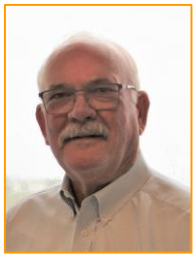
UT SPARK INNOVATION CENTER
AT UT RESEARCH PARK

SPARK
Annual Report

September 2020 – August 2021



A Message from the Director

We're closing our first year at the Spark Innovation Center, and it's a good time to reflect on our progress and future direction. Our mission is to support early-stage tech businesses and drive adoption of their technologies in Tennessee and throughout the world. We provide laboratory and office space, and expert mentoring, to grow selected tech companies with the intent to permanently locate them in Knoxville.

As a builder of businesses, the Spark Innovation Center has exceeded its first-year expectations, as you'll see in this report, through a combination of several critical success factors:

- A meaningful vision and workable business plan,
- Seven member companies, who exactly fit the profile that our region needs most– high-tech and high-growth potential,
- Market fit for both Spark and our individual companies,
- Tremendous lab and office space provided by the UT Research Park and the JIAM facility,
- Strategic partners who have been extraordinarily supportive with time, talent, and funding,
- Collaboration with UT's academic departments and other regional incubator and accelerator programs, like ORNL's Innovation Crossroads.

We have been fortunate to receive initial funding from ORNL, UT Research Park, and TVA and have also been selected by the US DOE for two awards, one that will establish a new Spark CleanTech business accelerator beginning next year. It's a privilege to receive such tremendous support and we're focused on returning value in the form of successful locally-based companies.

Perhaps the most rewarding part of my job is to work directly with the founders/CEOs and staff of the Spark member companies, and to experience their extraordinary intellect and skills, and their passion for entrepreneurship and business success.

This is where exciting current and future Tennessee and American businesses are being built, and we welcome you to learn more and hopefully become a part of the Spark mission. Thank you for your time, interest, and continuing support of the Spark Innovation Center.

Signature

John Bruck
Director, Spark Innovation Center

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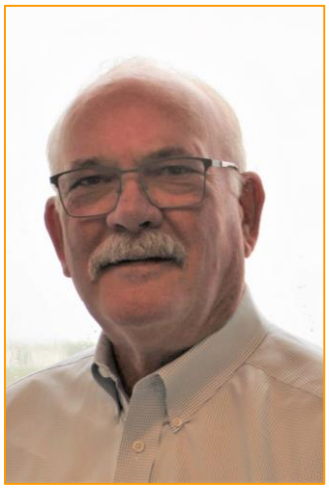
The Spark Team



John Bruck
Director
Spark Innovation Center

John Derrick
Entrepreneur-In-Residence
Spark Innovation Center

Courtney Piper
Executive Director
TN Advanced Energy
Business Council

Tom Rogers
President & CEO
UT Research Park

Angelee Day
VP of Marketing &
Administration
UT Research Park

By the Numbers

- $7.5 million in R&D grant awards (potential TN match not included)
- New Jobs: 8 FT and 1 PT employees, 2 interns
- 12 Industrial Customer and Supply Chain Partnerships
- 6 workshops delivered with our partners PYA and 3Roots Capital
  - Understanding Outside Investment
  - Working with Cap Tables
  - Valuation
  - Accounting Refresher
  - Tax
  - Being a CEO (or Hiring One)
- Several collaborations underway between Spark clients and the Tickle College of Engineering and the Haslam College of Business at the University of Tennessee

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Spark Member Company Reports

American Nanotechnologies Inc. is developing technology to isolate high-value semiconducting carbon nanotubes from raw sources which contain a mixture of metallic compounds. CEO Will Fitzhugh is participating in ORNL's Innovation Crossroads program, is working with the Anderson Center for Entrepreneurship and Innovation, and has submitted several SBIR grant proposals.

Chem Chip, LLC produces working electrodes based upon carbon nanospike innovation developed at Oak Ridge National Laboratory. Chem Chip has an exclusive license from ORNL, a CNMS User Agreement, and has built a team that includes the co-inventor of the technology and the founder of Reactwell. They are now building a Joint Industrial Partnership to facilitate continued materials synthesis prototyping and future activation of a U.S. manufacturing line in the Knoxville, TN region.

Eonix reduces the time and cost to develop new materials for lithium batteries and ultracapacitors using a novel high throughout, semi-autonomous technique. Founder and CTO Don DeRosa has completed ORNL's Innovation Crossroads fellowship program, and has also been awarded grants from the State of New York, the National Science Foundation, and the U.S. Army.

Neptune Fluid Flow Systems has developed a novel method for preparing thin films of soft material solution for cryo-TEM work, a new analytical tool of great interest to the scientific community. While they work at ORNL's Innovation Crossroads program on material science applications, Drs. Trevor McQueen and Winnie Liang will be also working with researchers in UT's Biology Department and at JIAM to prepare biological samples for structural characterization. Neptune has also been awarded a Department of Energy SBIR Phase I grant, a National Science Foundation SBIR Phase I grant, and a RevV! grant from the State of Tennessee.

Sky Nano, LLC produces high purity carbon nanotubes from ambient CO2 for use in multiple markets. An Innovation Crossroads graduate, Dr. Anna Douglas has also won a National Science Foundation SBIR Phase I grant, a $2.5 million Department of Energy award, and has her first commercial customer. She will be utilizing the SEM tools at UT's Joint Institute for Advanced Materials as she continues to scale up her technology.

Active Energy Systems is developing an innovative ice thermal storage system to provide **cooling that is affordable, efficient and resilient**. Our heat exchanger directly utilizes refrigerant to improve energy efficiency by 20%. The AES system has a **power peaking ability**, providing a *very high* cooling output for a limited period of time. We enable a 50 ton cooling unit to output 500 tons through enhanced thermal storage.

Qubit Engineering is a quantum computing company that has developed new optimization methods for micro-siting for wind turbines. The quantum powered micro-siting software will considerably improve the efficiency of wind farms and reduce the overall cost of the projects. Qubit was founded by Drs. Marouane Salhi and George Siopsis.

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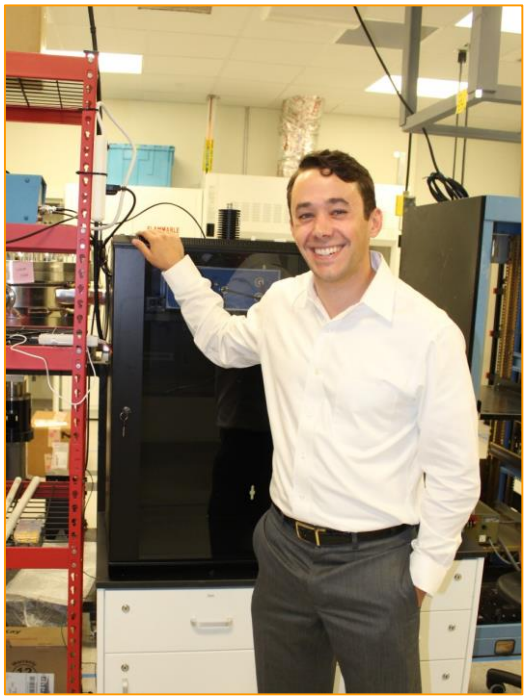
American NanoTechnologies



- Carbon nanotube purification equipment (bench scale) procured, assembled and tested
- Awarded NSF grant $256K
- Hired senior materials physicist
- Completed AFWERX Phase I
- AFWERX STTR proposal in collaboration with UT Center for Materials Processing (CMP)
- ANI to be highlighted in UT CMP annual report

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ChemChip

- Awarded DOE/ORNL $1.5M on Integrated Direct Air Capture of CO2 and Conversion to Ethanol
- Awarded DOD USAF $50K SBIR Phase 1
- Ongoing negotiations with U.S. national beverage company and seven global energy companies
- Procured/Installed several lab scale equipment components
- Hired Mechanical Engineer to be located at Spark
- Invented Endless Oxygen concentrator, filed patents, filed trademarks and now negotiating agreement global partner
- Cash flow positive and profitable (proj) CY2021
- Started collaboration with NASA, U.C. Berkeley and Arizona State University student team

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Eonix

- Awarded $2.1M in R&D contracts
- Collaborated thru Spark to hire a UT business student intern
- Designed a Non-flammable lithium-ion battery electrolyte
- Scaled a Non-flammable lithium-ion battery prototype from 5mAh test cells to 1Ah commercial prototypes (200X increase)
- Demonstrated the safety of our Non-flammable Lithium-ion battery technology to the Department of Defense and Grid Storage Customers
- Began development on additional lithium-ion battery product lines for Automotive and Consumer Electronics Markets with funding from National Science Foundation
- On-track to engage in grid storage and military lithium-ion battery pilots in 2022

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Neptune Fluid Flow

- Hired first employee
- Began detailed business model testing
- Performed multiple world-firsts demonstrating the feasibility of tech
- Demonstrated tech successfully on over 500 samples
- Conducted outreach and education to key customers
- Established partnership with Thermo Fischer, largest supplier of TEM equipment website.

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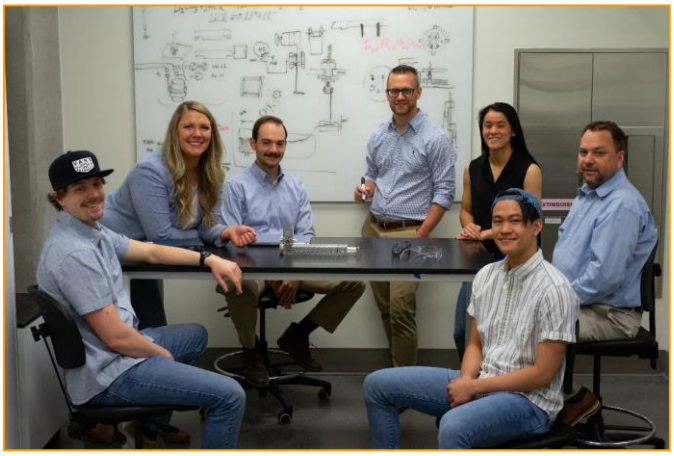
SkyNano

- Hired 3 FTEs for a total of 5 FTEs
- Kicked off a $2.5M project in collaboration with TVA and NREL
- Received a $50K USAF SBIR
- Secured a JDA to develop other carbon structures from our core technology
- Scaled up our production 50X
- Sold 80g of MWCNTs to 6 customers
- Supplied a CNT-enabled prototype to a customer through a collaboration with Endeavor Composites, a nearby UT-based startup
- Patent formally issued by the USPTO
- Collaborative presentation with Endeavor Composites to ARPA-E workshop on carbon negative building materials



Active Energy Systems

We take the heat

(non-resident Spark member)

- Hired 2 FT engineers, one UT (connection from Haslam College of Business)
- Hired intern UT Chem E student (connection from Spark)
- NSF SBIR grant award $1M
- Participated in New York manufacturing accelerator
- Filed second PCT application for heat exchanger technology
- Collaborating with UT CMP in prototyping

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Qubit Engineering

- Continued to improve quantum simulated solver for optimizing wind turbine placement for new projects, improving power production by 3-5%
- Continued to improve quantum optimization algorithms for wind turbine placement for new projects, improving power production by 1-5% with an average of 2.5% and increasing the size of the wind farms to be optimized (up to 150 turbines).
- Collaboration with co-founder and UT Physics Dept. faculty member
- Developing new software for dynamic turbine control
- Developed services contracts/partnerships with major renewable energy producers based on successful demonstrations
- RES (world's largest independent renewable energy producer) and five additional global companies in the renewable energy Developed very low-cost supplier/subcontractor agreements and technical development partnerships with **Microsoft & QCI**
- Cash flow positive and profitable (proj) CY2021

Future Directions

- Adding new Entrepreneur-In-Residence and other mentor support through the TN Energy Mentor Network, managed by TAEBC
- Current waiting list of Spark member companies
- Full deployment of partnership with UT's Center for Materials Processing and development of a network of machine shops serving to provide prototyping and pilot-scale equipment fabrication and assembly
- Midwest Regional Innovation Partnership: A CleanTech Accelerator 2022 – 2024 funded through DOE FOA
- New facilities being planned at UT Research Park
- By the end of 2024, through our incubator and accelerator programs, we will support the launch of **30** new advanced energy, advance materials and cleantech companies.

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