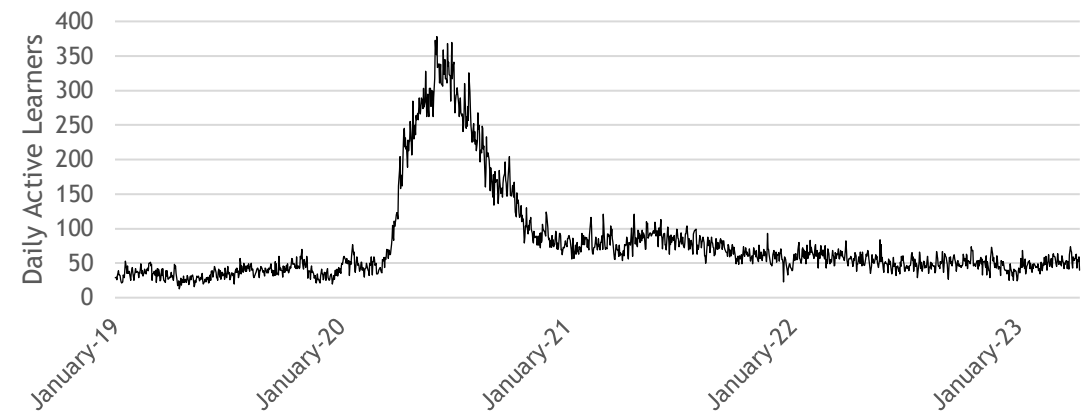
Lectures and in-lab demonstrations in RTNN labs by RTNN
students, faculty, and staff from diverse backgrounds

Promotes and advances equality of opportunity through
diverse teachers and lab demonstrators (primarily students)



Launched September 2017

- > **60,900** enrolled in course (Year 8: > 7,600)
- > **38,000** active learners (Year 8: > 4,900)
- > **11,700** completed course (Year 8: > 2,100)
- > **295,900** visitors (Year 8: > 33,100)



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL



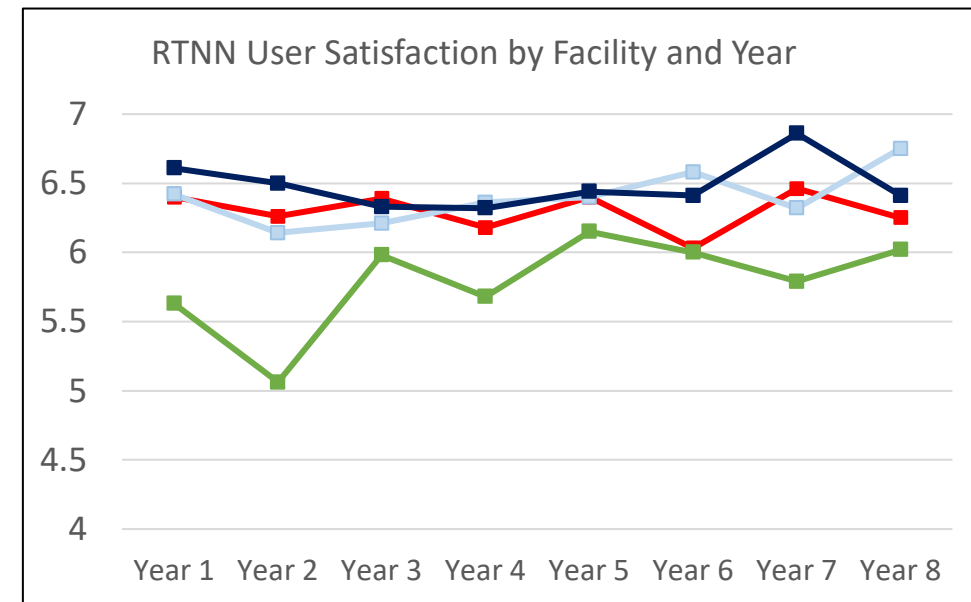
3. Assessment Yields Success

- **Assessment and evaluation** is a critical component of any large program.
- **Social science research (IRB-approved)** on the facility staff, leadership, and user base provides deeper insights into best practices, critical challenges, and opportunities, and informs the “future of work at the human-technology frontier.”



Example Assessment and Research Data:

- > 1600 user survey responses by Year 8
- > 1900 Coursera survey respondents
- Structured interviews of selected Kickstarter and REU participants
- Published assessments: 75+ page assessment report submitted as part of the annual report

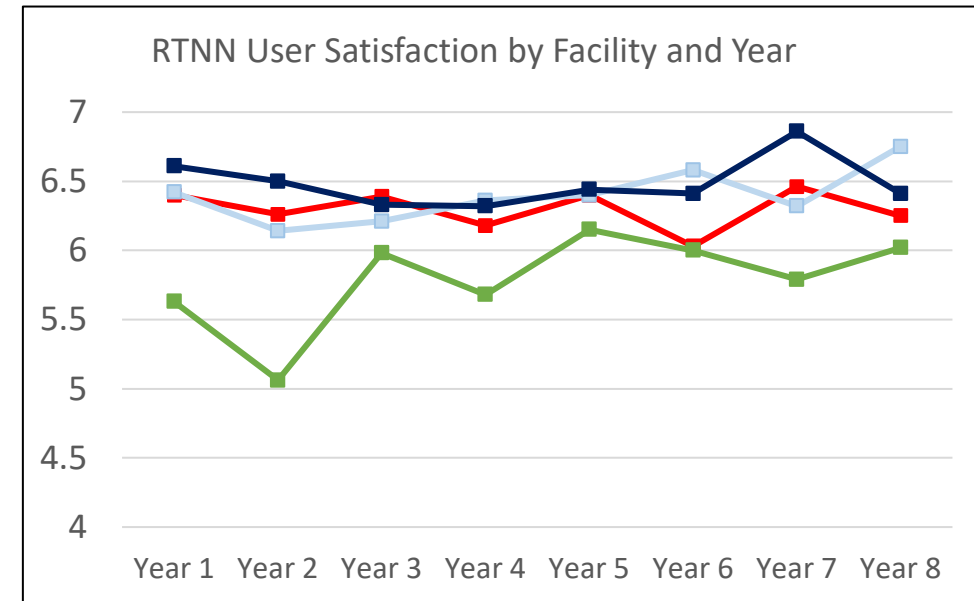


3. Assessment Yields Success

- **Assessment and evaluation** is a critical component of any large program.
- **Social science research (IRB-approved)** on the facility staff, leadership, and user base provides deeper insights into best practices, critical challenges, and opportunities, and informs the “future of work at the human-technology frontier.”



Social science research can use epistemological tools that involve allowing the assessment and evaluation data to speak and to tell the researcher what the research questions *should be*, rather than bringing the preconceived questions to the data

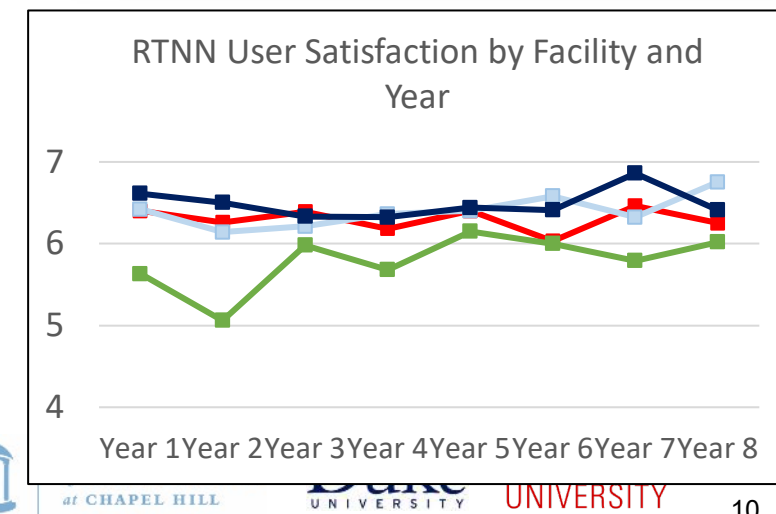
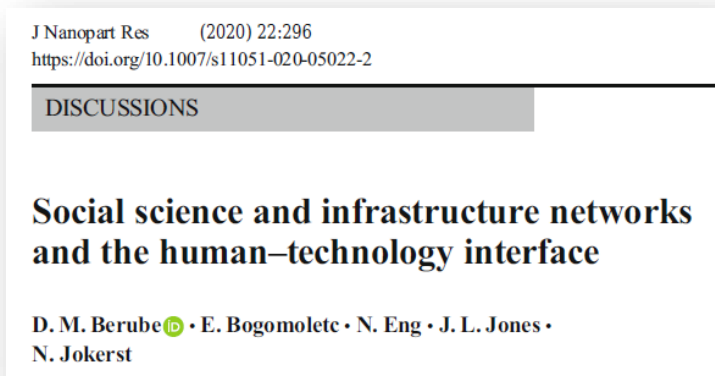


3. Assessment Yields Success

- **Assessment and evaluation** is a critical component of any large program.
- **Social science research (IRB-approved)** on the facility staff, leadership, and user base provides deeper insights into best practices, critical challenges, and opportunities, and informs the “future of work at the human-technology frontier.”

Outcomes and results published in peer-reviewed literature:

- Results helped administrators make a data-informed decision to invest **~\$11M institutional investment** in facility renovations, new tools, and accelerated the search for a new director.
- Data prompted **new research questions** that were not previously considered, e.g., satisfaction across gender, fields, first-time and repeat users, and role at home institutions.



New Idea to Complement “Regional Networks”

Topical Networks

- Collaboration of nanotechnology facilities across the U.S. or beyond who are all pioneering infrastructure for **application-specific, high-priority nanotechnology topics**.
- **Activities** could include sharing of best practices, amplifying awareness of unique capabilities, workforce development activities, etc.
- **International dimensions** could leverage resources outside the U.S.
- **Funding** could be reserved through Sites to support some activities at these locations.

Hypothetical Topical Network

Soft Matter Infrastructure Network

Sharing best practices for supporting and increasing awareness of facilities that cater to soft matter, e.g. polymers, organics, and biological specimens.

