



# Career panel - BNL perspective

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U.S. ATLAS HL-LHC Computing Co-Manager

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Computational HEP Traineeship Summer School, Princeton University

# My background, pivotal roles in bold

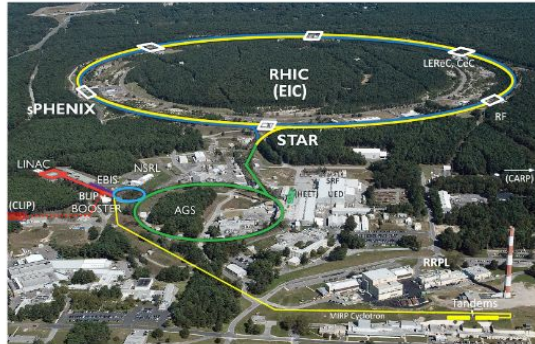
- U of Toronto physics undergrad, summers at DESY on ARGUS
  - Vertex detector simu, **DAQ, test beam**
- MIT grad student soon sent off to CERN to work on L3 (LEP)
  - Muon spectrometer **DAQ, test beam, online, offline, ops 'Alpha team'**
- Postdoc and staff scientist at LLNL working on superconducting supercollider (SSC) until there was no SSC
- Parachuted into BaBar (SLAC) B factory after SSC cancellation
  - Instrumented flux return, mu/pi separation, simu, reco, **simulation manager**
- To BNL in '97 and a switch to nuclear physics at RHIC (highly HEP-adjacent)
  - **STAR S&C manager**, built a group that built one of the first ROOT based software stacks
- Switched to ATLAS in 2000, just as STAR was starting to take data
  - Led creation of **US ATLAS software project**
  - Created **BNL's first software group** focused then on ATLAS
- Went to CERN 2002-2005 to work on the new LHC Computing Grid (LCG) project
  - Led the common software mandated **Applications Area** trying to build commonality among LHC experiments
- **Co-created PanDA** workload management system in 2005
  - Initially for US, then all ATLAS, now multi-experiment and extended to complex workflow management
- A succession of coordination roles in ATLAS: data management, distributed software, distributed computing, (deputy) computing coordinator
- Co-led the team that created the **HEP Software Foundation**
- Created my present group, software spanning HEP and NP, in 2019
- **Career arc:**
  - DAQ and online established **working under pressure**, it has to work, little oversight (bosses who know little about what I do) so **self-directed** and **seeing the big picture**, tight peer **collaboration in a team**, **async software skills**
  - With this ingrained, approached roles as taking a broad view of the need and building it, taking responsibility within a team
  - Took the plunge of accepting first coordinating role as BaBar simu manager, with trepidation
  - Everything since has followed from that

*The greyer the hair the smaller the font!*

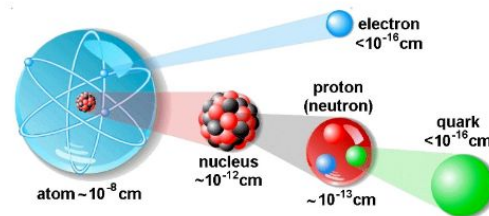
# Nuclear and Particle Physics at BNL

Brookhaven National Laboratory is a multidisciplinary laboratory with 7 Nobel Prizewinning discoveries, 37 R&D 100 Awards, and more than 70 years of pioneering research in HEP, NP and beyond

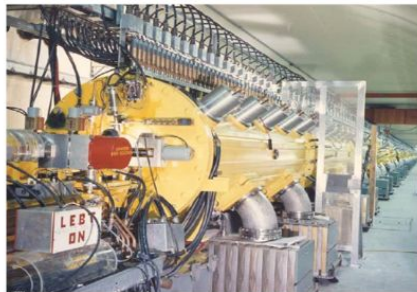
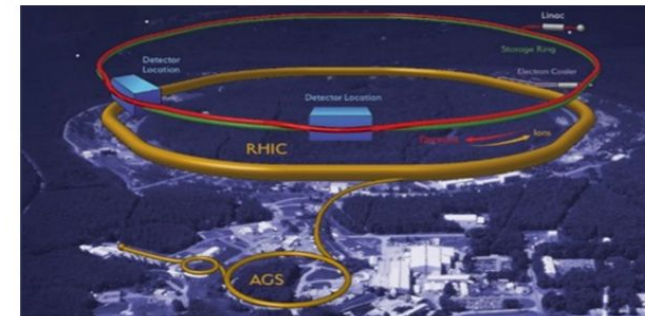
Workshop earlier this month on collaboration with minority serving institutions gives a good overview



To understand sub-atomic world deeper and deeper

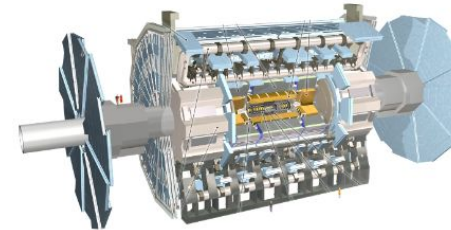
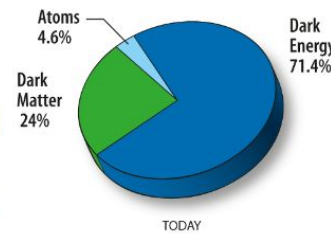


Electron-Ion Collider

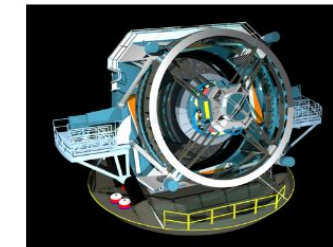


BLIP: Medical Isotopes

Develop unique technologies to answer fundamental questions in nature and for applications



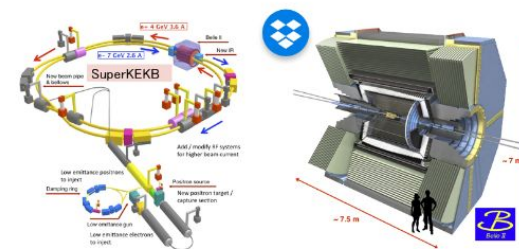
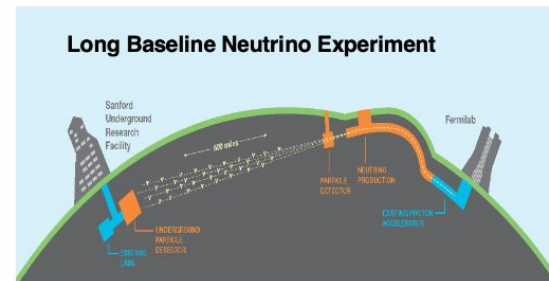
ATLAS @ LHC



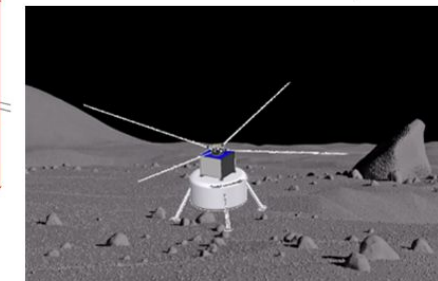
Rubin Observatory



NASA Space Radiation Lab



Belle II at SuperKEKB



LuSEE-Night mission

Active high-energy and nuclear theory groups; RIKEN-BNL Research Center (RBRC) and Center for Frontiers in Nuclear Science at Stony Brook

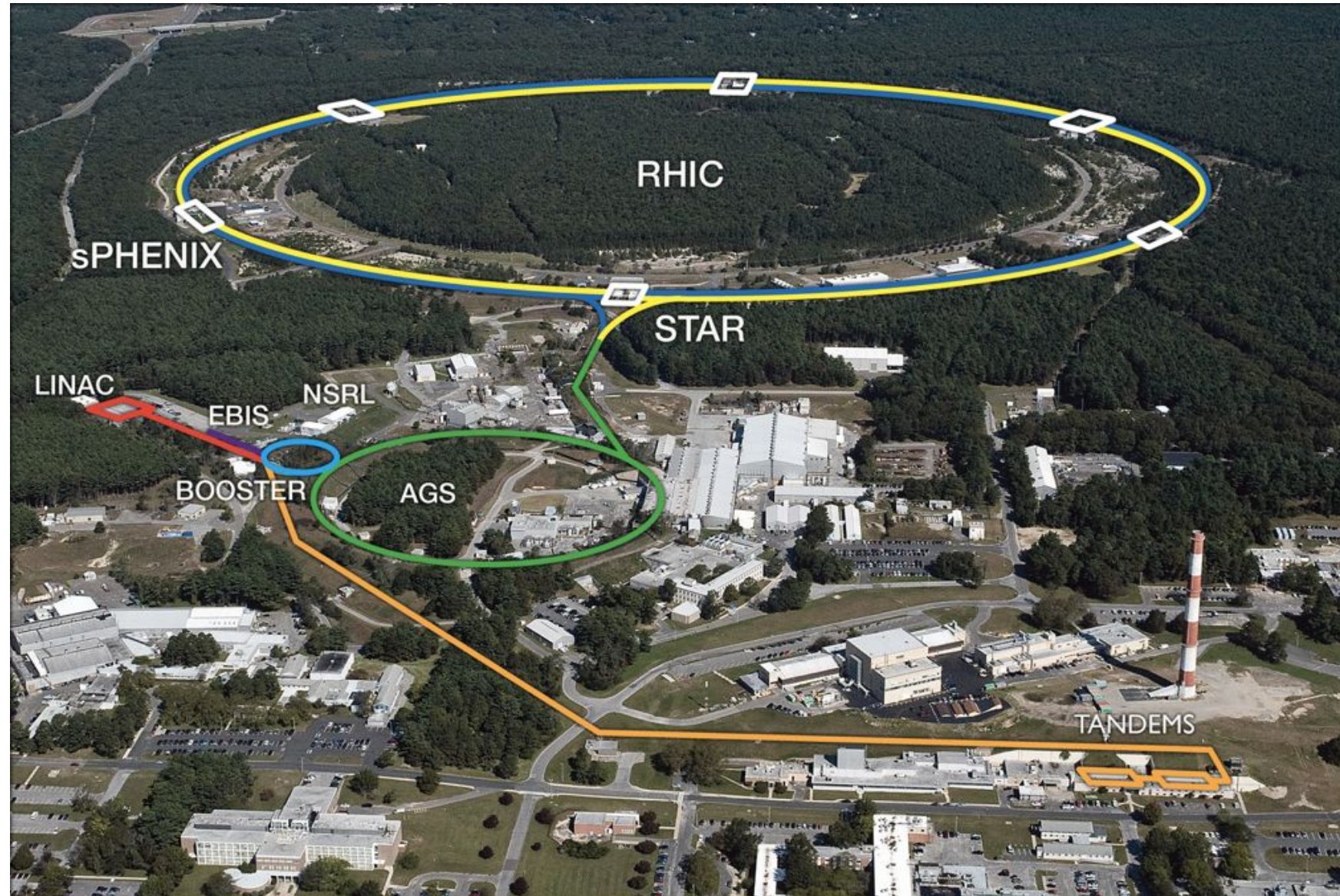
# Relativistic Heavy Ion Collider (RHIC)

In operation from 2000 to 2025

Most flexible collider in the world, from protons to Uranium over two orders of magnitude in energy and 100x design luminosity

Two experiments at present: STAR operating since RHIC's inception, and sPHENIX commissioning now for first datataking this year

After 2025...



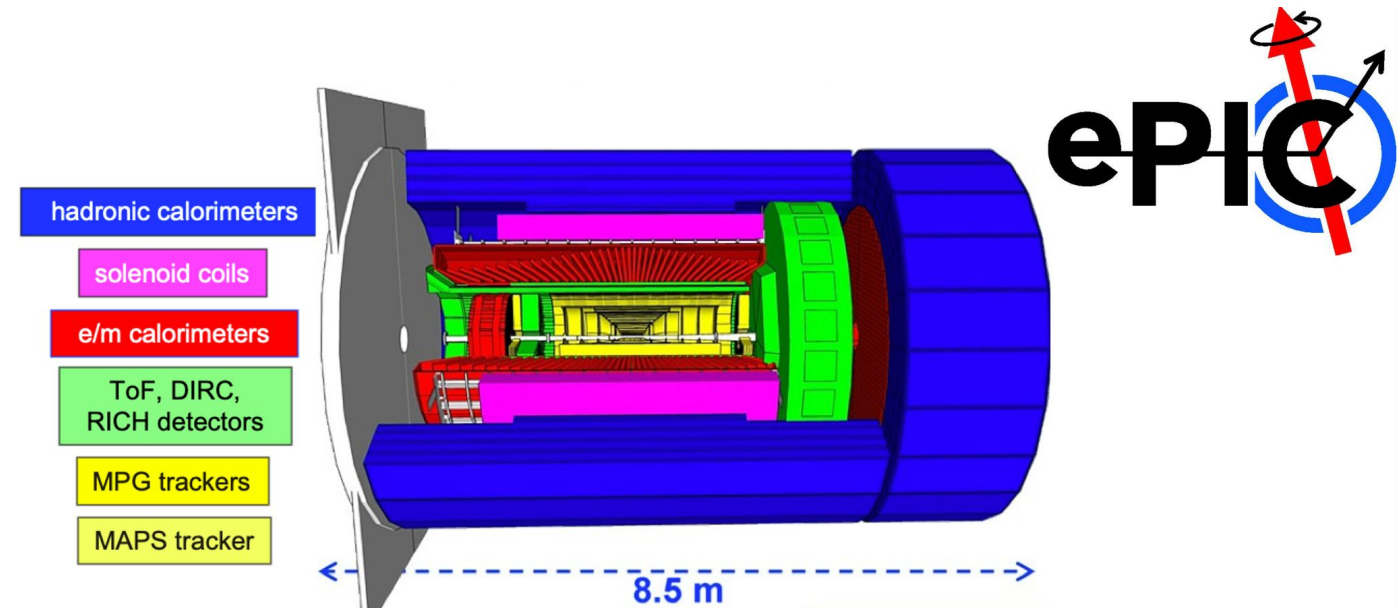
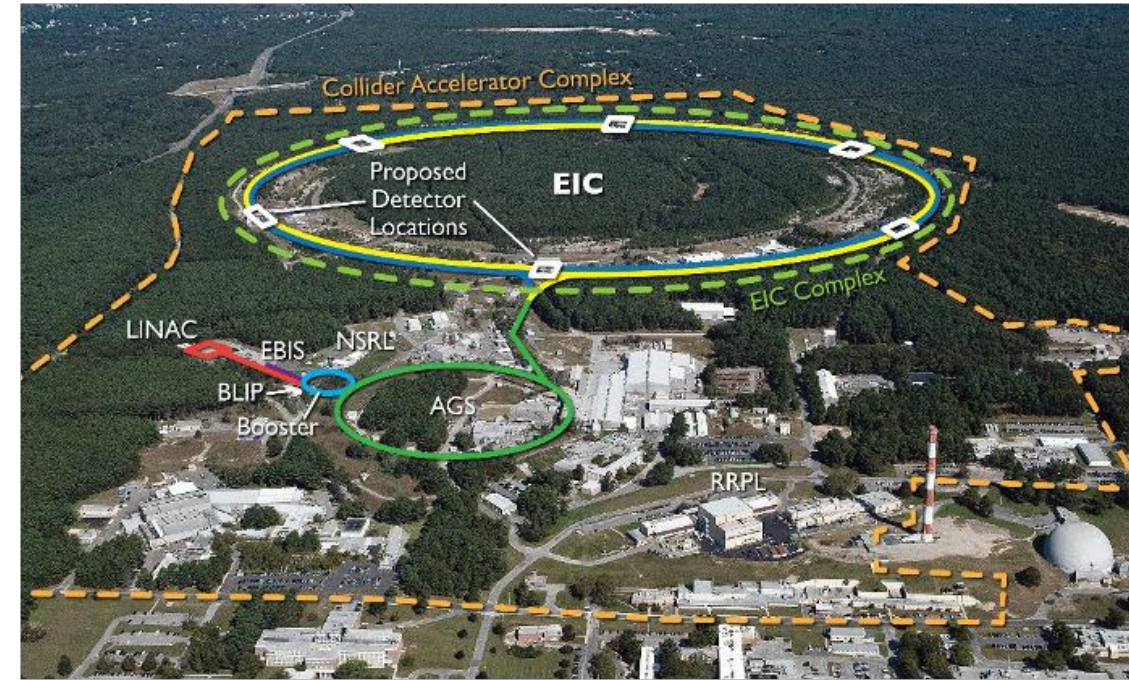
# Electron-Ion Collider (EIC)

A precision microscope to probe the nucleon: origin of mass and spin, emergent properties of dense systems of gluons

Double rings making use of the existing RHIC facility

Construction after 2025, datataking in the early 2030s

Detector collaboration recently formed



EIC project contains construction of one detector, operational by 2030's

# BNL HEP Program

## ATLAS experiment at CERN

Lead Lab for U.S. ATLAS collaboration of 800 US scientists  
Leading US ATLAS Operations program and hosting Tier 1 computing center

## Neutrino Program at Fermilab

Proto-DUNE detector with BNL-developed cold electronics  
Studying properties of neutrinos with short-baseline experiments

## Belle II experiment at KEK

Lead Lab for U.S. Belle II experiment in Japan

## Rubin Observatory

Commissioning the experiment in Chile  
Developing computing and software for data analysis

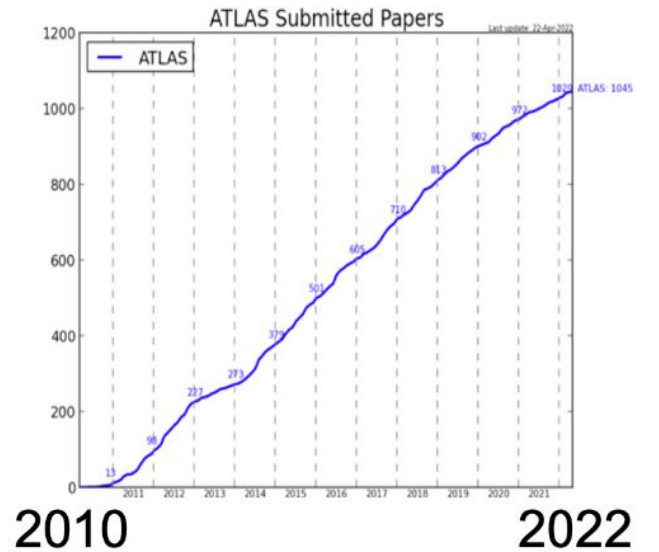
## Theory

Fundamental progress on  $(g-2)$  value calculations  
Exciting new developments in neutrino and colliders physics

Assembly of muon system at CERN



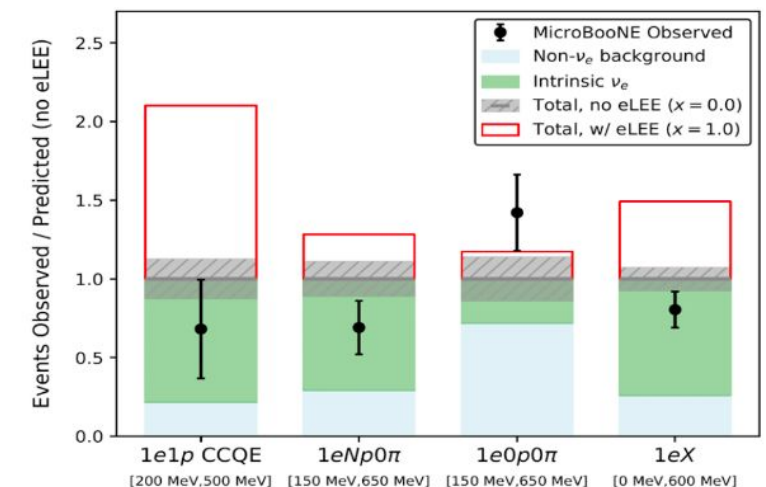
ATLAS published over 1000 papers



Tier 1 center in new building at BNL



Exclusion of sterile neutrinos



# BNL Computing and Software Activities

NSLS I building re-purposed

- Just finished move to a new state of the art facility
  - Host computing for ATLAS, Belle II and many other experiments
  - One of the largest computing centers in the world
- Strong team in software developments
  - AI/ML tools development
  - Software for distributed computing, including cloud computing
  - Development of quantum computer-based codes for unique calculations



# Software Careers: The NPPS Group

The Nuclear and Particle Physics Software (NPPS) Group consolidates much (not all) of the NP and HEP software development in the Physics Department

~23 NP, HEP members working on 10 experiments

- NP: sPHENIX, EIC, STAR, PHENIX
- HEP: ATLAS, Belle II, DESC, DUNE, Rubin Observatory, LuSEE@Night (lunar dark side radio telescope)

## Emphasis: cross-experiment common efforts across HEP and NP

Shared personnel, expertise, software

19 members working on >1 experiment

Substantial CERN based team

- 8 ATLAS, 3 DUNE + Belle II

## NPPS jobs

- Primarily physics PhD backgrounds, HEP and NP
- People with interest in a scientific software career
  - Motivated by the science
- Positions can mix software and research
  - Two (nearly) open positions on Belle II, DUNE are about 50/50
- We embed in the experiments as collaborators
  - Not a service organization
- Slowly growing: 19 at inception in 2019, ~24 in 2024
- Far from where we should be in diversity
  - Addressing that as positions and candidate pools permit

[Survey of activities from Jan 2023](#)

## Many collaborations





# Some attributes of success, roughly prioritized

Good place for seeing job postings is the [HSF forum](#) mailing list (google group)

- Motivated by the science
- Collaborative, open (i.e. not secretive), works well with others (even if work habits are solitary, which is fine)
- Listens and learns, asks well informed questions
- Skilled programmer, C++, python, SQL, async programming (DAQ, distributed computing), AI/ML
- Engages closely with and supports users and operations
- Strong technical and architectural judgement (pre-requisite to the next one)
- Self-directed, takes a task and carries it to completion, digs into problems and solves them
- Eager learner of new tools and techniques (while applying that technical judgement as a filter)
- Self-confident, ready to step into the unknown, into roles outside your old wheelhouse, into the higher level position
- Leadership traits and the interest to build on them