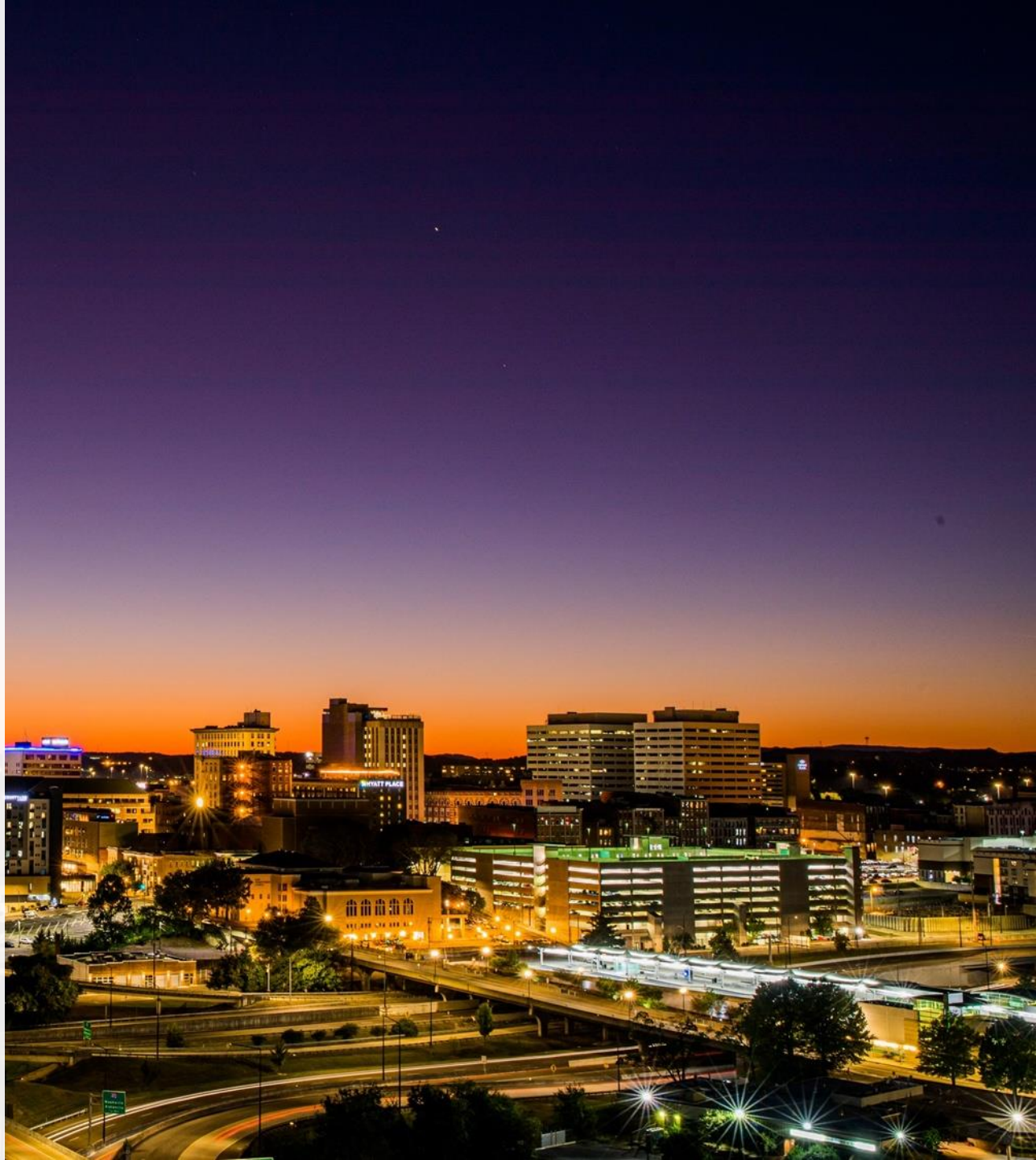
NE697: Introduction to Geant4

Geant4 from Scratch

November 9th, 2021

Dr. Micah Folsom



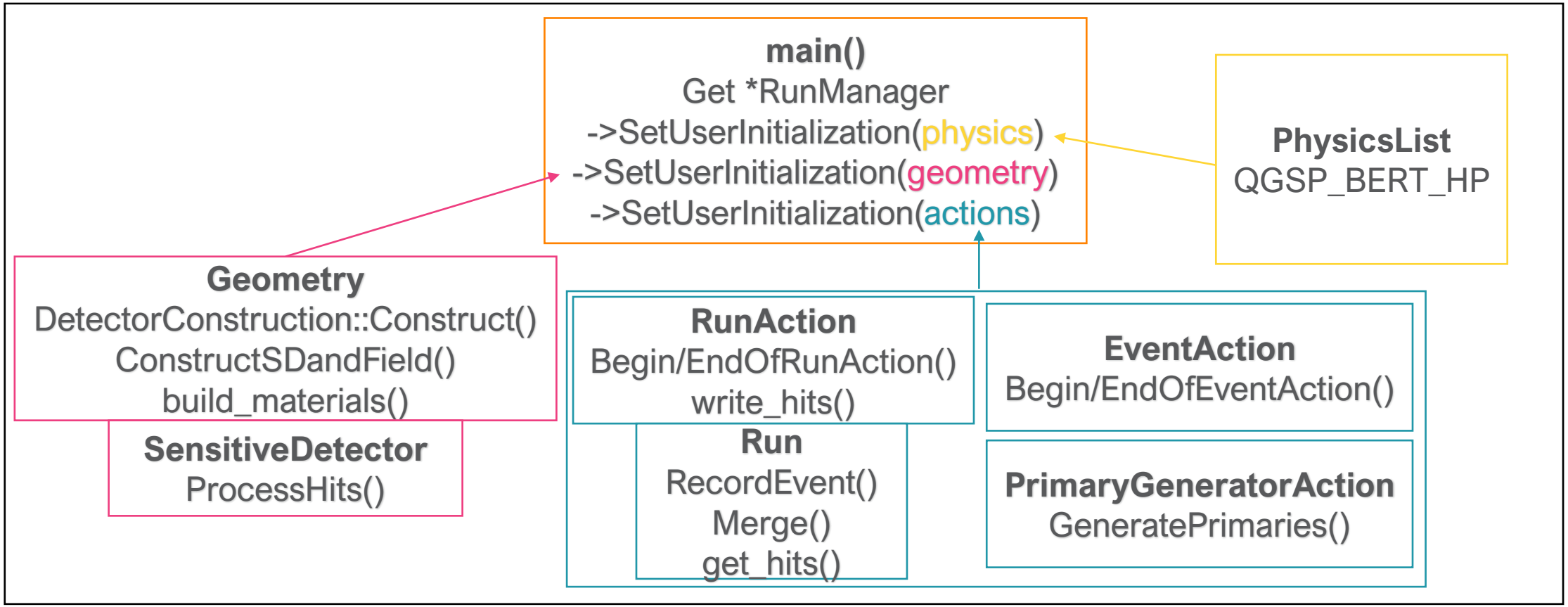
Today's Agenda

- Building our own Geant4 simulation
- Assignment 6
- Think about what you want to do for your final project
  - Proposal due by class, Thursday, November 11th
  - Create a "detection scenario": some sort of radiation bouncing around an environment
  - Ideally something relevant to your work (it's ok to simplify it a lot)
  - Record the hits and do something interesting with it
    - Imaging, different spectra, event reconstruction, dose calculation, etc
  - May use our current WIP as starting point

Final Project

- This class's final exam slot is Tuesday, Dec 7, 1:00-3:15 PM ET
- Final project will be due at this time
- Please prepare a 5-minute presentation outlining your work and showing some results
- So far, proposals sound reasonable

Geant4 Program Anatomy



Geant4: NE697 Version

- Minimum working example using best practices
- [DEMO]
  - Build system & directory structure - DONE
  - main() - DONE
  - DetectorConstruction - world created
  - Physics - DONE
  - PrimaryGeneratorAction – DONE
  - ActionInitialization - DONE
  - EventAction – DONE
  - RunAction – DONE

Geant4: NE697 Version

- Next steps…
- [DEMO]
  - Run object – DONE
  - Hit - DONE
  - HitTracker (SensitiveDetector) – need to connect in DetectorConstruction
  - File IO in RunAction → .csv (inefficient, but simple!) – write_hits()
- Coming up…
  - Custom material definitions (build_materials())
  - Messengers (custom UI commands)

Assignment 6

- Starting with our code, make a radiograph of a tungsten T phantom
  - Build the T in DetectorConstruction using G4Box solids
  - Build a detector panel using G4_SODIUM_IODIDE for the material
  - Modify the source to be a flat field from one side of the T
  - Track the hits in the detector panel
  - Make an image showing the shadow pattern
    - Try it at different energies and for different particles
- [DEMO]