
One Small Step for Parents,
One Giant Leap for
Homeschool Kids
Ad Majorem Dei Gloriam
By Domenico Ruggiero


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LET'S GET READY TO ROCKET!

Rocket… rock-it? Get it?

Eh… engineering humor.

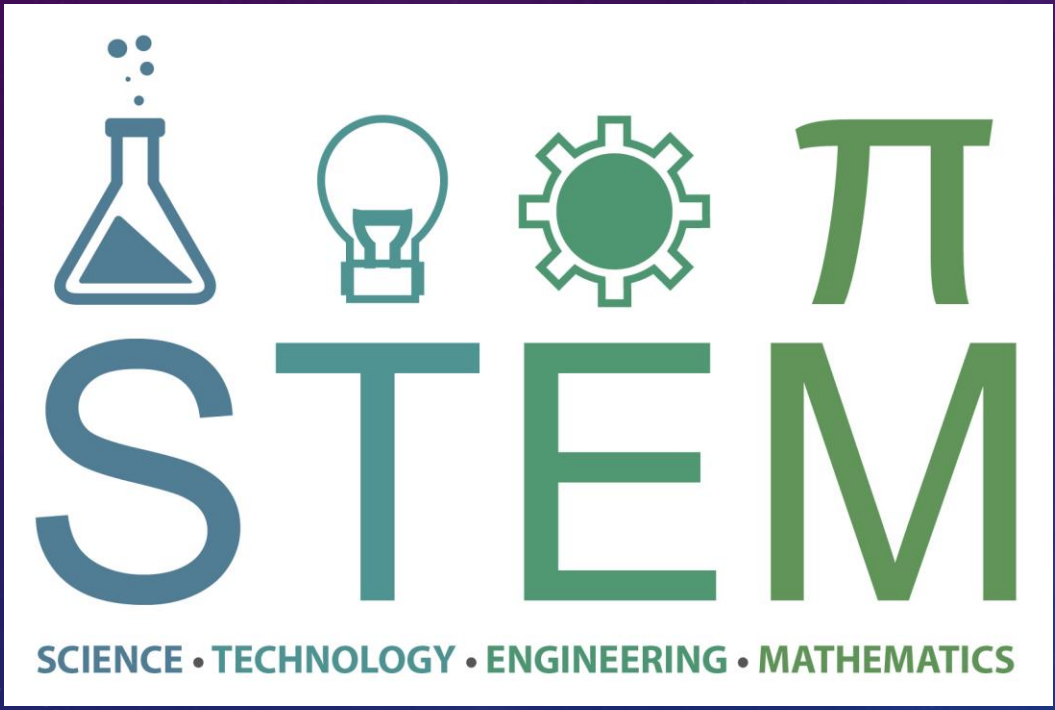
Discussion Topics

- Why this speech?
- Learning opportunities for little and no money
- Student success stores
  (Time permitting)
- Online Resource Links
  (Available for download)

Why This Speech?

(Besides the fact that I love science)

Science topics, especially in high school, can be challenging for students and parents



Students want to learn “cool” things that take them beyond textbooks (i.e. practical, hands-on activities)

Parents desire to provide fun and challenging subjects, but do not always have the background knowledge & experience to teach these subjects effectively

So here’s a solution to that challenge…

(Advances in Technology)

(Multiple Valuable Resources)

(Self/Group-Study)

AMAZING LEARNING EXPERIENCES!

The world of S.T.E.M. is large, but I will focus on some specific “cool” areas of my personal expertise

Main Topics

- Computer Programming
- Radio Communications
- Spaceflight Operations

All three are inter-connected to a limited degree

Also includes

- Hardware and Software
- Cost considerations
  (Preview: Most are FREE!)
- Interesting computer science trivia
- 1 scary Astronomy Fact about the sun

Pop Quiz!

Fun Catholic Computer Science facts

Famous Catholics in Computer Science

Who was the first woman to earn a Ph.D. in Computer Science in the United States?

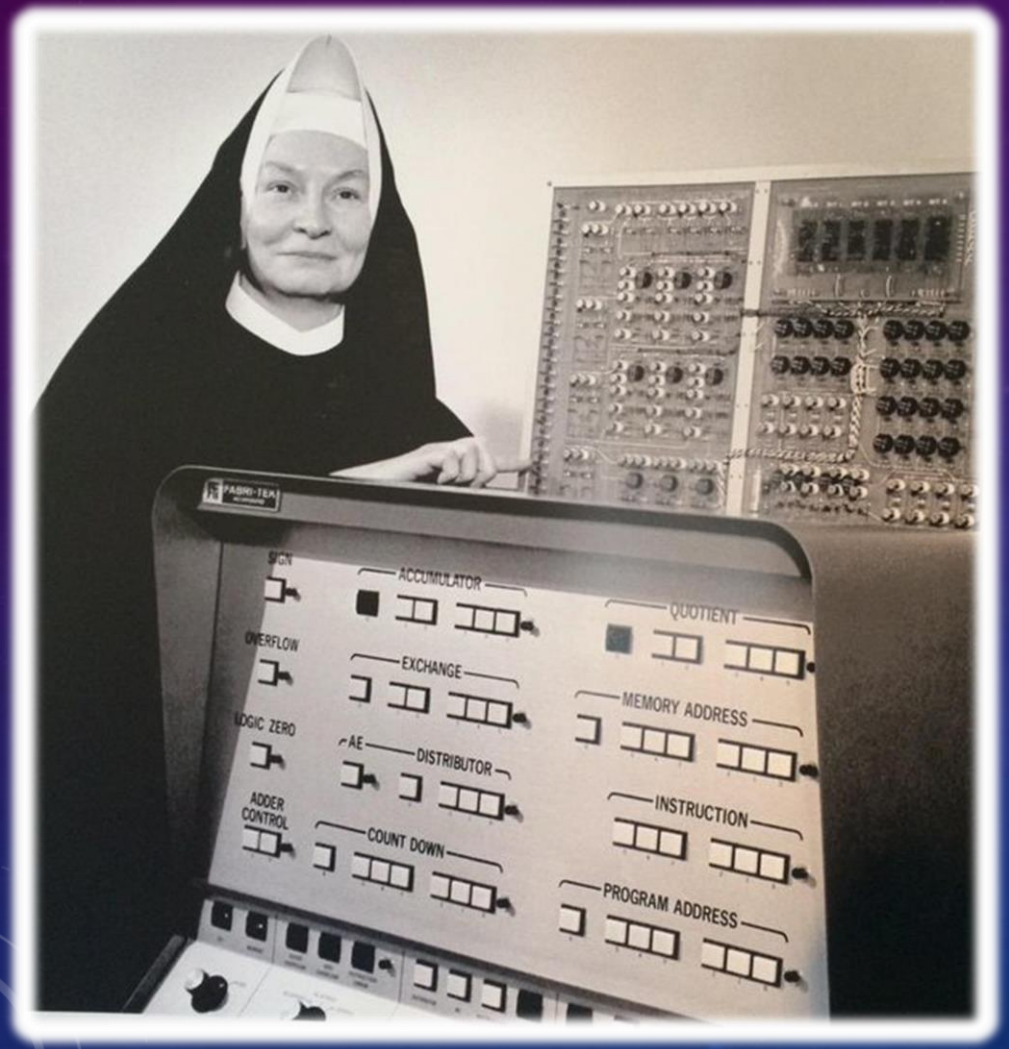
Famous Catholics in Computer Science

Sister Mary Kenneth Keller

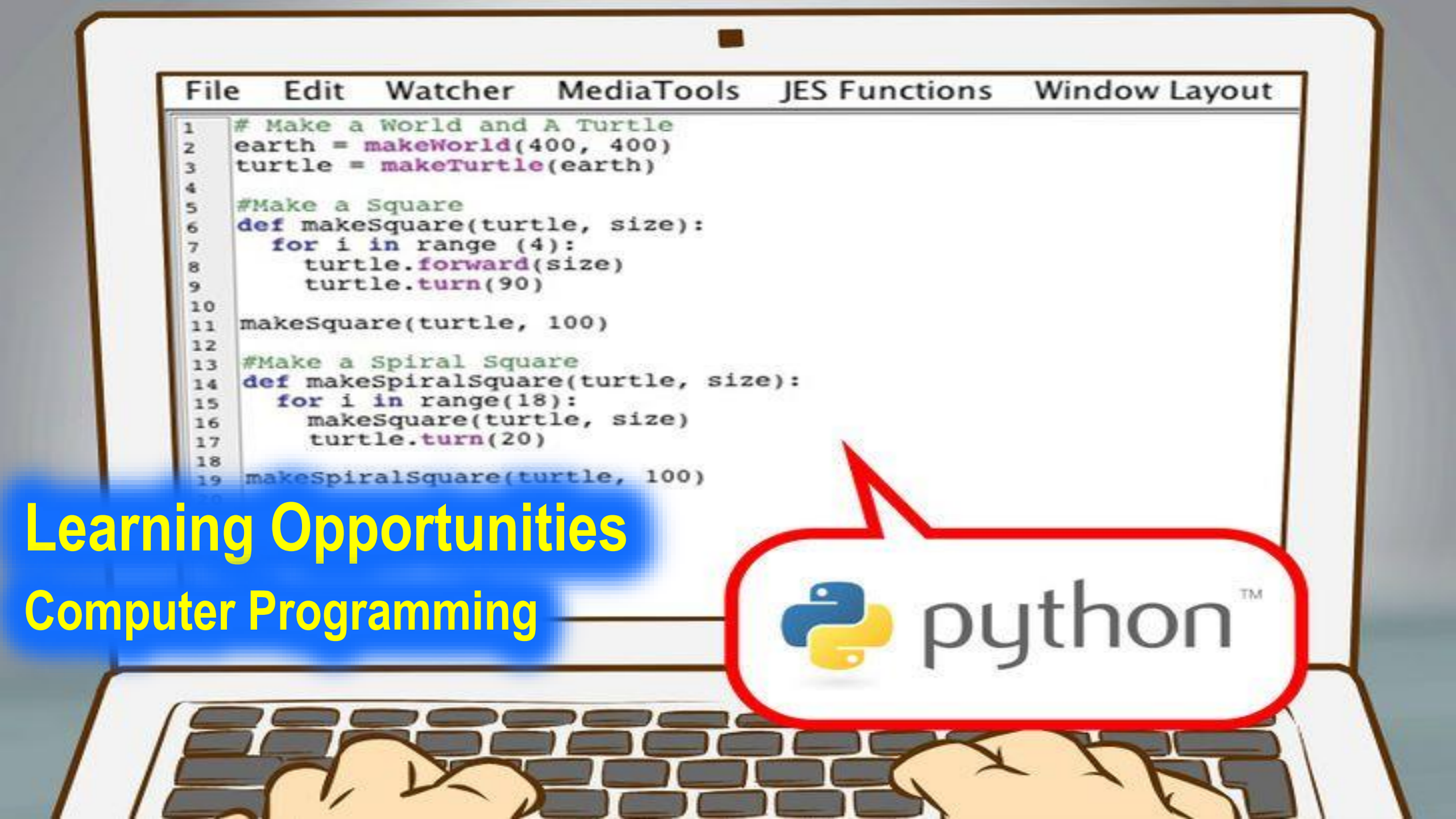
- Born in Ohio in 1914
- Entered the Sisters of Charity in 1932 and professed her vows in 1940.
- B.S. in Mathematics and an M.S. in Mathematics and Physics from DePaul University
- 1965: She became the first American woman to earn a Ph.D. in Computer Science. Her dissertation, written in CDC FORTRAN 63, was titled "Inductive Inference on Computer Generated Patterns."

Famous Catholics in Computer Science

Sister Mary Kenneth Keller



"For the first time, we can now mechanically simulate the cognitive process. We can make studies in artificial intelligence. **Beyond that, this mechanism [the computer] can be used to assist humans in learning. As we are going to have more mature students in greater numbers as time goes on, this type of teaching will probably be increasingly important.**"


File Edit Watcher MediaTools JES Functions Window Layout
1 # Make a World and A Turtle
2 earth = makeWorld(400, 400)
3 turtle = makeTurtle(earth)
4
5 #Make a Square
6 def makeSquare(turtle, size):
7 for i in range (4):
8 turtle.forward(size)
9 turtle.turn(90)
10
11 makeSquare(turtle, 100)
12
13 #Make a Spiral Square
14 def makeSpiralSquare(turtle, size):
15 for i in range(18):
16 makeSquare(turtle, size)
17 turtle.turn(20)
18
19 makeSpiralSquare(turtle, 100)
Learning Opportunities
Computer Programming
python™

Computers have changed a lot over the Years

- Home computers were uncommon and extremely expensive in the mid 1980s
- I started programming BASIC on a Tandy Color Computer 3 with 64k of RAM in the 3rd grade →
- This early exposure to programming has helped me in many ways throughout my career

Computers have changed a lot over the Years

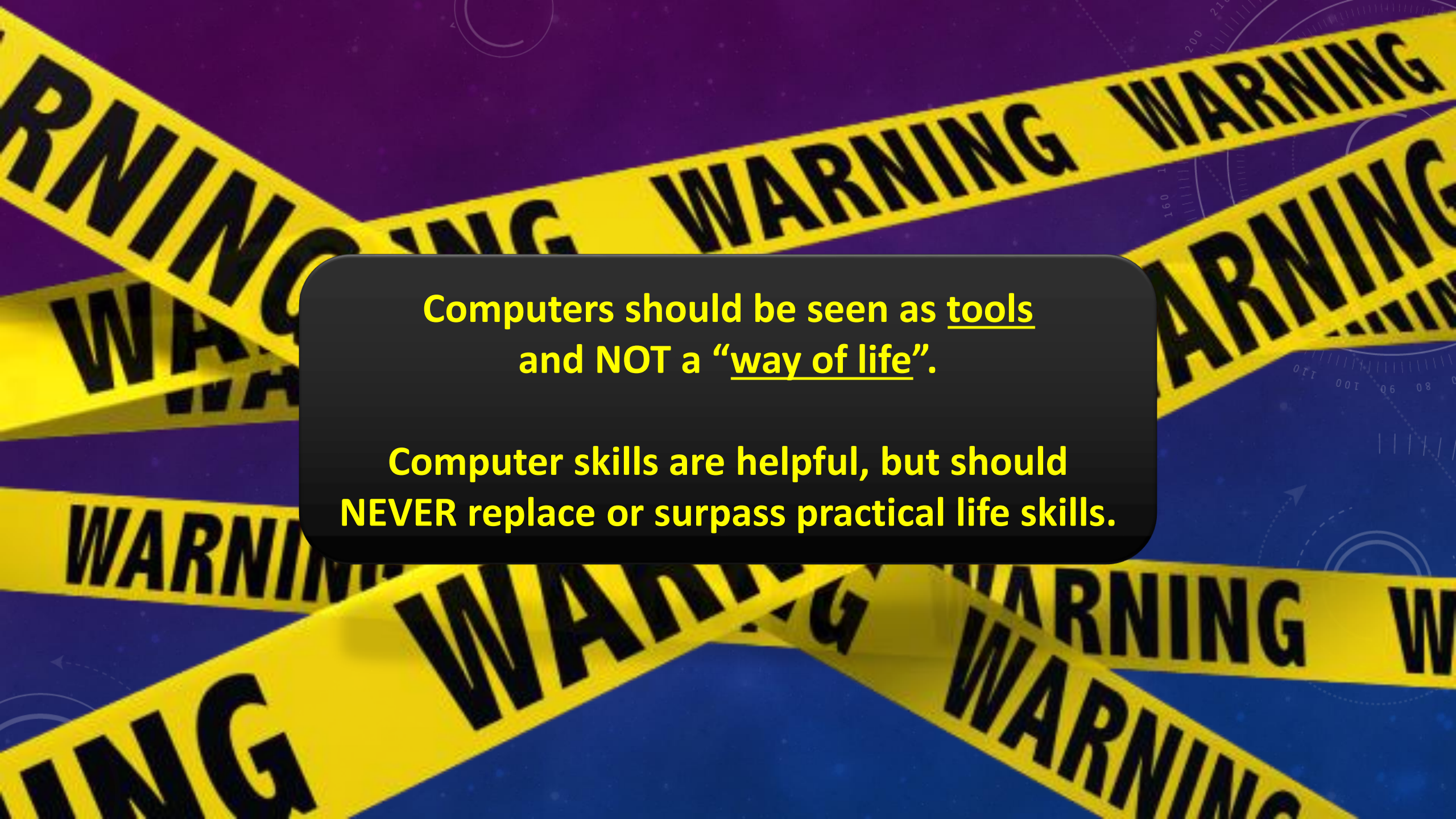
- Most homes have computers in various shapes and sizes (desktops, laptops, “smart” phones, appliances, etc.)
- Computers have allowed for fantastic learning opportunities and also MANY pitfalls (access to all things tied to the world, the flesh, and the devil).

Computers in our lives

Unless we're hit by some massive electrical catastrophe…

… computers will remain an integrated part of our society.

SCARY! The entire world was almost kicked back to living like 18th and 19th century civilizations. Missed by only 7-9 days!


Computers should be seen as tools
and NOT a "way of life".
Computer skills are helpful, but should
NEVER replace or surpass practical life skills.

Python Programming Language

Introduction

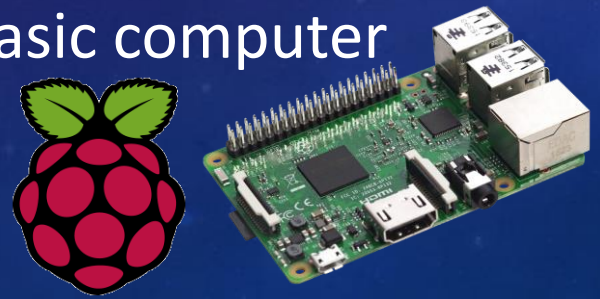
- Probably the easiest language to learn and also extremely functional
- Widely used in many industries
- Python interpreter (program that runs the code) is free to download and continues to be actively developed
- Has a large library of modules (most free) that can accomplish a multitude of activities – including building games with the **PyGame** module

Some Benefits

- Teaches students to think logically, to solve problems, to apply math skills, and can even test their patience when things don't work well
- Gives ability to write programs to meet specific needs not met elsewhere
- A good springboard into other programming languages (VBA, Java, C#, etc.) and more complex applications (e.g. 3D computer development)

How to Learn Python

- Free tutorials throughout the internet (written and/or video)
- Online virtual learning through Homeschool Connections (*"Computer Programming 101"* with some Catholic programming assignments)
- Also found on the **Raspberry Pi** (approx. $40+) single-board computers that are used to promote the teaching of basic computer science



Visit www.python.org to learn more and to view the Python Documentation

TIP: Don't be discouraged with setbacks – programming is like learning a musical instrument or a foreign language… it takes some time and repetitive practice

Learning Opportunities

Radio Communications

Radio Communications for Homeschoolers

Why learn communications?

There is SO MUCH to learn in this area and it costs nothing to start!

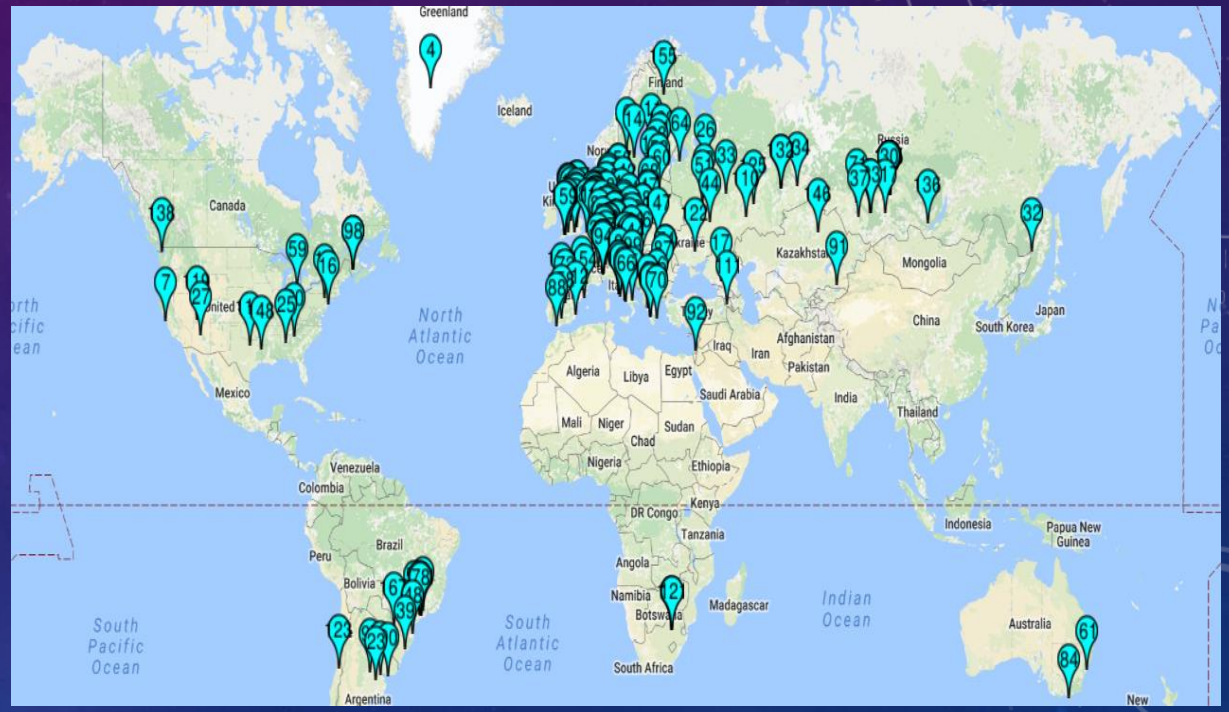
- It's what the "cool people" at NASA do (scientists, astronauts, etc.) – voice, commands, data, pictures, etc.
- Be a helpful resource to your family if "normal" communication methods fail (TV, internet, phone) during emergency situations (severe weather, natural disaster, or other crisis-like event)
- Can lead to a deeper study of electronics with simple circuit kits

Radio Communications for Homeschoolers

Online Software Defined Radio – No Hardware Required

Control internet-connected radios from around the world at

http://websdr.org/



Over 160 stations available around the world!

The University of Twente (Netherlands) is extremely popular for shortwave bands.

Radio Communications for Homeschoolers
Hardware Radios – Show and Tell

Receive Only Options

- Scanners for local communications (handheld or base units)
- Shortwave Radios for long range communications (commercial units or hobby kits)
- Software Defined Radio Hardware for local and long-range communications

Receive and Transmit

- Transceivers for local and long-range communications (handheld or base units)
- Software Defined Radio Hardware for local and long-range communications

All hardware will cost money to acquire with prices varying based on age and capabilities.
Look for used hardware being sold at a discount.

NOTE: Stock antennas are usually average in performance and get you started, but building an antenna designed to accomplish a specific task is usually a good follow-on activity

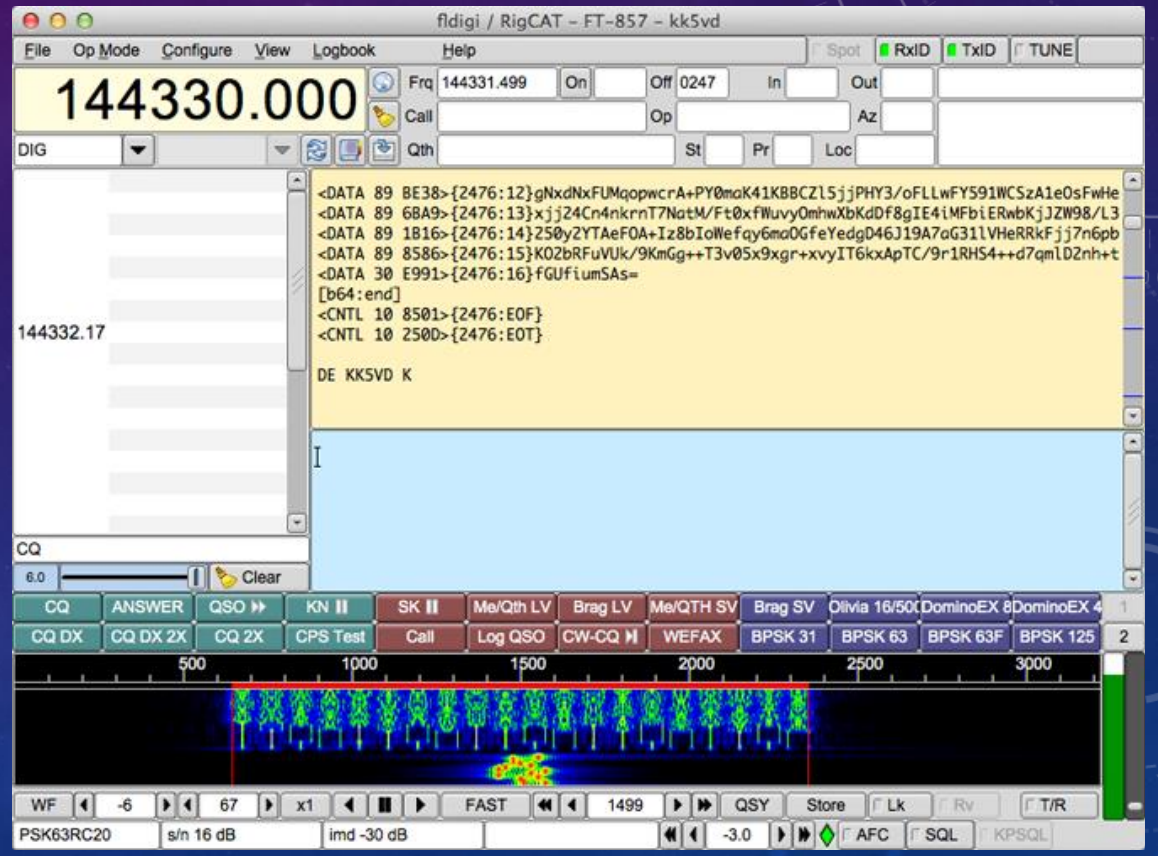
Radio Communications for Homeschoolers

Hands-On Activities

- No license required to RECEIVE (RX)
- No license require to TRANSMIT (TX) on low-power (short range) radios
  - Family Radio Service (FRS) radios
  - Citizens Band (CB) radios
- License is required to TRANSMIT on high-power radios
  - Ham Radio bands
- Online self-study and printed guides are available to pursue a Ham Radio License so that you have the right to TRANSMIT with high-power on Ham radio bands
- Interesting to think you can listen to shortwave radio from around the world (e.g. EWTN shortwave radio, Radio Vaticana, and so much more)
- Listen to the many emergency preparedness radio networks
  - AmRRON has scheduled nets frequently held throughout the country
- The ability to decode and encode digital messages allows for long-range (DX) communications
- Look up locations for the different radio callsigns at **https://www.qrz.com**
- Pin your contacts on a world map to see how far you can go

Radio Communications for Homeschoolers
FLDIGI – Enabling Digital Communications

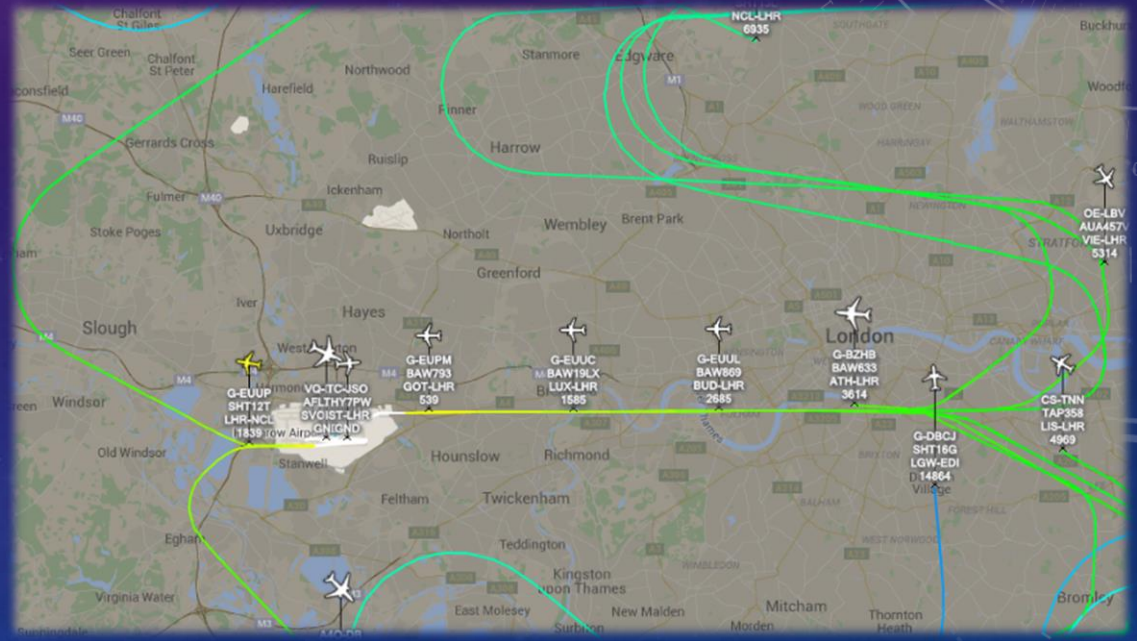
- FLDIGI (Fast Light Digital Modem) FREE @ http://www.w1hkj.com
- Used to support the encoding and decoding of digital communications
- Can transmit/receive text, formatted messages, and even pictures (B&W or color)
- Follow documentation for set-up; connecting audio via **VoiceMeeter** is recommended
  Free @ http://vb-audio.pagesperso-orange.fr/Voicemeeter



Radio Communications for Homeschoolers

Virtual Radar Server – Your Own Aircraft Radar

- Using an hardware-based Software Defined Radio capable of receiving 1090MHz with a small antenna, you can receive the ADS-B data packets from many aircraft flying around your location
- Position is plotted using GPS coordinates; other info such as the altitude, speed, heading, callsign, and more is available
- An internet connection allows for the software to lookup images of the aircraft, known route info, and more



A series of aircraft are coming in for a landing.
Other aircraft are traversing the area
or taxing on the ground.

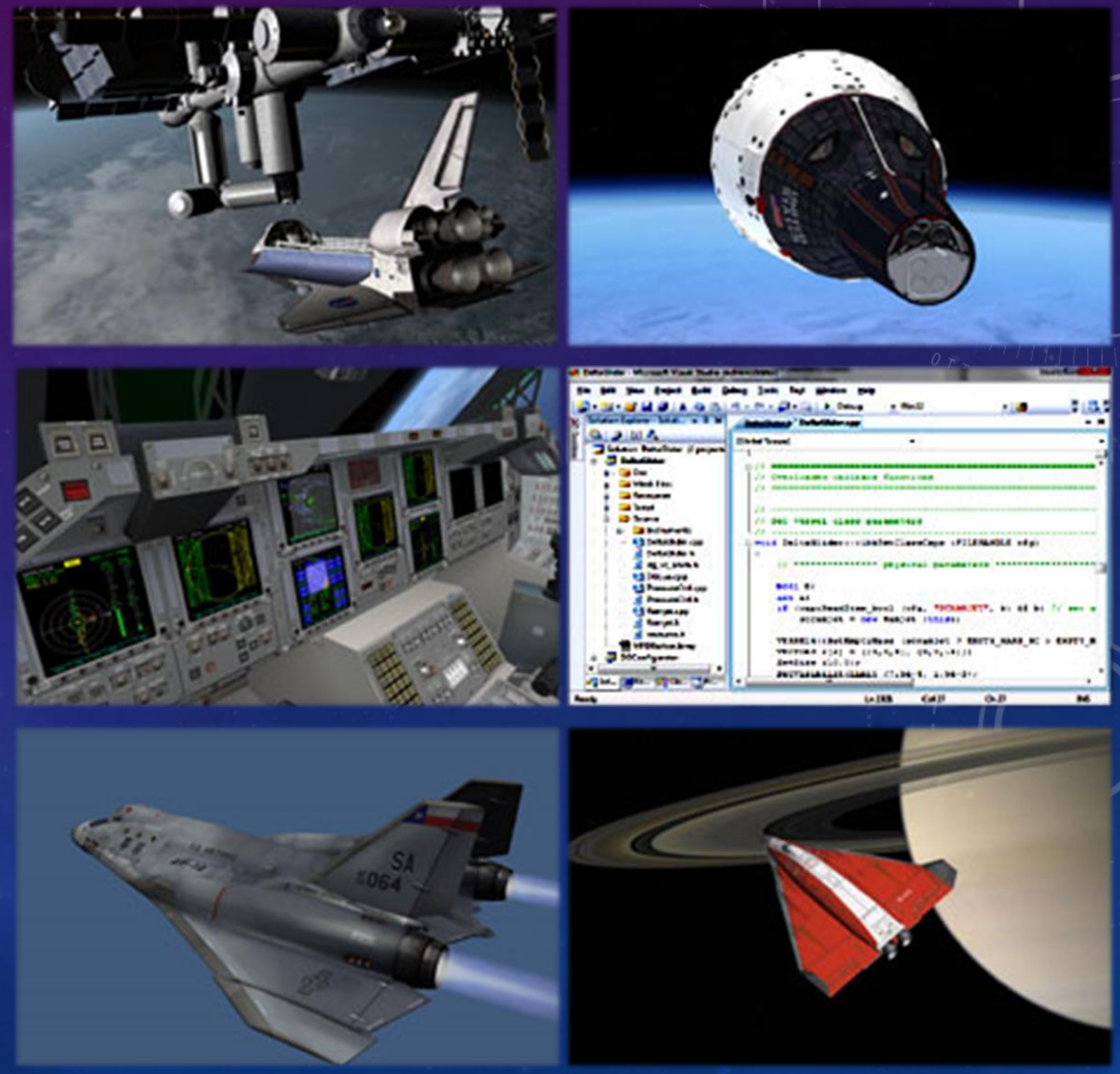
Learning Opportunities

Spaceflight Operations

Spaceflight Operations for Homeschoolers
Orbiter Spaceflight Simulator

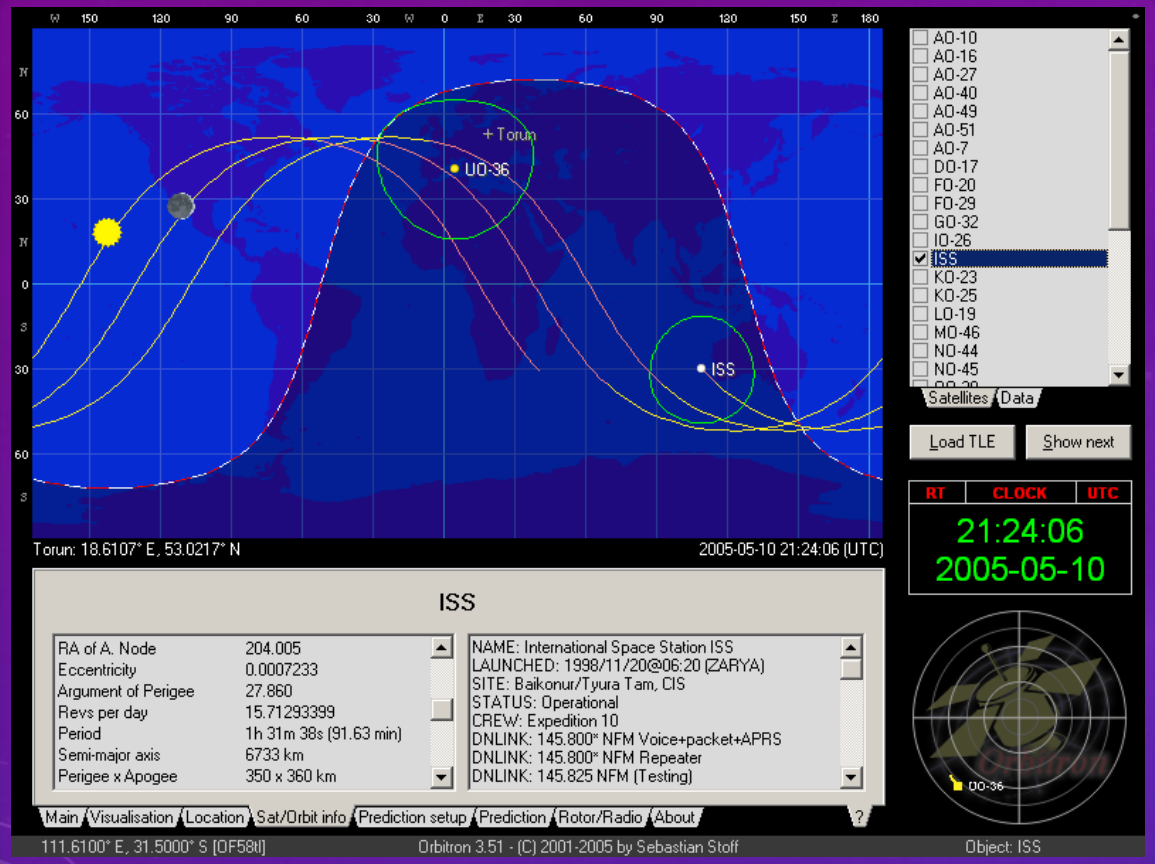
- REALLY!?!? Absolutely!
  Not easy, but achievable!
- The simulator is NOT a video game
  - No aliens, no laser beams, just pure spaceflight operations to stimulate your family's imagination
  - Realistic physics simulator that allows exploration of the solar system in a number of realistic and fictional spacecraft
  - Program your own add-ons using C++ with the provided software development kit (SDK) and documentation

FREE at **http://orbit.medphys.ucl.ac.uk**



Spaceflight Operations for Homeschoolers

Orbitron – Satellite Tracking System



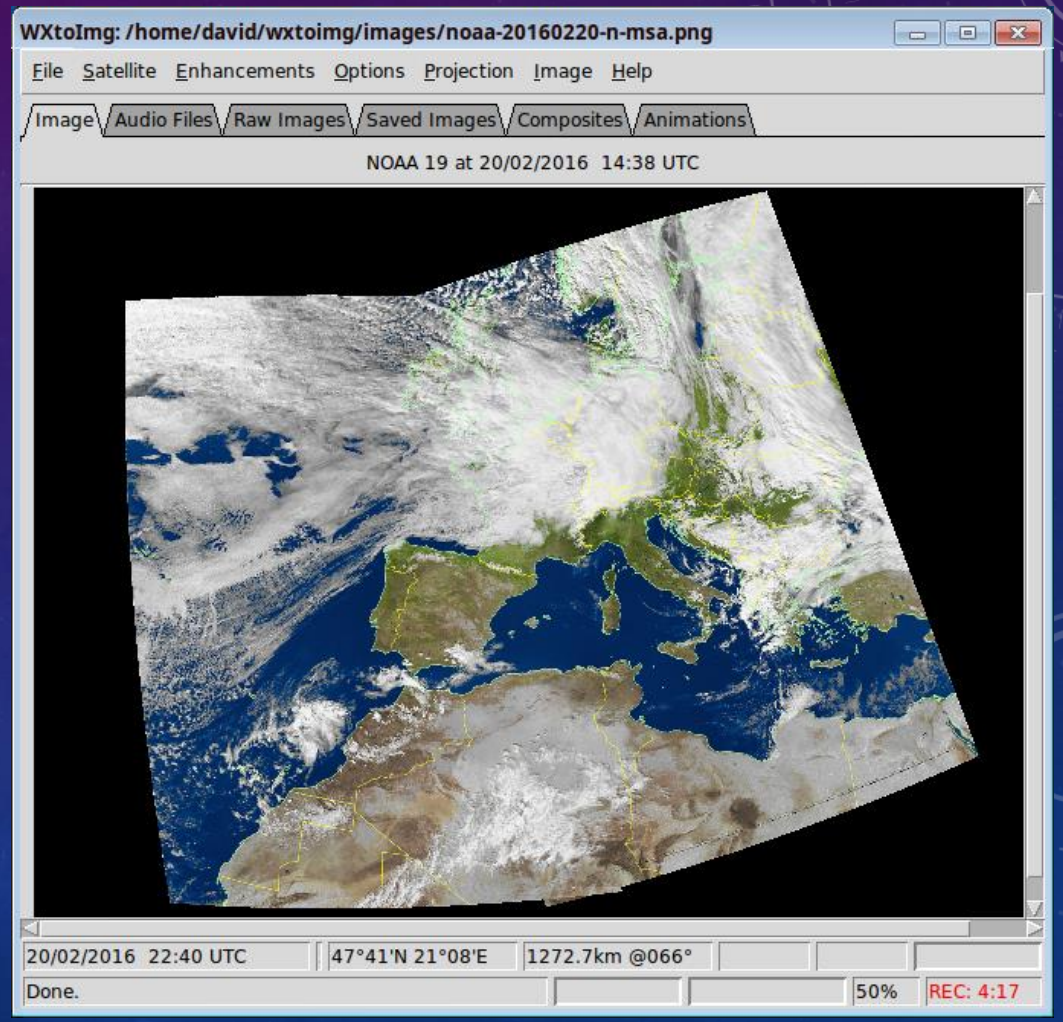
- View the location of countless satellites in real time or at other times in the past or future
- Demonstrates different types of orbits
- Will identify when satellites will be passing over your choice of locations (e.g. over your house or WebSDR sites)
- Use this along with radio communications to know when specific radio targets are going to be in range

FREE at **http://www.stoff.pl/**

Spaceflight Operations for Homeschoolers

WXtoImg – Decoding data from weather satellites

- Using online tutorials for hardware, software, and antenna setup, it is possible to set up a “weather ground station” that can receive imagery from NOAA weather satellites that regularly pass over your location
- The WXtoImg software decodes their data into various real-time image products with map overlays, color enhancements, multi-pass image stitching, and more
- Capable of working day or night
- Free @ **http://www.wxtoimg.com**



Spaceflight Operations for Homeschoolers

Celestia – 3D Astronomy Software

Monday, August 21, 2017

Don't forget to participate in a

TOTAL SOLAR ECLIPSE!

Totality will take place over some parts of Nashville!

- 3D astronomy program with a catalog of 118,322 stars along with extrasolar planets, dwarf planets, moons, asteroids, comets, artificial satellites, and spacecraft
- Travel to other planets in our solar system or even to another galaxy
- NASA uses this for their educational outreach programs
- Over 10GB of add-on extensions are available from the active user community
- Use it to predict lunar and solar eclipses

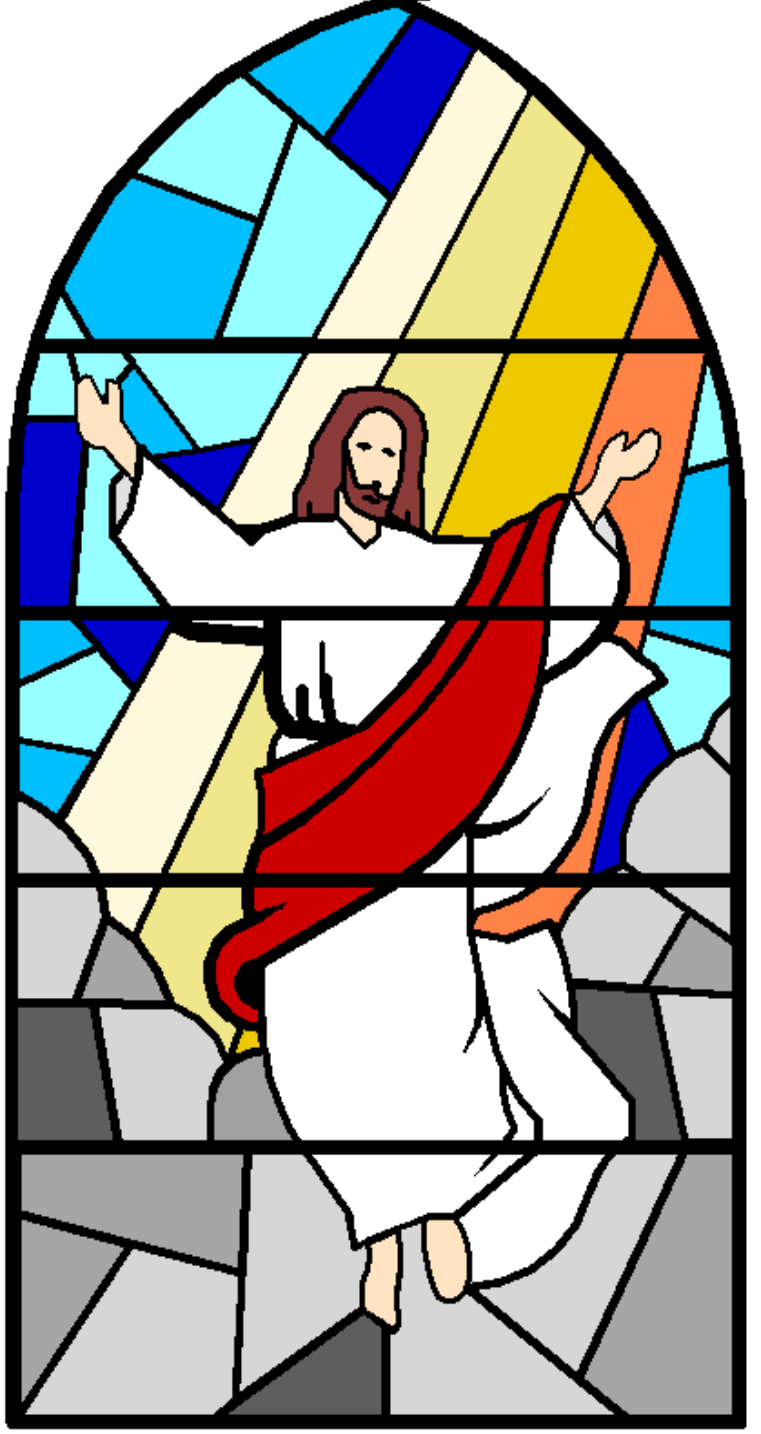
FREE @ **http://sourceforge.net/projects/celestia/**

Homeschooling Science Success Stories

FAR, FAR too many to include, so top selections in each area

Homeschooling Success Stories
Computer Programming –Catholic Art

- Daniel was a new computer programming student
- Assignment was to just produce some sort of Catholic imagery using Python programming
- He went above-and-beyond by combining other elements of his studies, namely the use of audio and animation
- Finished code produces this image in a step-by-step process, all while you listen to the playing of “Hallelujah”
- Demonstration available at my table… it’s AMAZING!



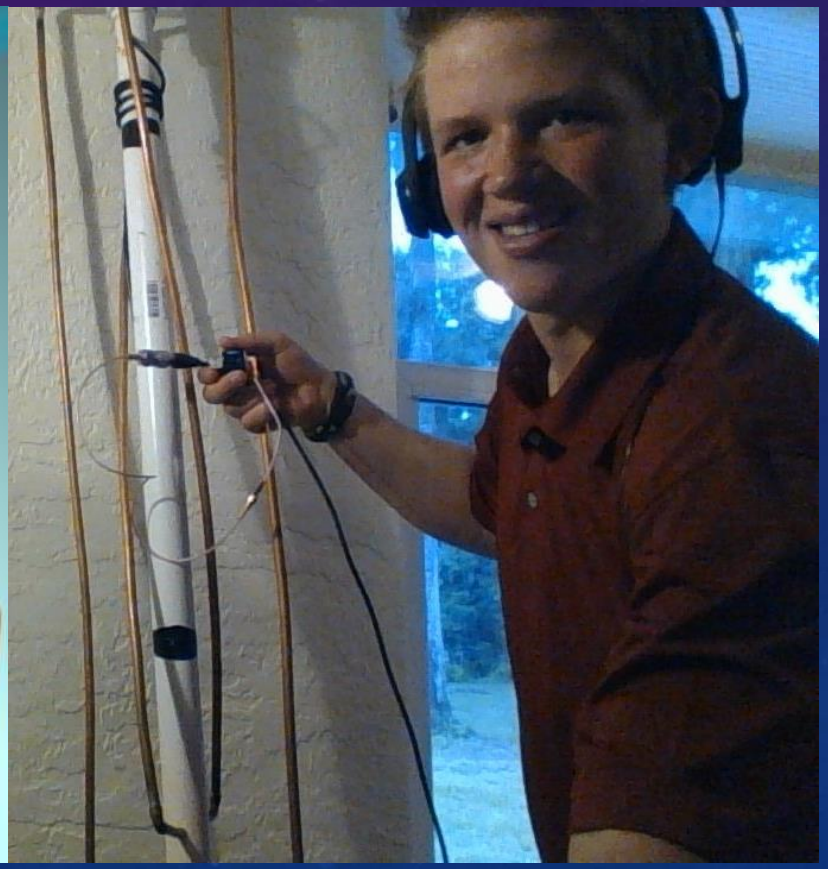
Homeschooling Success Stories

Radio + Spaceflight – Receiving Weather Satellite data

Process

Materials

Kristopher's Antenna



Resource Links

NOTE: The following slides will be available for download from my personal website:

https://www.thesoftwaremaestro.com/community-outreach/

Online Resources – Computer Programming

- Python Software Foundation
  Free @ http://www.python.org
- PyGame – Python Gaming Module
  Free @ https://www.pygame.org
- Raspberry Pi Foundation
  https://www.raspberrypi.org
- **Homeschool Connections** course – *"Computer Programming 101"*
  Register @ http://homeschoolconnectionsonline.com/

https://www.thesoftwaremaestro.com/community-outreach/

Online Resources – Computer Programming

These are best tackled after learning the basics of computer programming:

- **Blender** – Open source 3D creation suite
  Free @ https://www.blender.org/
- **Unity3D** – Industry-leading full-featured game engine
  Free @ https://unity3d.com/
- **Homeschool Connections** course – *"Fundamentals of 3D Computer Development"*
  (Beginning live lectures in the Spring of 2018)
  Register @ http://homeschoolconnectionsonline.com/

https://www.thesoftwaremaestro.com/community-outreach/

Online Resources – Radio Communications

- WebSDR – Online Software Defined Radio Stations Worldwide (they own the hardware but you control it)
  Free @ http://www.websdr.org
- FLDIGI digital encoded/decoder software
  Free @ http://www.w1hkj.com
- Extensive blog dealing with Software Defines Radio hardware and software
  http://www.rtl-sdr.com
  - Summary of Software Defined Radio hardware
    Free @ http://www.rtl-sdr.com/roundup-software-defined-radios/
  - Summary of RTL-SDR supported software
    Free @ http://www.rtl-sdr.com/big-list-rtl-sdr-supported-software/
- HDSDR – High Definition Software Defined Radio
  My preferred controller because of its ability to schedule recordings and to play them back later
  Free @ http://www.hdsdr.de/
- Virtual Radar Server (Plane plotting application) used with the Dump1090 ADS-B Decoding application
  Free @ http://www.virtualradarserver.co.uk and Free @ https://github.com/MalcolmRobb/dump1090

https://www.thesoftwaremaestro.com/community-outreach/

Online Resources – Radio Communications

- **Homeschool Connections** course – *"Spaceflight Operations and Related Sciences (SOARS)"*
  Register @ http://homeschoolconnectionsonline.com/
- **AmRRON** – American Redoubt Radio Operators Network joined with The American Preparedness Radio Network (TAPRN)
  Contains multiple online resources and a list of the many scheduled radio nets
  https://amrron.com/
- **ARRL** – The National Association for Amateur Radio
  http://www.arrl.org/
- Shortwave Radio Frequency Schedule
  http://www.short-wave.info/
- Radio Signal Identification Guide
  http://www.sigidwiki.com/wiki/Signal_Identification_Guide
- Ham Radio Callsign lookup (to learn about them, their hardware, and location)
  https://www.qrz.com
- **VoiceMeeter** – Software to connect multiple applications (outputs to inputs) without the use of cables
  Free @ http://vb-audio.pagesperso-orange.fr/Voicemeeter

https://www.thesoftwaremaestro.com/community-outreach/

Online Resources – Spaceflight Operations

- **Orbiter Spaceflight Simulator**
  Free @ http://orbit.medphys.ucl.ac.uk
- **Orbitron** – Satellite Tracking System
  Free @ http://www.stoff.pl/
- Graphical view of orbiting objects
  Free @ http://www.stuffin.space
- **Celestia** – 3D astronomy software
  Free @ http://sourceforge.net/projects/celestia/
- **WXtoIMG** – Software to decode APT and WEFAX signals from weather satellites
  Free @ http://www.wxtoimg.com
- **Homeschool Connections** course – *"Spaceflight Operations and Related Sciences"*
  Register @ http://homeschoolconnectionsonline.com/

https://www.thesoftwaremaestro.com/community-outreach/

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