Science AMA Series: I'm amateur scientist and author Forrest M. Mims III. For many years I wrote books and developed lab kits for RadioShack, which still stocks my best-selling "Getting Started in Electronics."

Forrest$_M ims^1 andr/ScienceAMAs^1$

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April 17, 2023

Abstract

Hi reddit! My main interests are doing science, writing books, and keeping a photographic record of the plants and animals on the land behind my office and residence. Since 1990, I've measured the ozone layer, the water vapor layer, solar UV-B, haze and various other atmospheric parameters. Many of my findings have been published in peer-reviewed scientific journals, and you can see a list of publications and some of the data at http://www.forrestmims.org. You can learn more about my research and interests in a Slashdot Q&A in 2014: https://features.slashdot.org/story/14/06/08/206220/interviews-forrest-mims-answers-your-questions Last year I talked to Slashdotters about airport security and electronics: https://hardware.slashdot.org/story/15/12/24/2147204/forrest-mimms-on-modern-air-travel-with-a-bag-full-of-electronics Recently I completed a nine-week assignment from NOAA to calibrate their world standard ozone instrument at Hawaii's Mauna Loa Observatory (11,200 feet MSL). This was my 25th year to calibrate instruments at MLO. Let me know if you have any questions. I'll be glad to respond for an hour or so and then must conduct the daily sun and sky observations. I'll be back at 1 pm EST (10 am PST, 6 pm UTC) to answer your questions, ask me anything!

the WINNOWER

REDDIT

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FORREST_MIMS R/SCIENCE

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My main interests are doing science, writing books, and keeping a photographic record of the plants and animals on the land behind my office and residence. Since 1990, I've measured the ozone layer, the water vapor layer, solar UV-B, haze and various other atmospheric parameters. Many of my findings have been published in peer-reviewed scientific journals, and you can see a list of publications and some of the data at http://www.forrestmims.org.
You can learn more about my research and interests in a Slashdot Q&A in 2014: https://features.slashdot.org/story/14/06/08/206220/interviews-forrest-mims-answers-your-questions Last year I talked to Slashdotters about airport security and electronics: https://hardware.slashdot.org/story/15/12/24/2147204/forrest-mimms-on-modern-air-travel-with-a-bag-full-of-electronics
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Not a question, but a thank you.

I got started in electronics when this book came out around 79. I was 13 and biked to my Radio Shack, took examples from the notebook, started jamming 555's and 74xx's and those newfangled LED's into project board, and made real things. At some point, you can piece several ideas together and make a more complicated thing, solder it together and have something useful.

It turned into a way of thinking, and a career. Just saying, it was influential, and thank you.

mnp

The reason that book was so successful was that I was doing exactly what you did. I have never taken a course in electronics, but experimenting led to what you describe as "a way of thinking, and a career."

Not a question, but a thank you.

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mnp

You mentioned biking to Radio Shack. That reminds me about dictating my earliest Radio Shack books into a portable tape recorder while riding my bike 20 miles every afternoon. My wife Minnie typed those books from the recording. Dictation wasn't feasible with the hand-lettered books, which had to be carefully designed in advance to fit everything on one or two pages per topic.

Hi Forrest! Thank you for writing those little Engineer's Mini Notebooks . For young people excited about electronics, as I was, these are terrific bite sized introductions to the field.

My question: How did these books come about? Did Radio Shack approach you to write them, or was it the other way around? An entire generation of makers thanks you!

timethy

The Radio Shack books began in the early 1970s when Howard Sams @ Co. asked if I would like to develop a series of hobbyist books. These early books sold well, and after a dozen or so were in the stores Radio Shack asked me to visit the headquarters in Fort Worth to discuss working directly for them. Radio Shack editor Dave Gunzel was familiar with my hand-lettered lab notebooks, and at he asked if I could do an entire book the same way I prepared the notebooks. This became the first "Engineer's Notebook," which sold 650,000 copies. The first few pages were prepared with a Selectric typewriter. I then inserted a signature to ease the reader into the hand lettered concept Dave wanted. After several pages, the book shifted to entirely hand-lettering and illustrating. The book was written/drawn with India ink on toothed Mylar, which meant a single error required redoing an entire page. This was a very tedious project, which drew blood from the middle finger of my right hand. The Mini-Notebook series (16 titles) was much easier to execute, for I used a 0.7-mm mechanical pencil on paper. Radio Shack proposed this series, which was eventually merged into four compilations of four Mini-Notebooks each. Master Publishing handles the printing and distribution. A typical Mini-Notebook took around three weeks to produce, including building each circuit four times.

No question, I grew up with your books and I got my ham radio license because of you and I just wanted to say "thanks!" I also got an A in physics 102 because it was all electronics. That A was part of my prerequisites for medical school, so thanks for that, too. I hope you're aware of the positive impact you've had on people in this world.

drsteve103

Thanks, drsteve. When I was assigned to the Air Force Weapons Lab after Vietnam way back in 1968, my supervisor was Roger Mark, who held a PhD in EE from MIT and an MD from Harvard Medical School. Roger was very much a hands-on engineer, and I learned much from working with him. When he said we needed a one-shot multivibrator to trigger a flash lamp for a key experiment, I studied transistorized multivibrators and built him one using discrete transistors. It worked. Roger also taught me how to derive a range equation for my travel aid for the blind project. That equation allowed the range of my devices to be predicted in advance with reasonable accuracy. I suspect that you are pretty much like Roger, which means your electronics background has played a role in your medical profession.

Hi, Forrest.

As others have said, thanks for helping so many of us get started in -- and enjoy -- electronics. I think pretty much every electronics geek about my age is familiar with those neat little graph-paper booklets full of wizardry.

I hope this question is appropriate here. I'm asking in all sincerety and mean no disrespect. I am told that you are a Creationist, but I find this difficult to reconcile with your admirable record of conducting solid, evidence-based science. Can miracles and the existence of God, in your view, be proven scientifically, and to your belief, has this been done? I admire some of the ideas of religion but find the description of supernatural events difficult to believe without tangible evidence. Hopefully you can relate -- I'd appreciate your thoughts.

FlyByPC

This is off topic and would require a book to fully answer. In fact, I will address some of this in a new memoir. For now I believe there is a God, and I know many scientists who share this belief. As for evolution, I am troubled by the absence of evidence to explain the origin of many biological functions, ranging from the halteres that provide stable flight in the crane and other flies in my amber collection to kinesin molecular motors. I'm advised by Reddit to stay on topic and will have much more to say in the memoir.

Hi! I had your Getting Started in Electronics book as a kid and still own it!

I'm a biochemist now, and I'm curious how ozone detection works - what is special about the ozone molecule that allows you to track it specifically?

superhelical

Ozone efficiently absorbs UV-B and UV-C wavelengths. It also absorbs in the visible, with peaks around 590 nm and 610 nm (the Chappuis band), I detect ozone with a 2- or 3-channel instrument that measures sunlight at 300 nm, 305 nm and 311 nm. Since ozone absorbs more effectively at the lower wavelengths, the ratio of any two of these wavelengths is directly proportional to the amount of ozone between an observer and the sun (when corrected for the intervening air mass, pressure, etc.). The principle also works for detecting ambient ozone. I employ the Chappuis band to detect the height of the main stratospheric layer of ozone during twilight. This works surprisingly well, and the twilight result is usually within 5-10 percent of the height measured by balloon-launched ozonesondes. The UV instruments must use very expensive filters. The twilight method uses a 50-cent orange LED that detects at 600 nm.

"scholarly communication doesn't just happen in journals"
This makes my day. While I've published a fair number of papers in peer-reviewed journals, as former

editor of Science Probe! and The Citizen Scientist, I know that "scholarly communication" certainly occurs outside scientific journals. The disadvantages of peer-review are well and include excessive delay, conflicts of interest, rivalries, etc. A key advantage of peer review is that reviewers both require and inspire improvements to one's work. For example, I'm now reviewing a paper for a major scientific journal in which I will suggest a few ways to improve the manuscript.

Just popping in to say hi! I am the editor of Forrest's new book, a collection of his columns from the first 10 years of **Make:** magazine. Like the rest of you, I had his books as a child, and I was unbelievably thrilled to be working with the man who helped me to make my first telegraph!

Forrest which of your **Make:** magazine columns has gotten you the most reader responses, good and bad?

MakeEditor

Probably the twilight photometer. This has provided the most interesting science I've done in many years. I always wondered about the altitude of smoke and dust layers that were increasing the optical depth (haze) during the daily sun and sky measurements I began on Feb 4, 1990. Now I can find out so long as the sky is free of clouds for several hundred miles in the direction of sunset or sunrise.

This thread is already full of this, and is only going to get more so... I just wanted to thank you for the books. They were a huge part of how I ended up in engineering.

raygundan

Thanks, raygundan. I had no idea the books would become as popular as they did.

Hey Forest! I've been a fan for many years. As someone who plays a part in sharing maker's stories (I'm senior editor at Make:), I'm always wondering how I can help foster MORE makers.

Do you have any thoughts on how we can help create more makers?

calebkraft

Hi calebkraft. Here are some thoughts:

(1) Robotics. I can't overestimate how big this is for teenagers. My daughter Sarah was a member of her school's robotics club. I had no idea what they were building until I accompanied Sarah to a robotics competition. Frankly, their robot looked exceedingly primitive--but it worked! And that's what mattered. I've since been to other robotics competitions and never cease to be impressed by the enthusiasm. One of my columns in MAKE proposed MARS-BOT, a robot that combined the engineering required to build a robot with the science a robot can perform. (It's chapter 17 in my new book.)

(2) Drones. During my recent 9-week assignment at Hawaii's Mauna Loa Observatory, two documentary crews visited to record what happens at MLO and some of my science. Both crews had flying cameras, and their ability to fly and maneuver at 11,200 feet was so impressive that I decided to get into drones. One of my forthcoming column for MAKE will describe some of the science I've been doing with drones. The enthusiasm for drones is very similar to that expressed for robotics.

MAKE already does a super job covering these topics, but I'm always surprised when I visit with people who have never heard of MAKE. The magazine has a great website, and Maker Faires certainly

promote the magazine.

Do you get followed around Radio Shack by the people working there, as they ask you "Can I help you find something" over and over?

drewtoothpaste

Yes! But they usually ask only once.

I had to say one of your books was the first Electronics book I ever got. Thank you for all the inspiration . Where do you get on your circuit ideas?

coolplate

Interesting question. Many of my circuit ideas are based on curiosity. Like I wonder what will happen if ...

If you wanted to make a device to measure water level, speed, and direction in a river using the things in your workshop (you do have a workshop, right?), how would you do it?

doodle77

Since I live near a creek, your question has long been on my mind. Rises and floods on this creek are very destructive and have flooded neighboring homes. So any sensors I might build would be useful only when the creek is stable. AS for actual devices, I'll consider developing some for my MAKE column.

Just another thank you for your books.

I've since given my copies to my son.

They have been wonderful to learn from.

flaggfox

Thanks very much.

Your books, and Alfred Morgan books. Inspirational for me in the 1970s!

patchvonbraun

Thanks, patchvonbraun. Much appreciated.

Hello :-)

Big fan here. I bought "Getting started in electronics" when I was in the USA and did not even speak English fluently at the time :-)

I still use it a lot, especially when planning projects with Children at a local school.

Any chance that the book will be translated to other languages?

schorhr

"Getting Started in Electronics" is in English and Spanish. I just signed a contract for a Japanese edition.

Hi Forrest! Can you tell us what your new book is about?

justpat

I write a science column for MAKE Magazine. The editors assembled some 30 of those columns into a new book: "Make: Forrest Mims' Science Experiments" here. Their layout team did a wonderful job with this book. It's not hand-lettered, but it sure is attractive. My favorite chapters are 10 and 11, which describe in detail how to make and use a twilight photometer. Many other topics are in this book, including tracking heat islands, vibration sensors, data mining, synthesizing music from data and objects (e.g., tree rings), snow science, digital pinhole photography, using LEDs to detect light, etc.

I've noticed your projects tend toward traditional electronics; curious about your thoughts/feelings about Arduino, Raspberry Pi, LittleBits, and the ever-easing landscape of electronic prototyping.

gtj

I began moving from electronics to science projects in 1989. So I never published any columns or books about the new generation of micros. Arduino, Raspberry Pi, etc. are incredibly important tools for introducing programmable electronics. I published a fair number of articles and a book on using BASIC to implement various real-world functions, including virtual instruments, random number generators, etc. I also developed PIP--Programmable Instruction Processor--for Popular Electronics magazine and "Understanding Digital Computers" (Radio Shack). PIP was a 4-bit programmable controller made from discrete TTL chips. PIP had half a dozen microinstructions. Data and programs were loaded using punched strips of paper with 4 holes for data/instructions and a middle 5th hole for the input clock. These paper strips were pulled through a slot fitted with 5 LEDs facing 5 phototransistors. The complete PIP was assembled on our kitchen table, where it occupied around 2 square feet. BTW, PIP used 3-state logic for the bus. This allowed data and instructions to use the same bus.

I remember meeting you back in 8th grade (1978) at the San Marcos public library! You were giving a talk on lasers to a group of students from the military academy.

That really got me into electronics. Even though I never progressed past amateur status, your talk had the single greatest impact on getting me into it. I've still got the "notebooks" I bought decades ago, and even got as many as I could for my son. Just last weekend we were burning our fingers and building and modifying circuits from your books.

I don't really have a question, just wanted to say "hi!" and thanks for all the years of teaching and inspiring!

But this might be deleted if it isn't a question, so I'll just ask: how are you?

ecafsub

Great to hear from you ecafsub! I recall that talk in San Marcos. My interest in science was motivated

in part by school auditoriums where science was presented. I was especially inspired by demonstration of weather balloons and liquid nitrogen. So I encourage reddit science people to look for opportunities to make science presentations in their local schools, libraries, scouting organizations and churches. A few days ago I flew a camera drone for students at a small private school. Their enthusiasm was wonderful, and I suspect some of them will become drone flyers when hey are older.

My uncle who was an engineer gave me the Radio Shack 50 in one set (and some of your smaller books) when I was a kid many many years ago. When I saw the project where you could use the ear piece to create a listening device I realized you could use electronics for mischief and I was hooked! (I got in trouble for "bugging" my sisters room when she was having a sleep-over!) 30 years later I still do electronics as a hobby. Thanks to you.

Thank you so much for creating accessible childhood inspiration.

brerrabbit

Thanks, brerrabbit. Mischief inspired a few of my childhood projects, also.

Hi, I'm a student in electrical engineering. I enjoy working with electronics, especially vintage electronics. I am two years into my degree but, if I'm being honest, electrical engineering is proving to be very disappointing. the courses focus more on theory and formulas and we never really get to do any real electronic labs or work. I feel more like a physics major. Even though I am doing fine in school I am considering changing to something like a technical college or trade school and majoring in something more practical and that I enjoy. I'm aware of the drop in pay and that it would be more physical work. You being someone who has taught me a great deal, I would appreciate any advice on what I should do or not do. Thank you for your time.

law_mann

law_mann, I tend to agree with your thoughts about moving to a more practical side of electronics. You will find it much more fulfilling than theoretical electronics. Several years ago one of the former students in a Sunday School class I taught earned a BS in electrical engineer--without ever building a single electronic circuit. Yes, many circuits can be simulated in software. But these simulations often fail to anticipate, much less teach, common problems that can occur in real world circuits, like noise, parasitic oscillation and so forth.

Have you ever been asked to produce the book in a non-handwritten form? I did see the comment that you used a digital version of your printing for some of your books; I'm curious if you've had folks say "this hand-written look is silly, can you re-do this with some proper typography and computer drawn graphics"? I've always loved the unassuming approach that the hand-drawn style imbues, and I think it really lowers the barrier to entrance that a more 'academic appearing' book might have.

linotype

Very few people have criticized the hand-lettered approach. As Dave Gunzel, my editor at Radio Shack, believed, the hand-lettered approach to basics was a much better way to reach hobbyists and experimenters than a more formal textbook approach.

If you're willing to talk about it —

Have you come to any further insights as to the rhetorical use of the Slippery Slope argument? Specifically, do you still advocate that it is necessarily only useful as a fallacy, and that someone who employs it to outline an argument, must necessarily be an advocate that the argument come to pass, and cannot possibly be entertaining a scenario in order to understand how to avoid that scenario?

Do you have any insights as to asking an author critical questions to clarify their position on a subject?

Could you discuss your understanding of what Eisegesis and Exegesis mean, as applies to scientific discussion and the criticism of scientific literature and work?

Thanks.

Bardfinn

Hmmm. You're asking philosophical questions that are beyond my expertise. So here's a practical response on my approach to experimental science: (1) What's out there that can be measured or quantified? (2) Is it significant enough to eventually warrant a formal report or paper? (3) Can I build an instrument to measure it? When a topic seems really interesting, I then proceed to build an appropriate instrument. Here's an example: Back in 1987 when the Federal government was ceasing UV measurements due to instrument problems, I decided to design and build my own UV radiometers. I published the details about two of these in Scientific American's "The Amateur Scientist" column. Those UV instruments evolved into my first instrument to measure the total ozone layer. But other projects may take much more time. That was certainly the case with my twilight project to measure the height of aerosol layers up to and within the stratosphere (3-50 km) and eventually the ozone layer (typical peak at my site is 22.5 km). Others had succeeded before me using expensive telescopes, photomultiplier tubes and ultra-high gain amplifiers. But my goal was to use a single opamp and no external optics. I abandoned this project more than a decade ago after months of experimenting and returned to it in 2013. I finally succeeded by using 10 and 20-gigohm feedback resistors with a TLC271 opamp. The optical detectors were mostly LEDs, which worked very well. Every evening there are no clouds between my Texas site and West Texas I now measure the atmospheric profile for aerosols and ozone. For full details (free), see my pair of articles on twilight photometry in MAKE magazine by searching <Mims twilight Make>. I've accumulated considerable data and hope to write a formal paper next year. Note that my approach to doing science is curiosity driven. I begin a project with no preconceived agendas and publish whatever is learned or discovered.

Forrest - By watching daily news broadcasts, there are a lot of news people who equate "weather" and "climate", and imagine that a few severe storms is proof of global warming. You have an extensive background in studying both. I think it might be helpful to many readers if you gave a short discussion as to the differences. I also remember that in the 1970's, climate scientists were discussing the coming ice age and global cooling. In only a few years, there has been a paradigm shift.

I am a big fan of your electronics books. Your most recent book on the MLO was extremely interesting!

Time_Guy_Mike

You're right. News people often equate weather with climate--and so do some prominent scientists who know better. The general agreement of the World Meteorological Organization, the US and most nations is that climate represents the average conditions during 30 years of weather. As for severe storms, the predicted increase in US hurricane strikes has not occurred. As for global temperature, the 40-some models used by the IPCC (I was an "expert reviewer" for their fifth report, AR5) have all missed their temperature forecasts. Why? Possible reasons include the failure of assumptions about the positive feedback of water vapor, a much more significant greenhouse gas than carbon dioxide. The small amount of warming caused by CO2 was expected to cause more evaporation, hence increased atmospheric water vapor. But that has not occurred. I've measured total column water vapor

since Feb 4, 1990, and the trend over my site these past 26+ years is -1.5 mm per decade. NASA's NVAP study showed no trend in global column water vapor from 1988 to 2009. Another missing factor could be the cooling effects of clouds (which can also cause warming). More water vapor means more clouds.

Hi Forrest! I'm an editor at Make: and I always enjoy working on and reading your pieces. I shied away from science and went the liberal arts route instead, but in spite of that I always find your articles engaging, and I'm always sure to learn something new from them. My question is about your scientific role models. Who do you find most inspiring? Any particular scientist whose work or talks motivated you to follow in their footsteps?

sophiacamille

(Sorry to be slow in replying.) My science role models include Michael Faraday, Thomas Jefferson, Benjamin Franklin and Roger Mark. You may not know about Roger, to whom I reported at the Air Force Weapons Lab in 1969-70. Roger has a PhD in electrical engineering from MIT and an MD from Harvard Medical School. My assignment to the Laser Lab under Roger was due to my after-hours work developing miniature guided rockets and travel aids for the blind. Though I had zero academic credentials (my BA is in government), not once did Roger doubt that I could do science. Soon after beginning work with/for him I was building circuits he needed for various projects and aligning both neodymium-doped YAG and glass lasers.

Not a question, a thank you.

About 10 years ago I was a musician who wanted to start building my own fx pedals and such. The first circuit I ever soldered was your 555 noise generator circuit. I became obsessed with electronics and dropped degree I was meant to be starting the following year and enrolled in a bEng course... It took me a while (went part time for a bit), but I graduated last year with bachelor in mechatronics... You make electronics fun and accessible - the challenge and reward of making that first little circuit really changed my life! Cheers

b38tn1k

Congratulations for studying electronics! Based on the emails I receive, the 555 timer chip has inspired countless experimenters to become professional engineers.

I spent much of my childhood taking apart TVs for parts, and much of my allowance at RadioShack. I noticed the Shack slowly dumbing down over the years, turning into a phone store. And let's not mention the demise of good chemistry sets.

My question is:

Do you think the the Golden Age of Hacking is in the past (maybe 1950s-1980s), and that home-building is fading?

Or do you think that modern era of Arduino/RPi/3d-Printer/robotics is making builder culture stronger today? What is the level of public interest (say, book sales) today vs the past?

(From my perspective, it's harder to purchase stuff locally, but much easier to get stuff by mail, from China, or get amazing used industrial surplus on ebay, and the internet makes it far easier to pick other people's brains.)

anonymous-coward

The maker movement, best illustrated by MAKE magazine, is alive and well. Every issue is like a course in what today's experimenters and makers are doing and how we can follow in their steps. On the other hand, the availability of powerful software and very inexpensive phones and tablets has had a major impact on the younger generation. Science fairs once had many physics, chemistry and electronics projects. These kind of projects have experienced a sharp decline over the past decade.

Hello Forrest;

I don't have any question, I just wanted to say thank you. Your books helped feed my childhood interest in electronics, and now I am an electronics technician. Your books still have a place on the reference shelf.

3DBeerGoggles

Thanks very much!

Would you please ELI5 the 1 over 1 over method to calculate total resistance in a parallel circuit?

I can plug in numbers just fine, I just don't understand why it's a thing.

Xesrac

Try this: Take 2 resistors and insert the leads of the first into a solderless breadboard. Measure the resistance. Now insert the leads of the second resistor in parallel with the leads of the first. Measure the resistance. Finally, check your actual measurement of the resistance of the two parallel resistors against the resistance of the resistors in parallel given by the formula (1/R1 + 1/R2). They should agree very closely.

Hello Sir,

Thanks for the books, these were the books that taught me how to understand circuit and got me as far as working on a electronics of a spacecraft.

Thank you for your work ! I still recommend my students your books when theyre starting out on electronics.

testuser514

Thanks for writing--and for recommending my books to your students.

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testuser514

Thanks very much for writing--and for recommending my books to your students.

I want to lead with a thank you for writing Getting Started and the Engineer's Notebook series.

I got started with very basic electronics from my dad (basically batteries, switches, and LEDs), but when I asked more questions then he had answers for, he purchased me a copy of your book from Radioshack, and the wonders haven't ceased yet.

I have a couple of questions:

1. Was the book all hand lettered/drawn? Or was it laid out with stencils or computers or something similar?
2. If it was hand lettered, is that your standard handwriting? Or is that something you really have to focus on to achieve?
3. Any chance of an updated Getting Started?
4. Have you worked with any data from the Arecibo Observatory? I spent a few years working there (on the RF/Electronics side), and I wonder how many people know we do optical (and radio) work for Atmospheric/Ionospheric science as well Astronomy.

ajford

Thanks for your questions, answer to which are: 1. The books were almost totally hand drawn and illustrated. I used plastic drafting aids for logic functions (especially AND, NOR and NAND gates). 2. My standard hand printing. For 3 lab kit manuals, I used a computer version of two of my alphabets and typed the manuals. 3. I had long planned "Going Further in Electronics" when RadioShack went bankrupt. This book would have moved up to Arduinos, data loggers, sensors, etc. 4. I've not personally used any Arecibo data but am glad to meet you and will do a search on Arecibo later tonight.

I know I'm too late for the AMA, but I wanted to leave one more thank you note. Your books inspired me as a boy and kindled an interest in electronics and computers that eventually became my career. I look forward to sharing your books with my children.

Fahkfahkfahkfahkfahk

Thanks for your kind thoughts--and for sharing the books with your children.

Where are the best places to keep up on your recent work? I didn't know you authored a new book until someone at my makerspace mentioned it. It looks like you are more active on Twitter this month, which is great! Are there any other channels where I can follow your work?

And like everyone else in this thread: thank you. I first read "Getting Started in Electronics" when I was 10 or 11. Of all the books I have read, your book had the strongest influence on my career decisions and life choices.

rickcarlino

Thanks, rickcarlino. I'm very glad to learn that "Getting Started ..." influenced your career. I'm on Facebook and Twitter, but not on a daily basis. I usually post only about my science. You can see some of this by looking at my timeline on Facebook. My main website is forrestmims.org. This has lots

of science results, publication lists etc. I'll update the home page soon.

I wanted to thank you as well. Your books and kits are part of what inspired me and made learning about electronics so easy. They are one of the many reasons why I became an engineer. Kudos to you good sir!

PacManFan123

Thanks for the kind words--and glad you became an engineer!

How old is the earth, and did humans evolve from primates?

lennyflank

Reddit told me to stay on topic. So, if you promise not to tell them, my answer to your first question is no one knows the exact age of the earth and neither do I. Clair Patterson used lead ratios in meteorites to estimate that the solar system (not the earth alone) has an age of about 4.6 billion years. Other scientists have claimed younger ages, and you can find much more information online. (BTW, Patterson's most important contribution was promoting the serious health hazards posed by lead in the environment.) The answer to the second question is more difficult. Some of my best friends strongly believe they descend from more primitive primates, while other best friends strongly do not. Since answering your question will significantly offend half of my best friends, I'll try to devise a diplomatic answer to this question for my next memoir, which I very much hope you will read. Meanwhile, I hope you can pose some on-topic questions here on reddit for us to discuss.