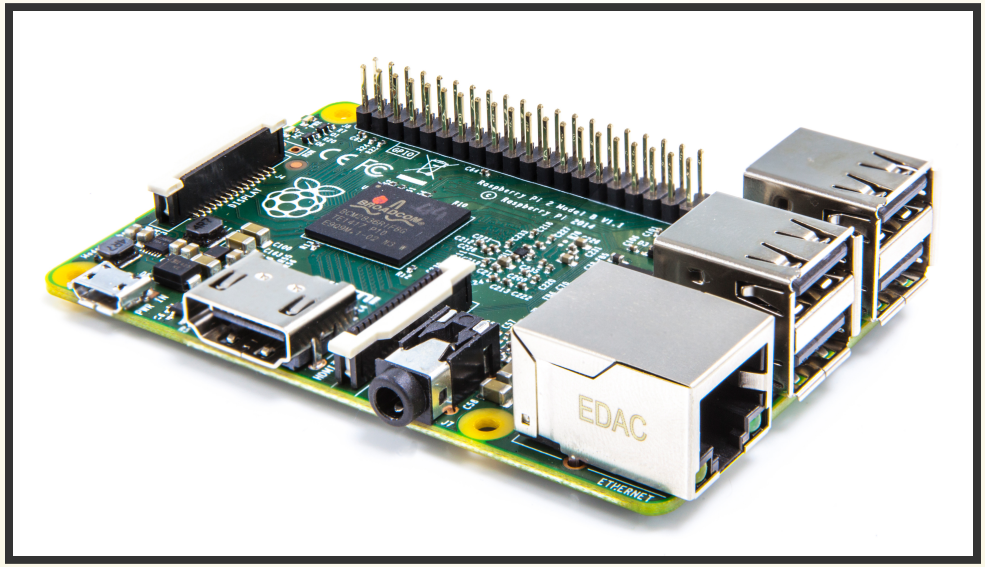
# RASPBERRY PI

## AN INTRODUCTION TO THE CREDIT-CARD SIZED COMPUTER




Jeffrey Kopcak - K8JTK
Ohio Section Technical Coordinator

# TECHNICAL COORDINATOR

The ARRL Technical Coordinator (TC) is a section-level official appointed by the Section Manager to coordinate all technical activities within the section.

- Supervise and coordinate the work of the section's Technical Specialists (TS).
- Refer amateurs in the section who need technical advice to local TS.
- Encourage amateurs in the section to share their technical achievements with others through the pages of QST, at club meetings, hamfests, and conventions.

# TECHNICAL COORDINATOR

- Be available to assist local technical program committees in arranging suitable programs for local club meetings, ARRL hamfests, and conventions.
- Promote technical advances and experimentation at VHF/UHF and with specialized modes, and work closely with enthusiasts in these fields within the section.

# TECHNICAL SPECIALIST

For a section team to be effective in one of the most important arenas in Amateur Radio, technology, there must be a cadre of qualified, competent Technical Specialists (TS).

"Advancement of the radio art" is a profound obligation we incur under the rules of the FCC.

TSes help meet this obligation.

# TECHNICAL SPECIALIST

TS supports the TC in two main areas of responsibility:
**Radio Frequency Interference** and **Technical Information**.

Technical Specialist can specialize in certain specific technical areas, or can be generalists.

http://www.arrl.org/technical-specialist

# OUTLINE

- About the Pi & creator
- Hardware & connectors
- Operating system
- Programming languages
- Projects
- Find out more

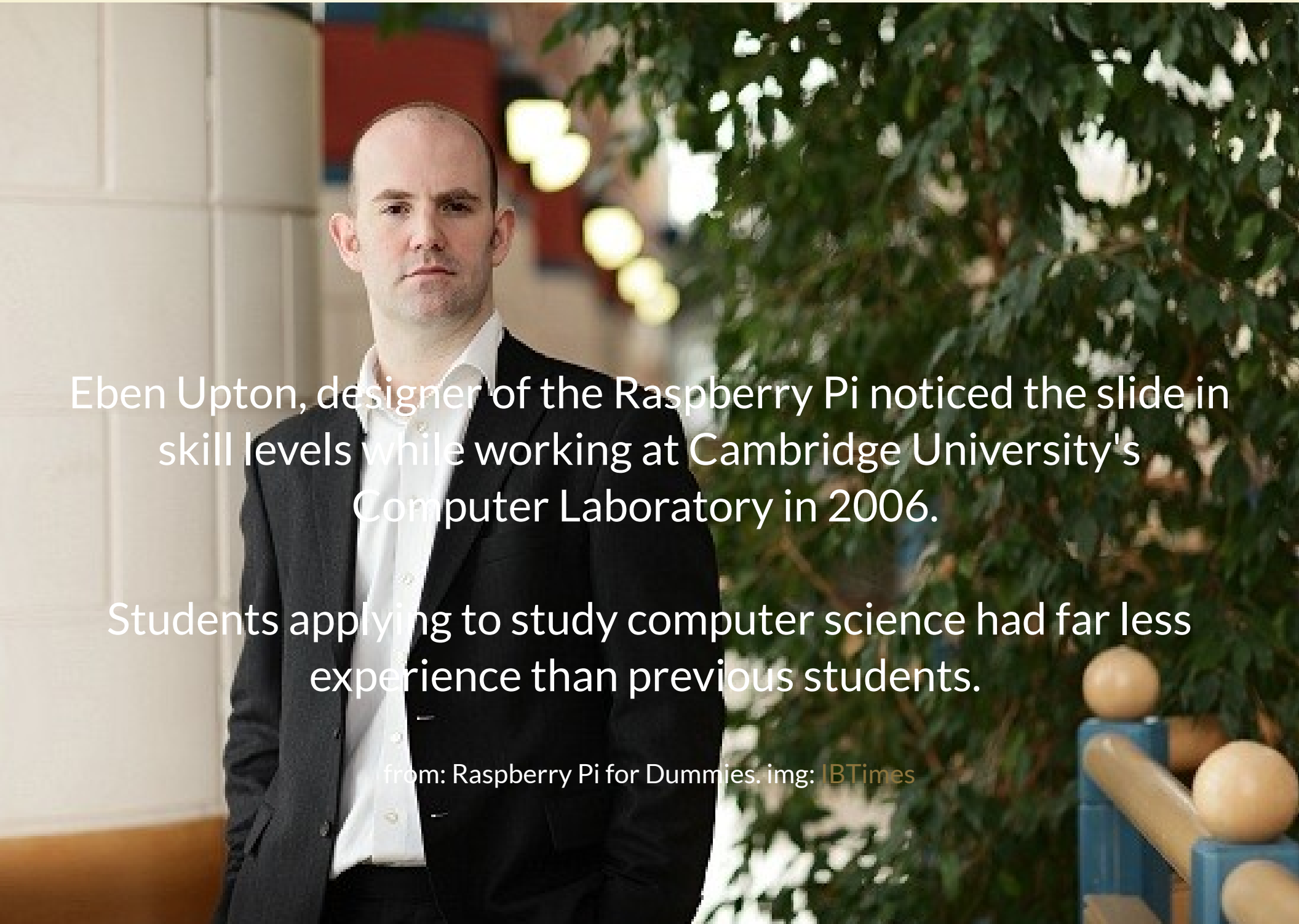
# QUÉ ES?

*The Raspberry Pi is a* ***low cost, credit-card sized computer*** *that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to* ***explore computing, and to learn how to program*** *in languages like Scratch and Python...*

# QUÉ ES?

*...It's **capable of doing everything you'd expect a desktop computer to do**, from browsing the internet and playing high-definition video, to making spreadsheets, word-processing, and playing games. What's more, the Raspberry Pi has the ability to interact with the outside world, and has been used in a wide array of digital maker projects.*

from: What Is A Raspberry Pi?

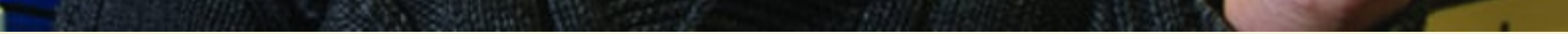


Eben Upton, designer of the Raspberry Pi noticed the slide in skill levels while working at Cambridge University's Computer Laboratory in 2006.

Students applying to study computer science had far less experience than previous students.

from: Raspberry Pi for Dummies. img: IBTimes


Eben and his colleagues came up with the idea of creating a computer, that came with necessary tools, sold for $25, was robust enough to survive a children's book bag, that did interesting things, and drew people to use it.
from: Raspberry Pi for Dummies. img: Cambridge Judge Business School



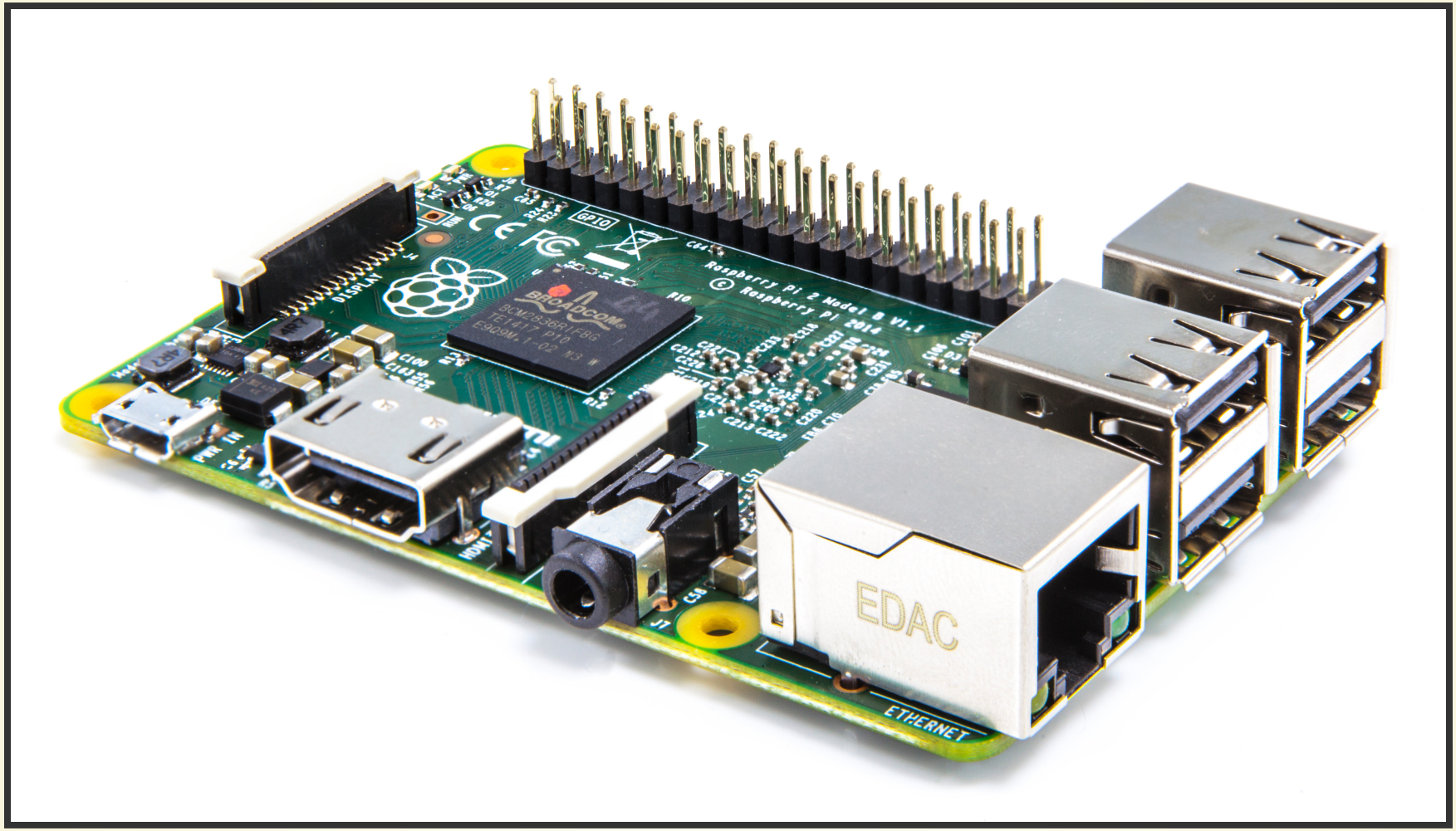
# UNINTENDED CONSEQUENCES

The Raspberry Pi was designed to inspire children to take-up programming, but the vast majority of the £25 computers have been bought by adults.

"The reason we've sold so many of these (over a million) is largely is that they've sold to technology capable adults more than they've sold to kids," Upton said. "We think only 10-20%, maybe 30% of the ones we sold have ended up in the hands of kids."

from: PC Pro

# HARDWARE




img: Raspberry Pi Foundation

# HARDWARE

- Currently 7 models of Raspberry Pi: A, A+, B, B+, 2, Zero, 3.
- CPU equivalent to the chip used in older smartphones or a Pentium II processor (late '90s).
- Graphics equivalent to the Xbox game console (2001).
- **ARM SoC** (system on a chip) architecture (tablets & smartphones) which includes: CPU, GPU (graphics), and RAM (256 MB - 1 GB).
- **Overclocking** (forcing a component to operate faster than the manufactured clock frequency) is built into the operating system and does not void the warranty.

from: Raspberry Pi for Dummies and Wikipedia

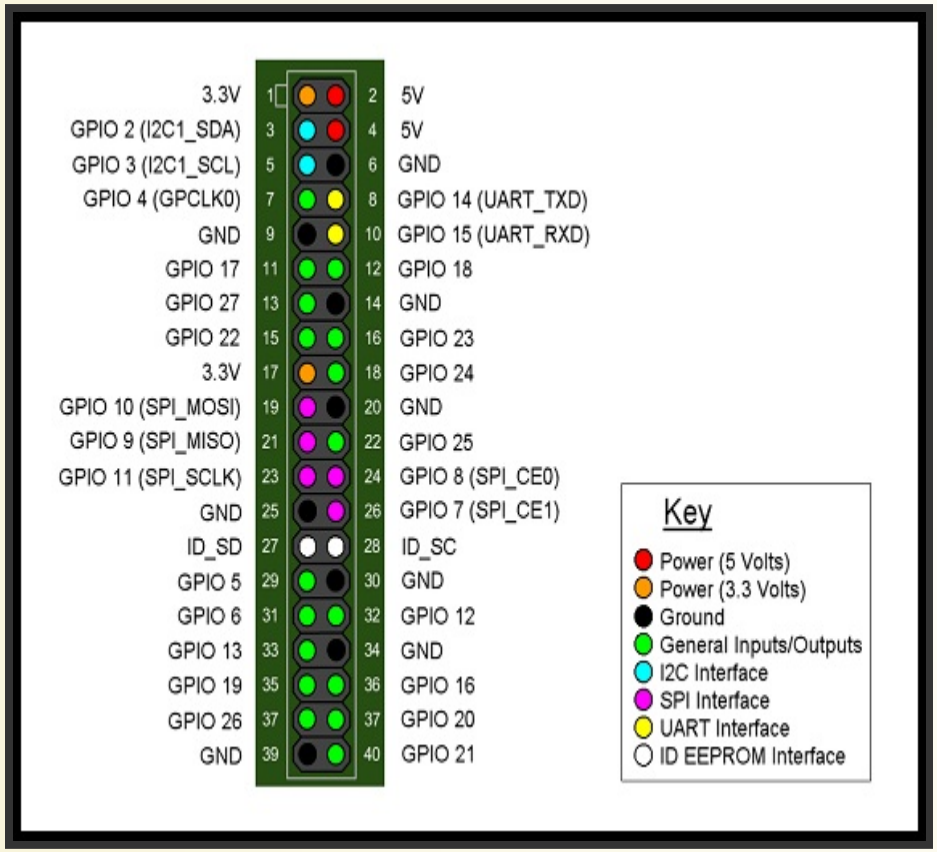
# TYPICAL CONNECTORS

- MicroUSB power.
- 1 - 4 USB connectors.
- Video camera input.
- HDMI, RCA or TRRS (tip, ring, ring, sleeve) on audio port for video out.
- 1/8" audio out.
- SD (Secure Digital) or MicroSD card for storage.
- Ethernet networking port (not "A" boards).
- GPIO (General-purpose input/output).
- Full list of specifications for each model available on Wikipedia.

from: Wikipedia

# GPIO

Interface the Pi with your own circuits!




- Headers come in 26 or 40-pin GPIO depending on model.
- First 26 pins are the same.
- General purpose input and output via Broadcom BCM2836.
- I2C is a standard that can talk to other I2C chips (also used in the ID EEPROM).
- SPI is the Serial Peripheral Interface (sensors, LCD).
- UART is Universal asynchronous receiver/transmitter (Serial port).

img: DesignSpark

from: Wikipedia

# OPERATING SYSTEMS


- Primary operating system is Linux.
- There are many Linux variants (called distributions) available for the Pi.

  *Distributions* have various programs, software / hardware libraries, and / or package management system installed along with the Linux Kernel.
- Raspbian is the recommended RPi distribution.

# DIVE IN, RIGHT?

Not so fast.

The quickest way to get discouraged about something is to have no idea what you are going to do with it... AKA the "now what?" phenomenon.

Figure out a problem you want to solve **FIRST** before anything else.

# PROGRAMMING

- Python
- Scratch (kids)

Others?

- Any language which complies on an ARM chip.
- Bash shell scripting
- C/C++
- Java
- Ruby
- Wolfram
- Graphics
- Bare metal

# PROJECTS - USUAL LINUX STUFF

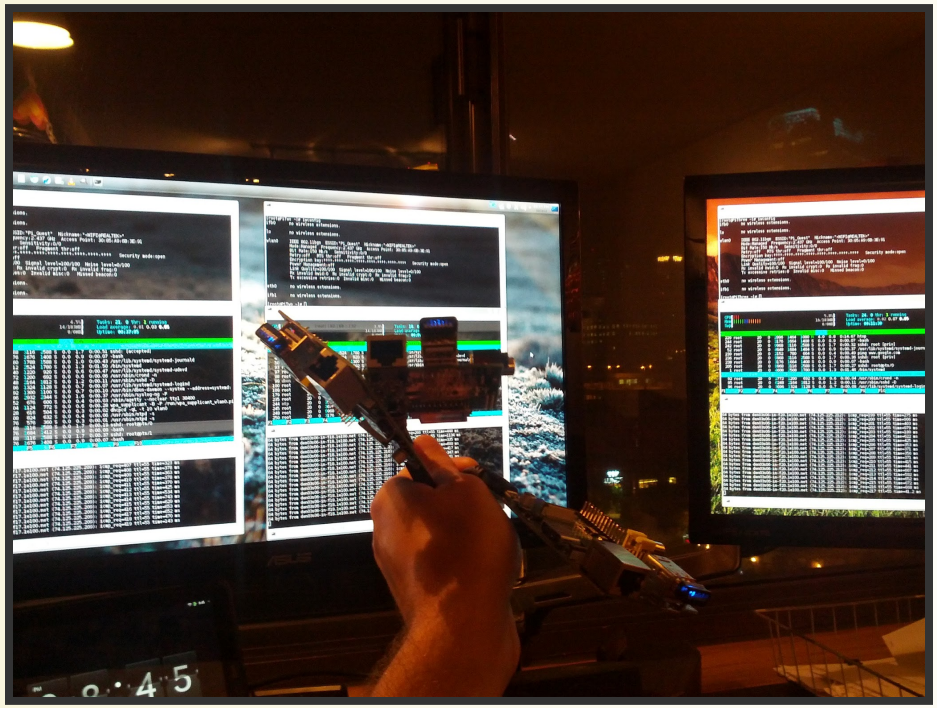
- RasPlex (Media Center)
- WiFi access point
- Network Attached Storage
- Web server
- VPN server
- NTP with GPS

# PROJECTS - GPIO CHRISTMAS TREE

Great for kids!

from: pocketmoneytronics

# PROJECTS - HAM RADIO



img: Eric Erfanian

- Freq Show (RTL-SDR Scanner)
- WSPR Transmitter
- Asterisk Allstar
- OpenRepeater (controller)
- TNC-Pi (APRS)
- HSMM-Pi
- K8JTK DVAP Pi Hotspot
- K8JTK FLDIGI
- K8JTK APRS RX IGate

# FINDING OUT MORE

- **Dongle Bits** articles I wrote for Lake Erie ARA and Wood County ARC.
- **Books**: on the Raspberry Pi itself. Programming language books, ones for the Raspberry Pi would be more specific to using the Pi hardware and interfaces.
- **Magazines**: hobby magazines. Articles in QST for example.
- **Podcasts**: how tos. AmateurLogic.TV, Hak5, Ham Nation.
- **Internet sites, blogs, YouTube**: Raspberry Pi forums, Slashdot, Lifehacker, Reddit, YouTube.
- **Search for an interest or project idea.** Example:

---

*APRS Raspberry Pi*

---

# THE END

## JEFFREY KOPCAK - K8JTK

- ARRL Ohio Section Technical Coordinator
- K8JTK@arrl.net
- This presentation is available on my website: K8JTK.org
- Ohio Section