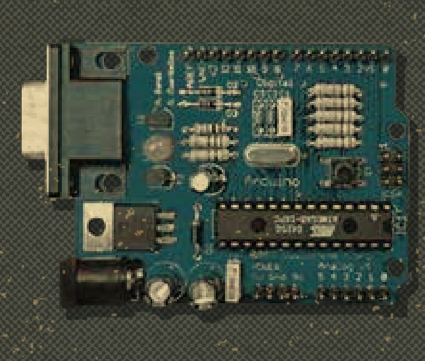
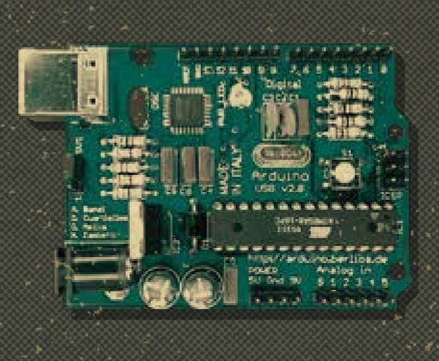
FIELD GUIDE
to
ARDUINO

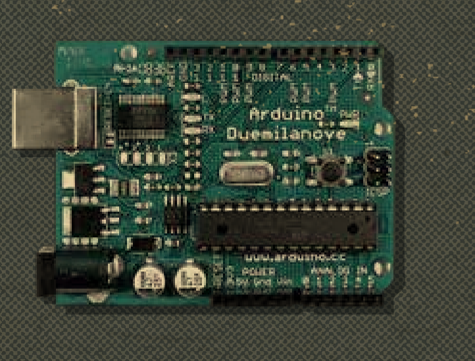
Memory Lane



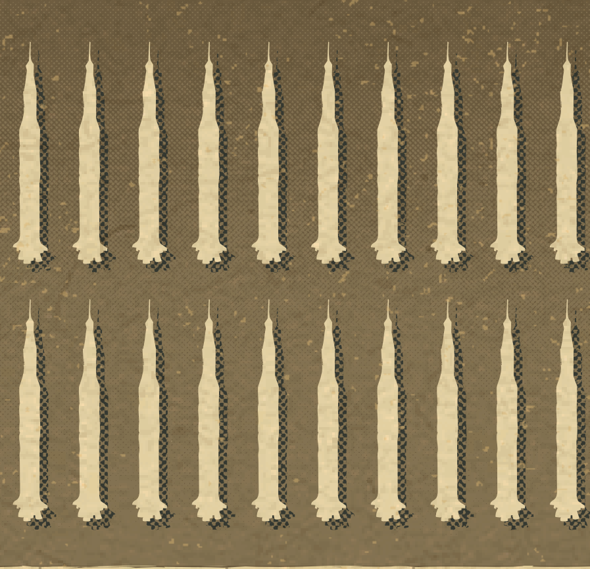
Arduino's earliest boards look familiar but lacked many of the features that we're used to today. The Arduino Board Serial, for instance, was without a USB-Serial bridge, and instead had an RS232 port for programming. It was also based on the ATmega8 microcontroller, which only had 8k of Flash memory!



The aptly-named Arduino USB was the first appearance of the now-familiar FTDI USB-Serial bridge, but it retained the ATmega8 until the production of the Arduino NG. Later versions of the NG included an ATmega168, an LED on pin 13, and RX/TX LEDs.

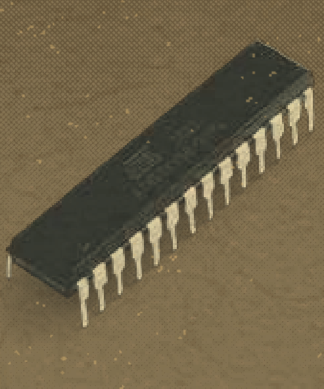


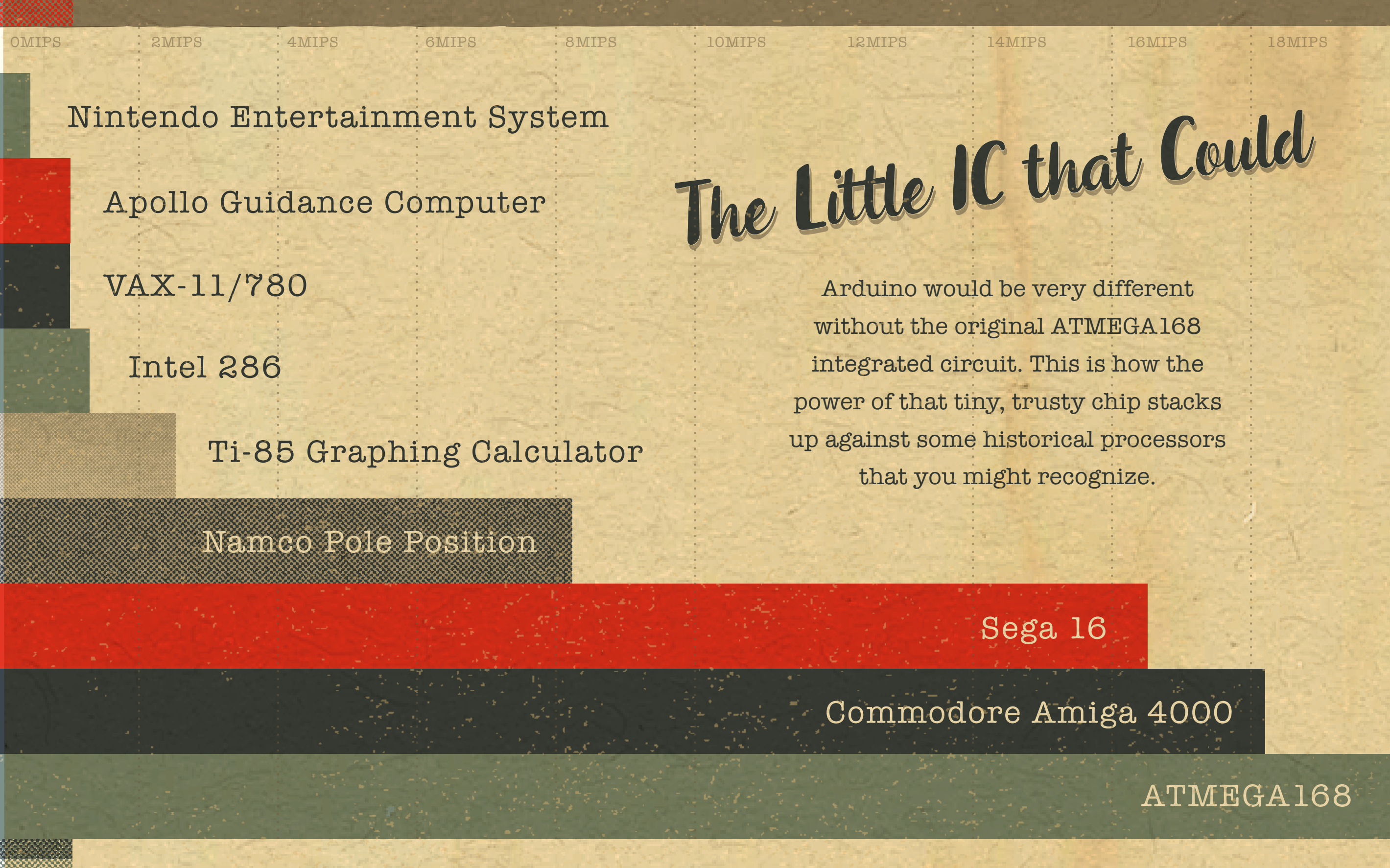
The ATmega328 wasn't part of the Arduino family until the Arduino Duemilinove, which also eliminated the power selection jumpers and added a solder jumper for enabling and disabling auto-reset. Replacing the FTDI USB-Serial IC with an ATmega8U2, and updating the color scheme to a friendlier shade of blue, brings us to the current day Arduino UNO.



Space for Improvement

In 1965, it would've taken the combined power of 20, 70-pound Apollo guidance computers to equal the processing power of a single Atmel ATmega168 microcontroller – about $300M in NASA money.



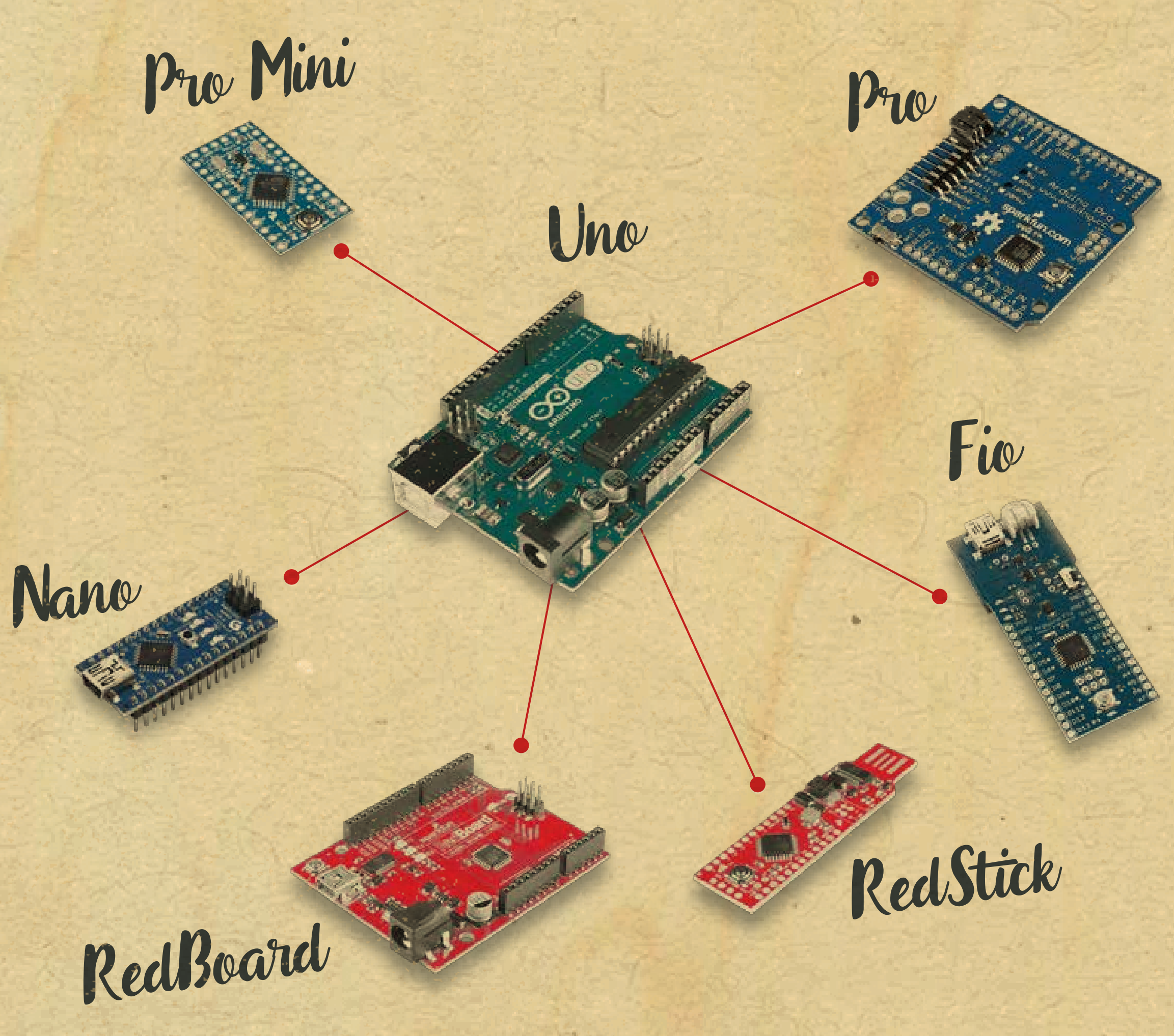


The Little IC that Could

Arduino would be very different without the original ATMEGA168 integrated circuit. This is how the power of that tiny, trusty chip stacks up against some historical processors that you might recognize.

The "328" family

These Arduino boards are all based on the ATmega328, the most basic microcontroller being used on Arduino boards today. Despite being the most... economical... controller, the 328 is head-and-shoulders above many of the microcomputers that you interact with on a daily basis. It has 32k of flash, eight channels of ADC and up to 23 channels of general purpose IO. Its wide voltage tolerance and low power consumption make it a perfect cornerstone for the Arduino lineup. Although all of these Arduino boards carry the same brain, they vary in size and price depending on whether you want on-board programming, breadboard-friendly headers or battery support.



Bar di 're Arduino

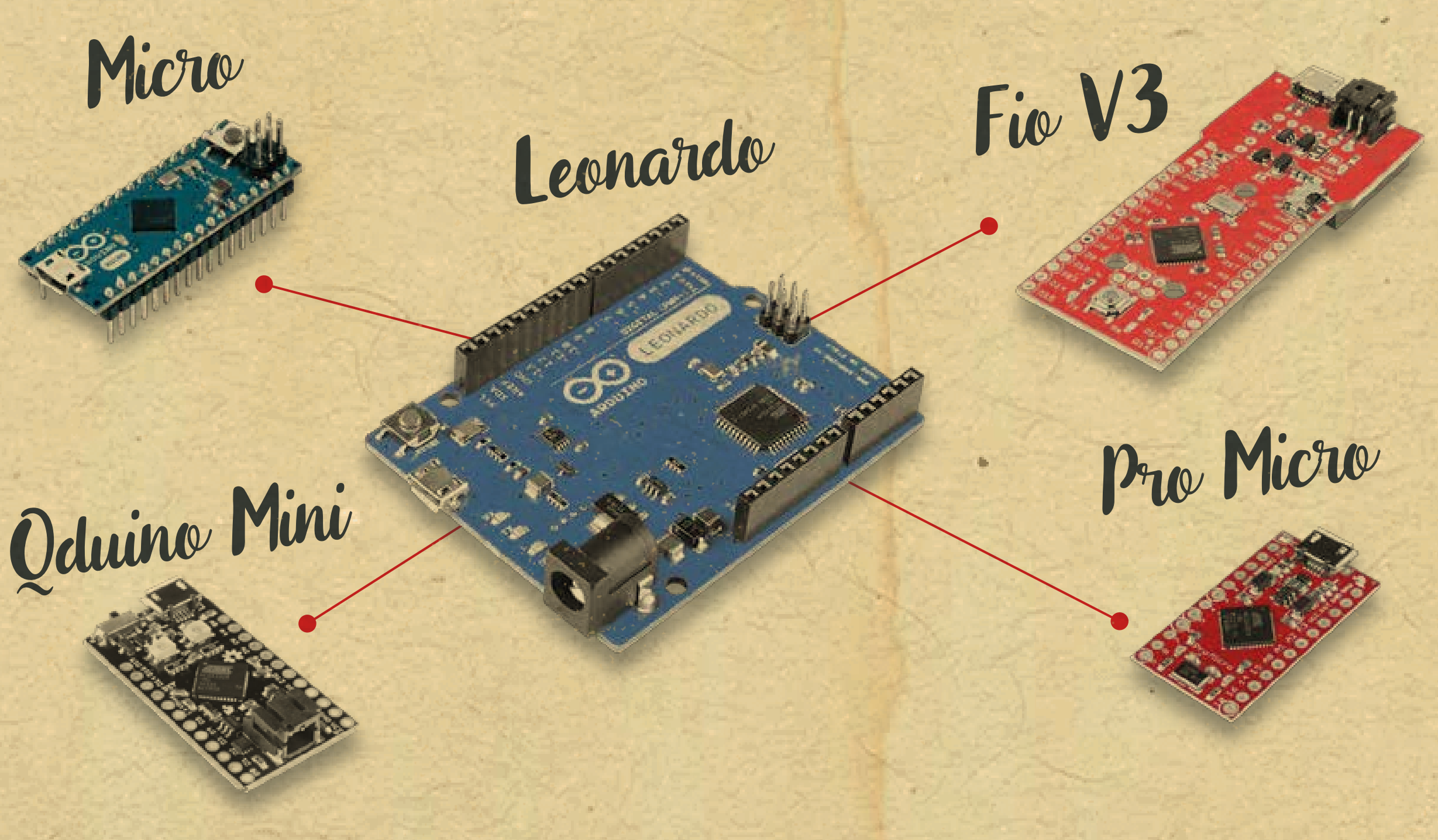
Arduino was named after a bar frequented by students at the Interaction Design Institute in the northern Italian city of Ivrea. The bar was named for an Italian king, Arduin of Ivrea, who briefly ruled Italy around 1000 CE. The word "Arduino" roughly translates to "strong friend."

Orange you kidding?

Unlike residents of New Orleans, who celebrate Mardi Gras with beads, booze and parades, Carnival-goers in Ivrea celebrate Fat Tuesday by having a town-wide, three-day-long orange fight – possibly commemorating the city's defiance of a tyrannical ruler (not Arduin).

Attack of the 32U4!

The ATmega32U4 has similar capabilities to the 328, but it includes a USB transceiver, so there's no need for a separate USB-Serial bridge. This allows the 32U4-based Arduino boards to be smaller and more power friendly! The native USB capabilities of the 32U4 also make it possible for your Arduino to masquerade as a USB mouse, keyboard or other peripheral device!

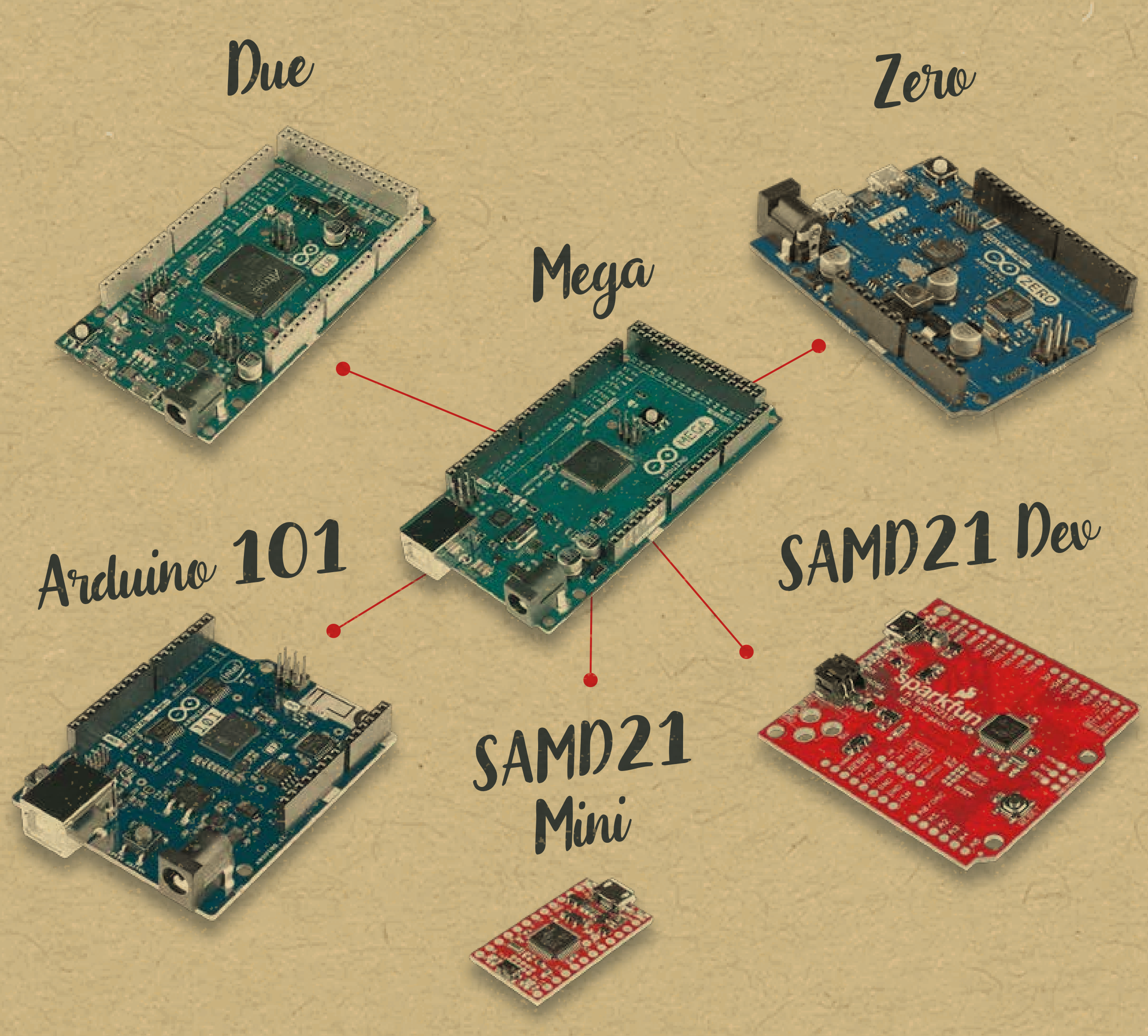


"What is a Michaelcontroller?"

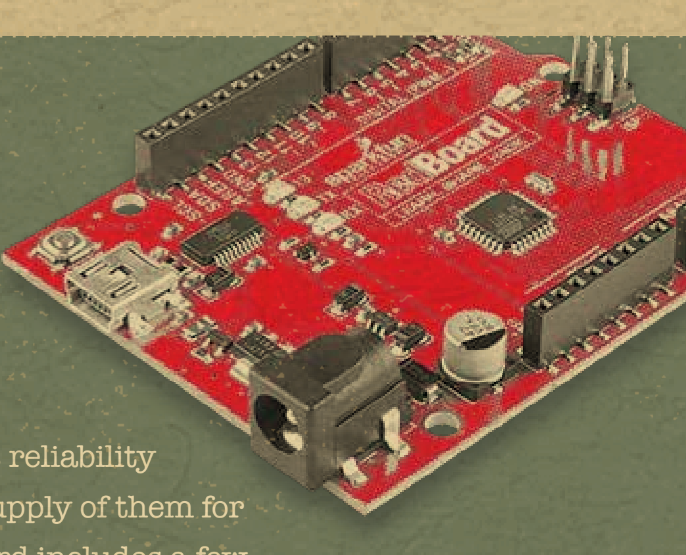
Microcontrollers are at the heart of every Arduino board, but what exactly is a microcontroller? To understand what a microcontroller (or uC for short) actually does, you need to know a little bit about how computers work. The working brain of any computer is the processor, a programmable logic device that doesn't do a whole lot except basic mathematical operations and moving numbers around in boxes called registers. When the processor is built on a single chip we call it a microprocessor, and this is the core of our microcontroller. So what does a uC have beside a microprocessor? Well, a lot of the same things that a computer has beside a processor: memory, storage, hardware peripherals, clocks and timers – basically everything you need to store programs, make decisions and talk to other computers! For instance, the ATmega328 on your Arduino Uno contains an Advanced RISC processor as well as a block of flash memory, multiple timers, analog-to-digital converters and PWM generators, all packed into that one little chip.

Bigger and Badder

If the 328 and 32U4-based Arduino boards won't quite cut it, there are always bigger and badder Arduinos to try – boards like the Arduino Mega, with 256k of flash, 4 UARTs, and 70 IO pins, for instance! Still not enough power? How about the 32-bit boards, like the SAMD21-powered Arduino Zero? The SAMD21's Cortex-M0+ ARM core runs at 48MHz and is supported with a ton of peripherals. Or how about the Arduino Due? It's basically an Arduino Mega with an ARM Cortex M3 core. That's a serious little computer!



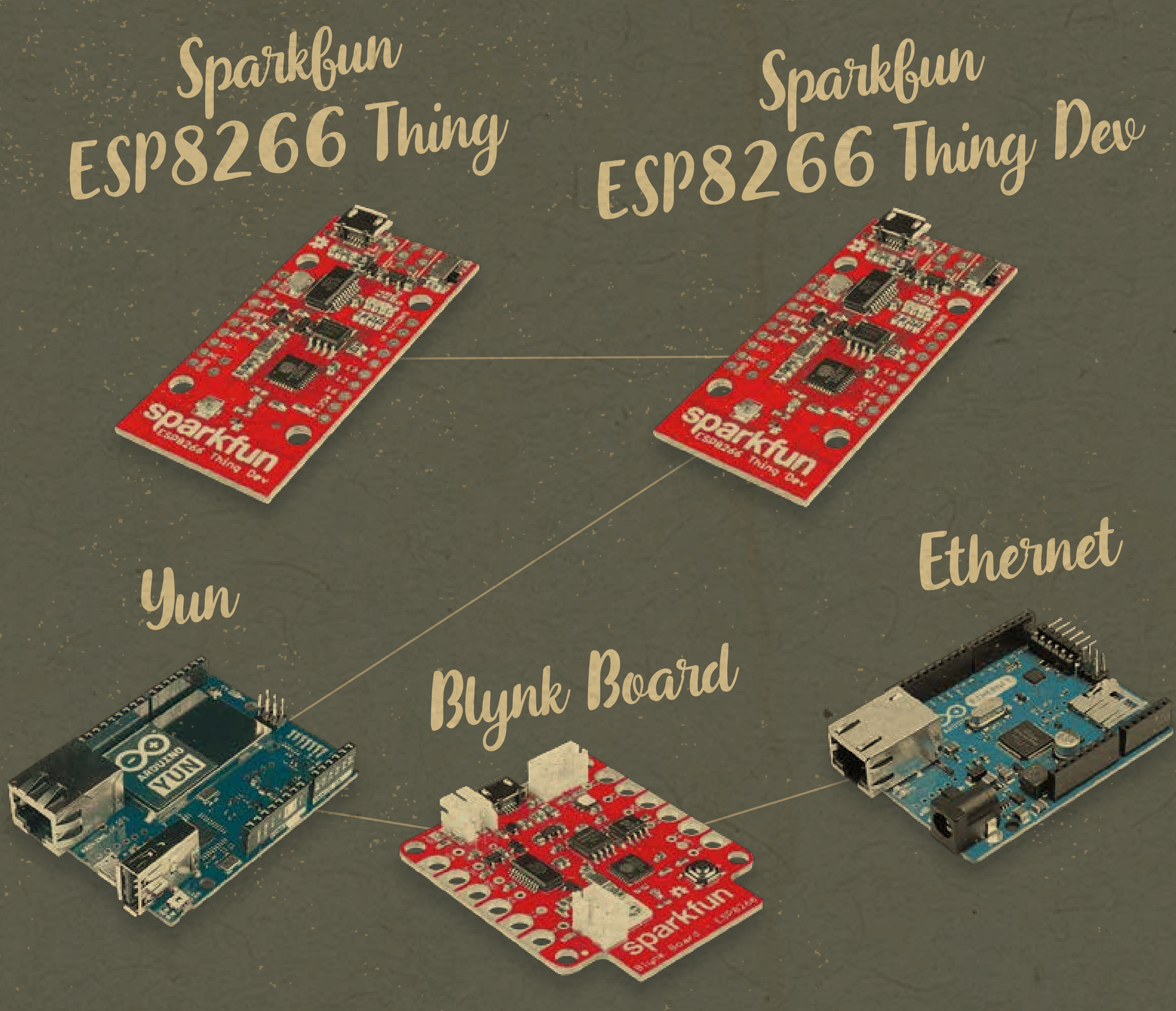
Why RedBoard?



The SparkFun RedBoard is essentially identical to older versions of the Arduino UNO. So why do we make our own? Essentially, we wanted a stable platform for use with some of our educational kits. The 328+FTDI design is one of our favorites for its reliability and simplicity, and we wanted to ensure we would always have a supply of them for our SIK and other Arduino-compatible kits. The SparkFun RedBoard includes a few other features like single-sided, surface mount construction (so it lays flat) and USB mini programming port (the most mechanically stable in our experience). Also, we like the color red.

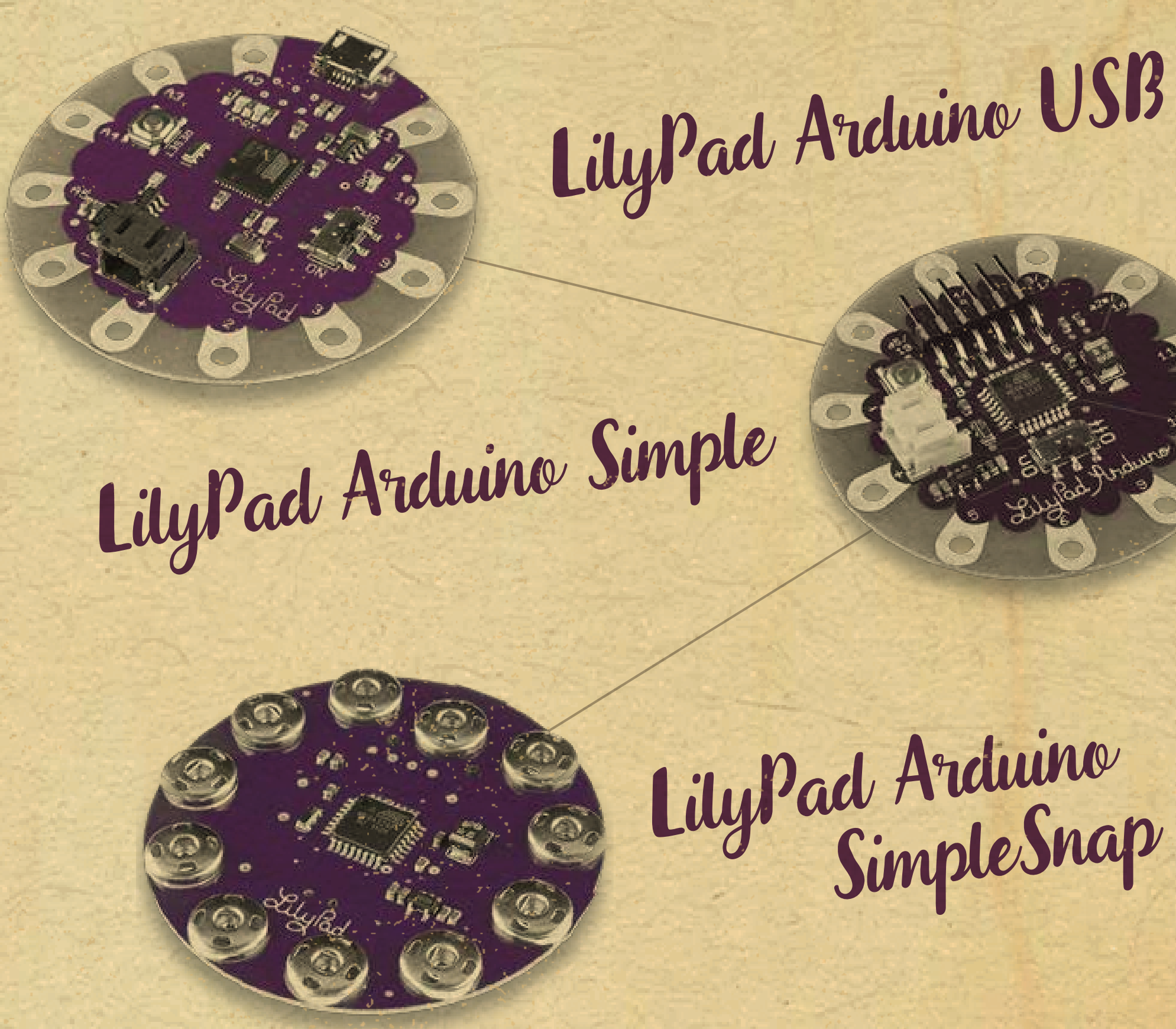
Arduino can has internet?

With the Internet of Things expanding every day, it won't be long before you'll want to take your Arduino for a stroll around the internet. Why not check out the ESP8266 Thing board? The Arduino programmable SoC with built-in WiFi and low power consumption makes the Thing an excellent IoT building block. The Arduino Yun pairs a 32U4 with an Atheros SoC for WiFi, MicroSD and USB host support. Don't mind being tethered? Try the Arduino Ethernet; it combines an ATmega328 with a W5100-embedded ethernet controller so you can plug your Arduino into the nearest internet hole!



Wear it out!

Costumers, cosplayers and fashion designers love the LilyPad line of sewable Arduino boards. LilyPad Arduinos feature large, sewable tabs for connecting your project with conductive thread, and a distinct lack of corners so they don't get caught up in your fabric.



Find out More!

Arduino is just one small part of single-board computing and the world of embedded electronics and DIY technology. Become a part of the community and find all the parts and knowledge you need for your next crazy idea at **SparkFun.com**

Arduino company backstory Wikipedia and Hackaday. Processor MIP data Wikipedia.
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sparkfun

FIELD GUIDE to ARDUINO

Arduino is an increasingly complex ecosystem of development boards. Give yourself a leg-up with our informative visual guide to this family of products.

EXPLORE THE GUIDE