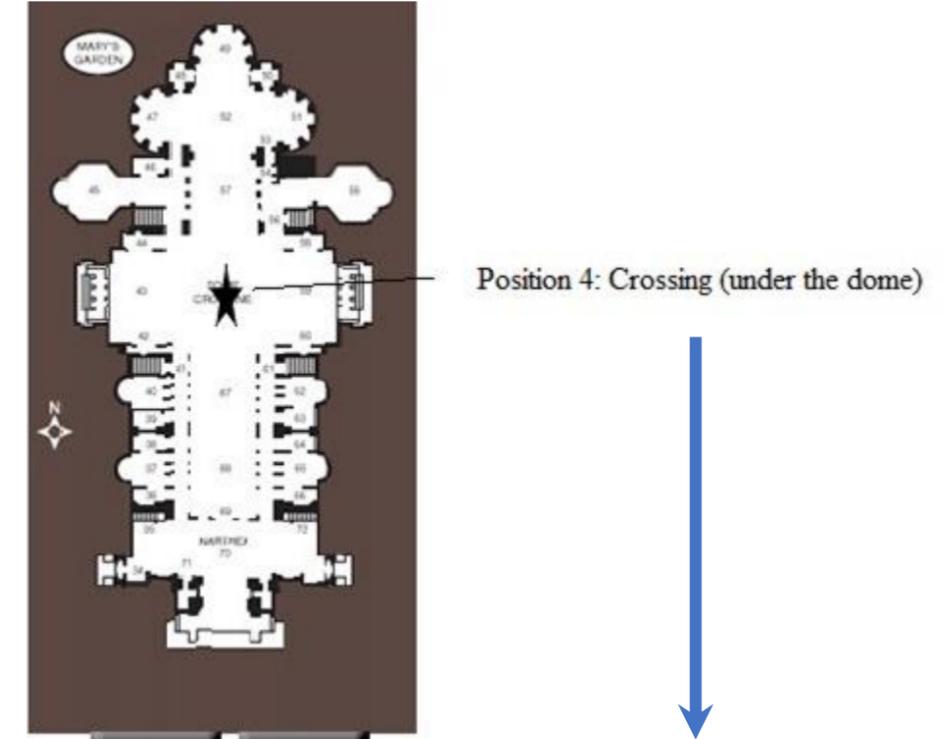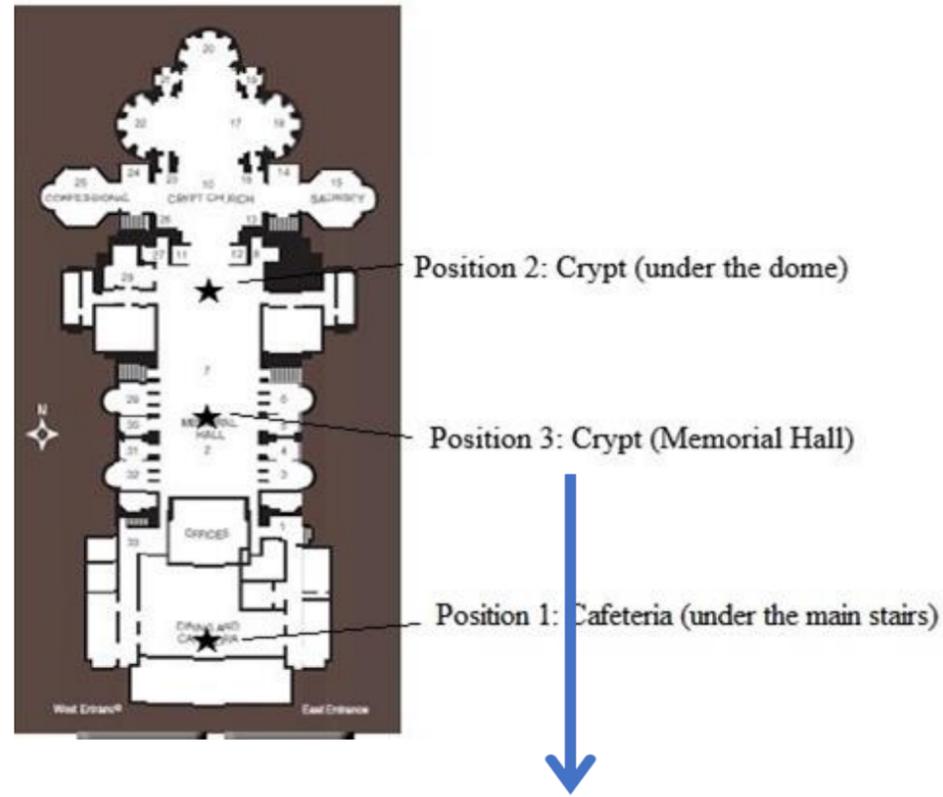# Muon Radiography/tomography

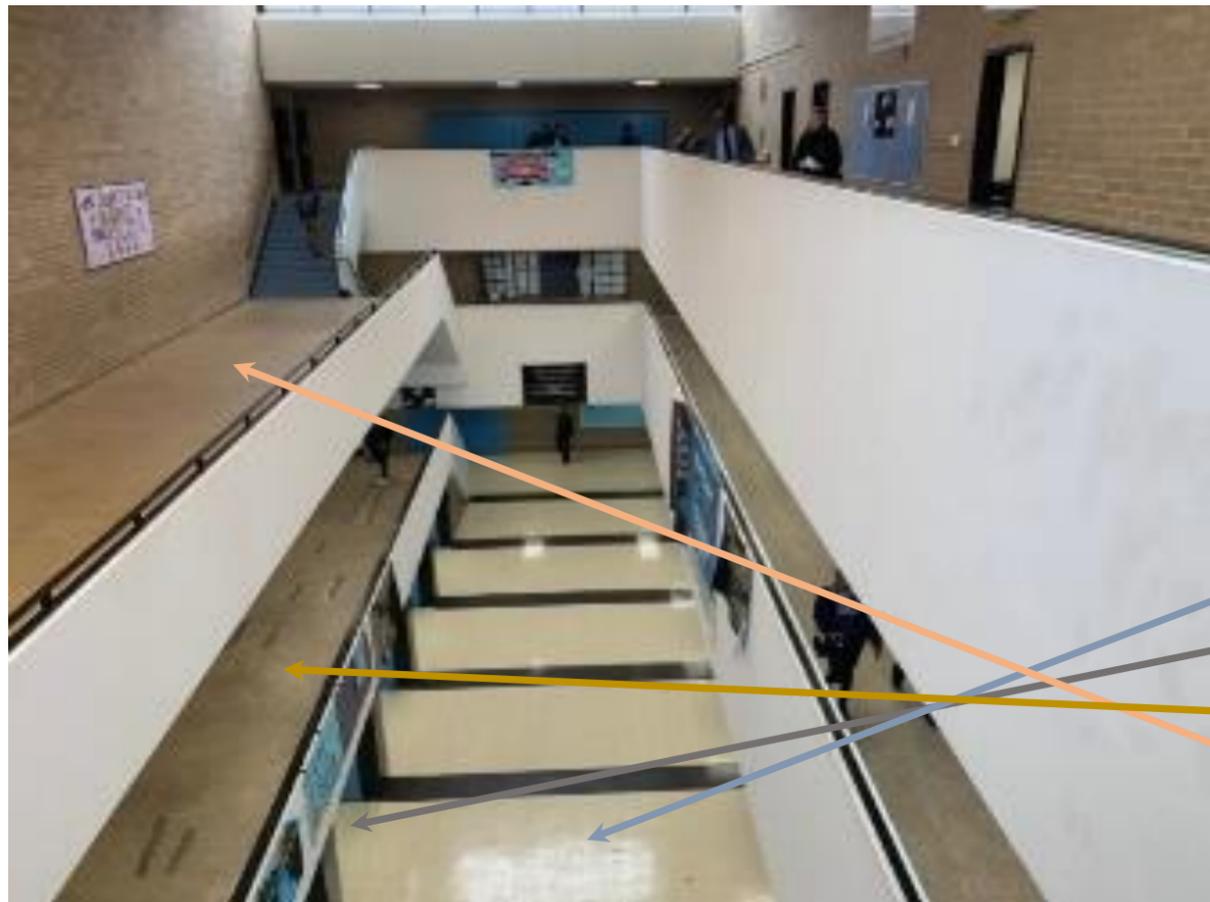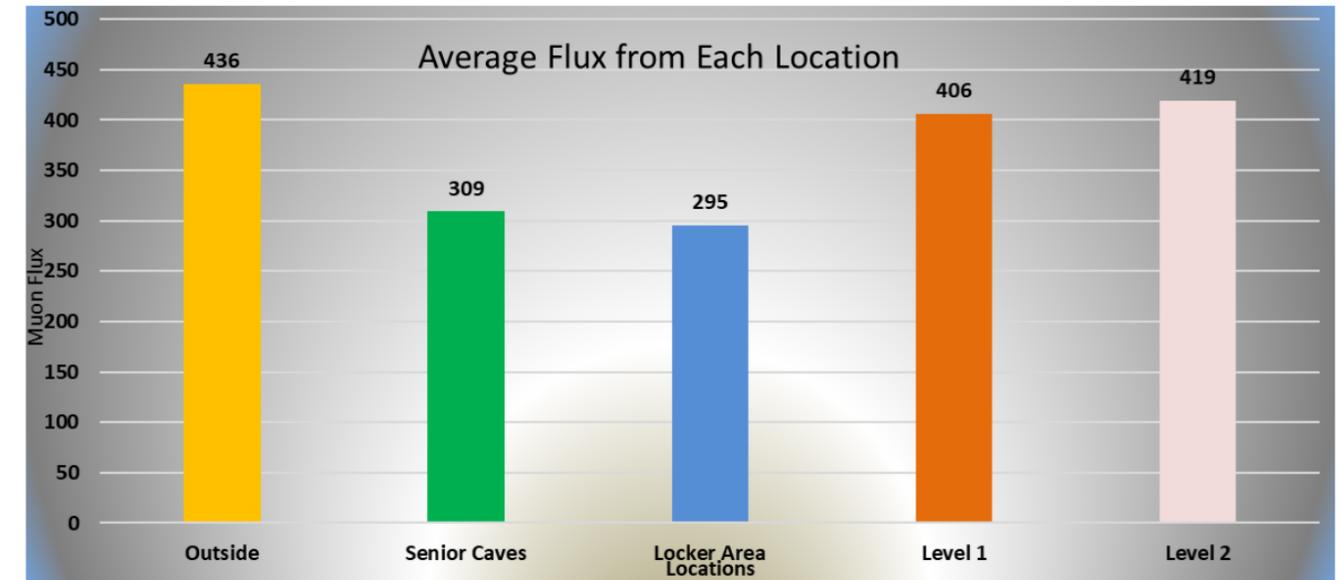- Study of muon absorption/scattering

- First attempts in the 50's

- Multiple recent applications, some using technology developed at CERN

- Homeland security (border protection). Environmental protection (survey if nuclear waste/nuclear reactor)

- Imaging of buildings (pyramids, dome of a church, railway tunnel (june 2019), steel furnace) and geological structures (mainly caves and volcanoes).

Data taking at Basilica (August 2018)

Position 2: Crypt (under the dome)

Position 3: Crypt (Memorial Hall)

Position 1: Cafeteria (under the main stairs)

Position 4: Crossing (under the dome)

Cosmic Ray Rates in Basilica

Muon flux rate (#.m^-2.min^-1)

Position in Basilica
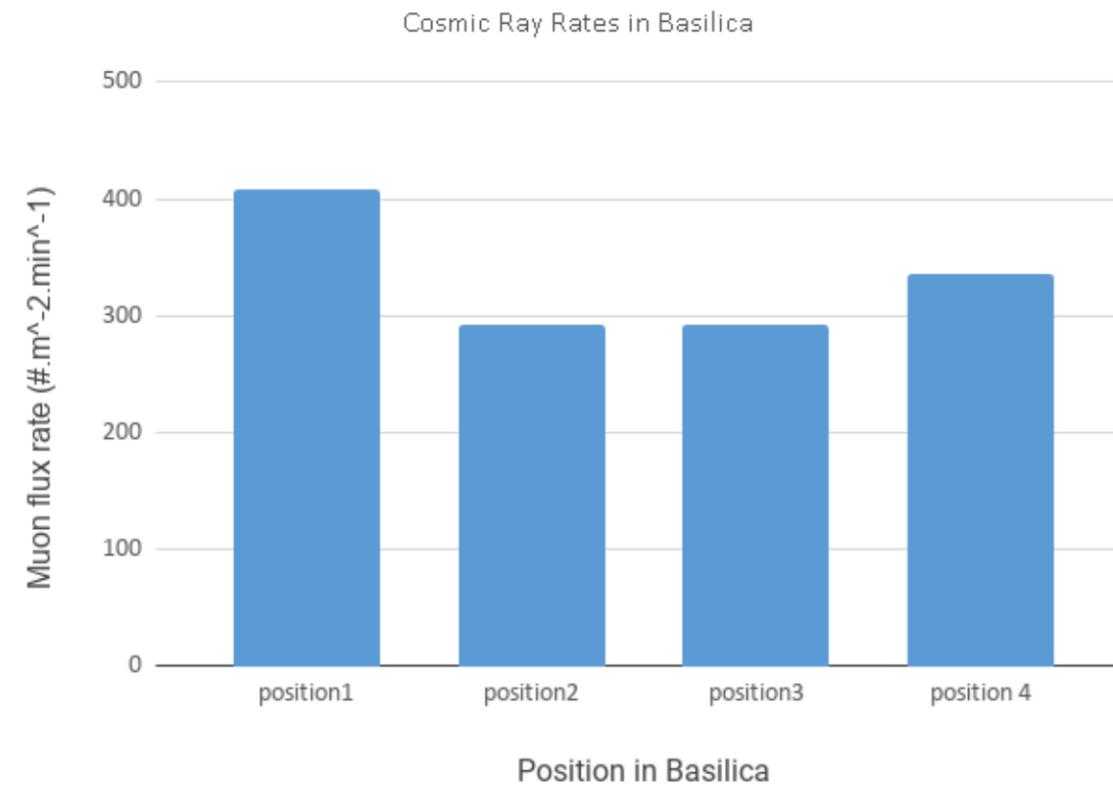
Data taking at ERHS (Spring 2019)

Senior Caves
Locker Area
Level 1
Level 2

Average Flux from Each Location

	Outside	Senior Caves	Locker Area	Level 1	Level 2
Muon Flux	436	309	295	406	419

Locations

Mean and Standard Deviation from Each Location

	Outside	Locker Area	Senior Caves	Level 1	Level 2
Mean	436	309	295	406	419
Stand Dev	19.79	18.15	24.29	20.4	16.17

Two tailed t test between the Different Locations

	$t_{crit} = 1.73$	
	p-value	t-stat
Level 2 Comparison to Outside	0.0586	2.020
Level 1 Comparison to Level 2	0.1701	-1.430
Caves Comparison to Level 1	p<<0.05	-10.70
Locker Area Comparison to Caves	0.189	-1.370
Level 1 Comparison to Outside	p<<0.05	-3.120
Caves Comparison to Outside	p<<0.05	-14.19