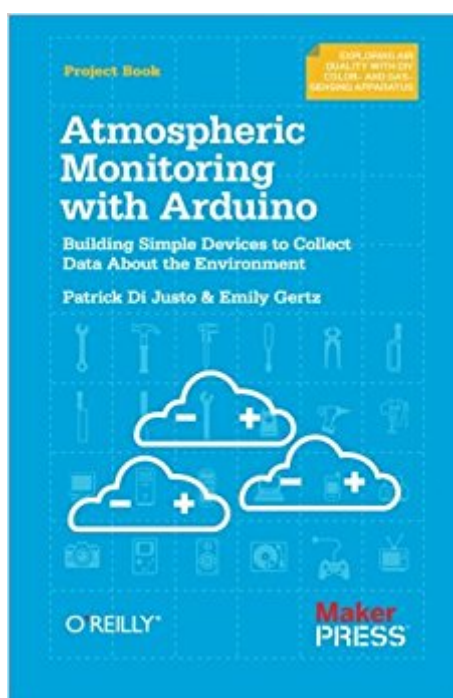


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# Atmospheric Monitoring With Arduino: Building Simple Devices To Collect Data About The Environment



## Synopsis

Makers around the globe are building low-cost devices to monitor the environment, and with this hands-on guide, so can you. Through succinct tutorials, illustrations, and clear step-by-step instructions, you'll learn how to create gadgets for examining the quality of our atmosphere, using Arduino and several inexpensive sensors. Detect harmful gases, dust particles such as smoke and smog, and upper atmospheric haze substances and conditions that are often invisible to your senses. You'll also discover how to use the scientific method to help you learn even more from your atmospheric tests. Get up to speed on Arduino with a quick electronics primer. Build a tropospheric gas sensor to detect carbon monoxide, LPG, butane, methane, benzene, and many other gases. Create an LED Photometer to measure how much of the sun's blue, green, and red light waves are penetrating the atmosphere. Build an LED sensitivity detector and discover which light wavelengths each LED in your Photometer is receptive to. Learn how measuring light wavelengths lets you determine the amount of water vapor, ozone, and other substances in the atmosphere. Upload your data to Cosm and share it with others via the Internet. "The future will rely on citizen scientists collecting and analyzing their own data. The easy and fun gadgets in this book show everyone from Arduino beginners to experienced Makers how best to do that." --Chris Anderson, Editor in Chief of Wired magazine, author of *Makers: The New Industrial Revolution* (Crown Business)

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## Customer Reviews

## Keeping an Eye On the Environment Above You

A Q&A with the Authors of Atmospheric Monitoring with Arduino

Q: Who is this book written for? A: Great question! This book is for anyone who wants to learn more about what's going on in the air around them.

Q: What will I learn to build with this book? A: Great question! The book shows you how to build two gadgets that monitor the atmosphere. The first simple gadget detects hydrocarbon pollution in the lower atmosphere, using an Arduino microcontroller and some cheap sensors. The second, more challenging, gadget detects the composition of the upper atmosphere while remaining on the ground, using nothing more than an Arduino and a handful of light emitting diodes.

Q: What is this Arduino thing you've mentioned? A: Great question! Arduino is an open-source microcomputer, which retails for about \$35; it's perfect for hobbyists and people who want to learn about computing. You can learn more about it at the Arduino page, [arduino.cc](http://arduino.cc)

Q: How much do I need to know to build the gadgets in this book? A: Great question! We've designed these gadgets with the total novice in mind: you can start these projects right away, even if you have no DIY electronics experience. And for those of you who know your way around a circuit, we offer challenging suggestions to make more advanced gadgets.

Q: But I don't know how to solder electronic parts. (Or, my parents | teachers | school administration won't let me use a soldering iron.) A: It's not difficult to learn to solder, and nearly anyone can be taught to do it safely. However, to make this book accessible to as many people as possible, we've designed the gadgets to be built with solderless breadboards.

Q: What do I do with the information I gather? A: Great question! You can do lots of things, from satisfying your own curiosity, to doing your own scientific experiments (we include a chapter on the scientific method!), to pooling your data online with other people around town or around the world.

Q: You tell us what you can do! A: I'm a science teacher, can I use your book as part of my environmental science curriculum? A: Great question! Yes! We devised these projects in part with students in mind!

Q: I'd like to have you speak to my [class | conference | group]. Who do I contact? A: Great question! You can reach us at [MonitoringWithArduino \[at\] gmail \[dot\] com](mailto:MonitoringWithArduino@gmail.com)

Q: What other books do you suggest I look at if I'm interested in environmental sensing? A: Great question! We like Michael Margolis's Arduino Cookbook and Tom Igoe's Making Things Talk II (Of course, there's our first book on this topic, Environmental Monitoring with Arduino, but modesty forbids us from mentioning it here.)

Q: Who are you two? A: Great question! Patrick was a robot programmer and a writer for Wired magazine. Emily was an environmental journalist. When knee surgery left her immobilized for a few months, Emily decided to use the time learning how to use an Arduino -- which Patrick had been

tinkering with -- to help her obtain first hand data about the environment. Â Both this book and our previous one came out of that collaboration.Â Q: Do I need opposable thumbs to make these gadgets?A: Yes. They will help immensely.

So far I have only done chapter 4, but I am already concerned about the scientific credibility of the book. ( I am evaluating it for a possible science camp next summer for teenagers.) This chapter tells how to build an LED sensitivity tester. The tester is to be used for measuring and recording the peak wavelength response of LEDs for use as detectors in a photometer in the following chapters. The tester uses a tricolor RGB LED to shine light of various mixed intensities of red, green, and blue. These RGB values can indeed create a full spectrum of perceived colors for the human eye. However, they CANNOT create the wavelengths of the intermediate colors; they are useless for direct spectral analysis of LED detectors. Besides being bad science, this bogus testing method invalidates the results of all the following chapters. Those chapters may be suitable for demonstrating how you would use a calibrated photometer to make atmospheric measurements, but the actual readings will be inaccurate. After I try the gas detectors, I will update this review.

I have been using Arduino (Mega 2560) for a few months now. I have several books on programming, but this book is the antithesis of programming. That's what makes it so great! This is a book of IDEAS. Practical projects that leave the typical "blink an LED" ideas in the dust. If you are looking for practical, useful, down to earth projects to do with your Arduino, this book is your destination. One caveat, though. Figure 1-4 on page 8 shows an LED connected to pin 13 and ground, with no resistor. You should ALWAYS use a resistor between an LED and ground. Your LED's and your Arduino will both thank you, and both will enjoy a longer life.

This is a short, reasonably priced book packed with information. It describes two instruments which can be made with an Arduino: a tropospheric gas detector and a photometer. Arduino code is included in the book and can also be downloaded from a web site. The book begins with "The World's Shortest Electronics Primer" and ends with an interesting chapter on the scientific method. There are several books on Arduino projects, and this is a friendly one.

May be good for some, but I have not found this book series (i have two from it) to be useful or informative. If you know nothing about electronics, don't have expectations of being able to do much, or just want a coffeetable book this is ok. Very short and didn't offer much.

It's a decent project book if you prefer physical books over reading online however there's really nothing in this book that you can't find within an hour of searching on the internet. Forest Mims gets plenty of credit for doing most of the work for them and this is pretty much a rehash of some of his homegrown experiments.

I am a novice Arduino "engineer". I enjoyed the simple but, not over simple explanations and how to. At the end of each chapter, after a project they have a little piece on taking the project to the next level. I would have liked maybe a little idea on how the "next step" should be begin. it was kind of like throwing a dog a bone and then teasing with a chunk of meat. Maybe that could be another book?

Interesting, but pretty basic.

Does a great job of bringing together projects if you are interested in atmospheric monitoring. it is straight-forward and personalized enough to inspire interest in the subject. I recommend it.

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