

Atmospheric Monitoring with Arduino: Building Simple Devices to Collect Data About the Environment

By Patrick Di Justo, Emily Gertz

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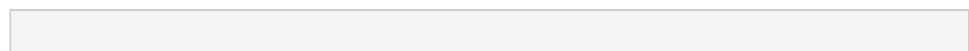
Makers around the globe are building low-cost devices to monitor the environment, and with this hands-on guide, so can you. Through succinct tutorials, illustrations, and clear step-by-step instructions, you'll learn how to create gadgets for examining the quality of our atmosphere, using Arduino and 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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Editorial Review

From the Author

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 show 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

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. You tell us what you can do!

Q: 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. Both this book and our previous one came out of that collaboration.

Q: Do I need opposable thumbs to make these gadgets?

A: Yes. They will help immensely.

From the Back Cover

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About the Author

Patrick Di Justo is a contributing editor at *Wired* magazine, where he writes the magazine's monthly What's Inside column, and the author of *The Science of Battlestar Galactica* (Wiley, October 2010). His work has appeared in *Dwell*, *Scientific American*, *Popular Science*, *The New York Times*, and more. He has worked as a robot programmer for the Federal Reserve, and knows C, C++, Java, and Processing. He bought his first Arduino in 2007.

Emily Gertz is a correspondent for *OnEarth Magazine*. She has been covering DIY environmental monitoring since 2004, when she interviewed engineer-artist Natalie Jeremijenko for *Worldchanging.com*. Her latest, on citizen radiation monitoring in Japan, was published by *OnEarth Magazine* in April 2011. She has been hands-on with internet technologies since 1994 as a web producer, community host, and content strategist. Her articles have appeared in *Grist*, *Dwell*, *Scientific American*, *Popular Mechanics*, and more.

Users Review

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Grace Moreno:

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Howard Kincaid:

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