

Introduction

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Eben Upton invented the Raspberry Pi. As a teacher, he noticed that engineering students were getting worse, not better, at basic computer science concepts. He realized that students were not tinkering with the guts of their computers the way he had with his childhood Amiga. His solution was to prototype a \$35 hackable computer, which we now know as the Raspberry Pi. With something so cheap and simple to program, engineering students could more easily study computing concepts.

Millions of people outside of his classroom scrambled to get their hands on a Pi. What he had designed for his students was now adopted by makers, tinkerers, and creators all over the world.

The Power of the Pi

The Raspberry Pi is a small computer. It has Ethernet networking, USB ports for peripherals, HDMI and composite video outputs, and a head-phone jack for audio. It also has a small number of General Purpose Input/Output (GPIO) pins that can be controlled with software to send and receive binary information to control electronic circuits and microcontrollers.

The Pi boots from an SD card that contains its operating system and programs. The “New Out Of Box System” (NOOBS) preconfigured SD card gives new users a simple user interface for installing various

operating systems, including the Raspbian Linux distribution, recommended by the Raspberry Pi foundation.

At the time of this writing, the Raspberry Pi Foundation released a new Pi model called the B+. This model offers more GPIO pins, additional USB ports, better audio, and lower power consumption. All four projects that are detailed in this book work with the B+.

Raspbian

Raspbian Linux makes the Raspberry Pi's desktop visible using an HDMI or RCA monitor, though most people prefer HDMI for a pixel-perfect display. While the Pi itself is cheap, the cost of peripherals like a monitor, keyboard, mouse, and power supply will cost many times more than the device itself.

One way to dodge such extra purchases is to network your Pi. All you need are a standard USB power cable and an Ethernet cable. Plug the USB into a power source, and plug the Ethernet into a router (or a laptop/desktop computer that is configured for network sharing), and you're good to go. Once the Pi has booted, you can see its desktop using a remote access program like VNC. With this type of setup, you can use your Pi without a keyboard, mouse, or monitor—"headless," as it is known in the Raspberry Pi community. However, because it sends the desktop as a series of images over VNC, it is not appropriate for high-frame-rate applications such as video playback.

Who Is This Book For?

This is not a beginner's book, but effort has been made to walk even novice readers through the projects. An electronics and soldering background would be nice to have prior to starting these projects, but is not necessary.

Projects in This Book

Five makers from all over the world have come together to share a few of their projects and inspire readers. This book consists of four main projects: Picussion, Raspberries from Scratch, Internet of Fish, and a Giraffe Mood Lamp.

Picussion, in [Chapter 2](#), is a wireless, wearable device, made by Clare Bowman and Cefn Hoile, that can be configured by a Raspberry Pi to trigger sound samples by knocking/hitting it or orienting it in space.

The **Raspberries from Scratch** in [Chapter 3](#), made by Sjoerd Dirk Meijer, turns everyday, conductive materials into a homemade conductive keyboard. This project walks you through building the conductive keyboard, and then walks you through making two computer programs with the Scratch language.

[Chapter 4](#)'s **Internet of Fish**, by Lauren Orsini, is a smart, communicative thermometer. With this project, your Pi texts your cell phone with any overheating or cooling emergencies, and it also feeds a local web server that reads and visualizes the thermometer's data. This project could be used in other ways, such as monitoring a swimming pool, or maintaining a perfect temperature for an at-home brewery.

The **Giraffe Mood Lamp** in [Chapter 5](#) has the brains of a Raspberry Pi and the exterior of a lamp. This project, created by Brian Corteil, is able to receive Twitter messages by harnessing the Twitter API, and flashes when it finds a new message.

Picussion

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By Clare Bowman and Cefn Hoile

Have you ever dreamed of playing in a one-man band? Follow along and construct cheap, wearable devices, using them to trigger interactive audio running on a Raspberry Pi. We call this project (Pi)cussion (Figure 2-1).

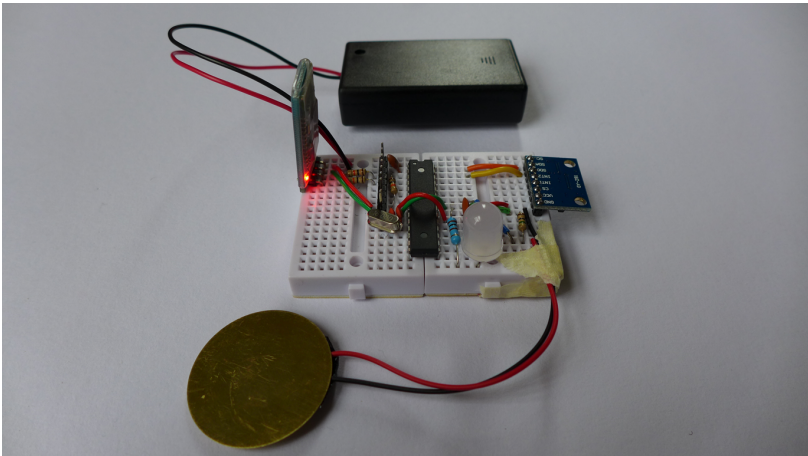


Figure 2-1. *Picussion*

Although the wearables themselves are based on an ATmega chip, the Raspberry Pi is integral to the Picussion project. The Pi runs a full desk-