INSIGHTS

LETTERS

Edited by **Jennifer Sills**

NextGen's course catalog

What was missing from your science education? In October, we asked young scientists to name and describe a course that would have better prepared them for their science careers. Below, we've created a course catalog featuring a sample of their responses, which range from serious to silly. To allow for as many voices as possible, in some cases we have printed excerpts of longer submissions (indicated by ellipses) and lightly copyedited original text for clarity. To read the complete versions, as well as many more, go to http://scim.ag/NG13_Results. Follow *Science*'s NextGen VOICES survey on Twitter with the hashtag #NextGenSci.

NEXTGEN VOICES

PSYCHOLOGY

PSY302: PREPARATION FOR SCIENCE

This course provides an introduction to the survival skills for a successful science career. The course covers the following topics: Never give up no matter how many times your manuscript has been rejected, stay optimistic when others are doubting your research, believe that science will love you back, prepare dinner and analyze data at the same time.... ***Li Dai***

School of Geographic and Environmental Sciences, Guizhou Normal University, Guiyang, Guizhou, 550001, China. E-mail: daili_helen@163.com

PSY501: FAKE IT TO MAKE IT

In this essential 1-credit seminar, you will learn to cultivate a hearty confidence while presenting ideas you barely understand, a stern resilience under repeated failure, and a keen cynicism about everything.

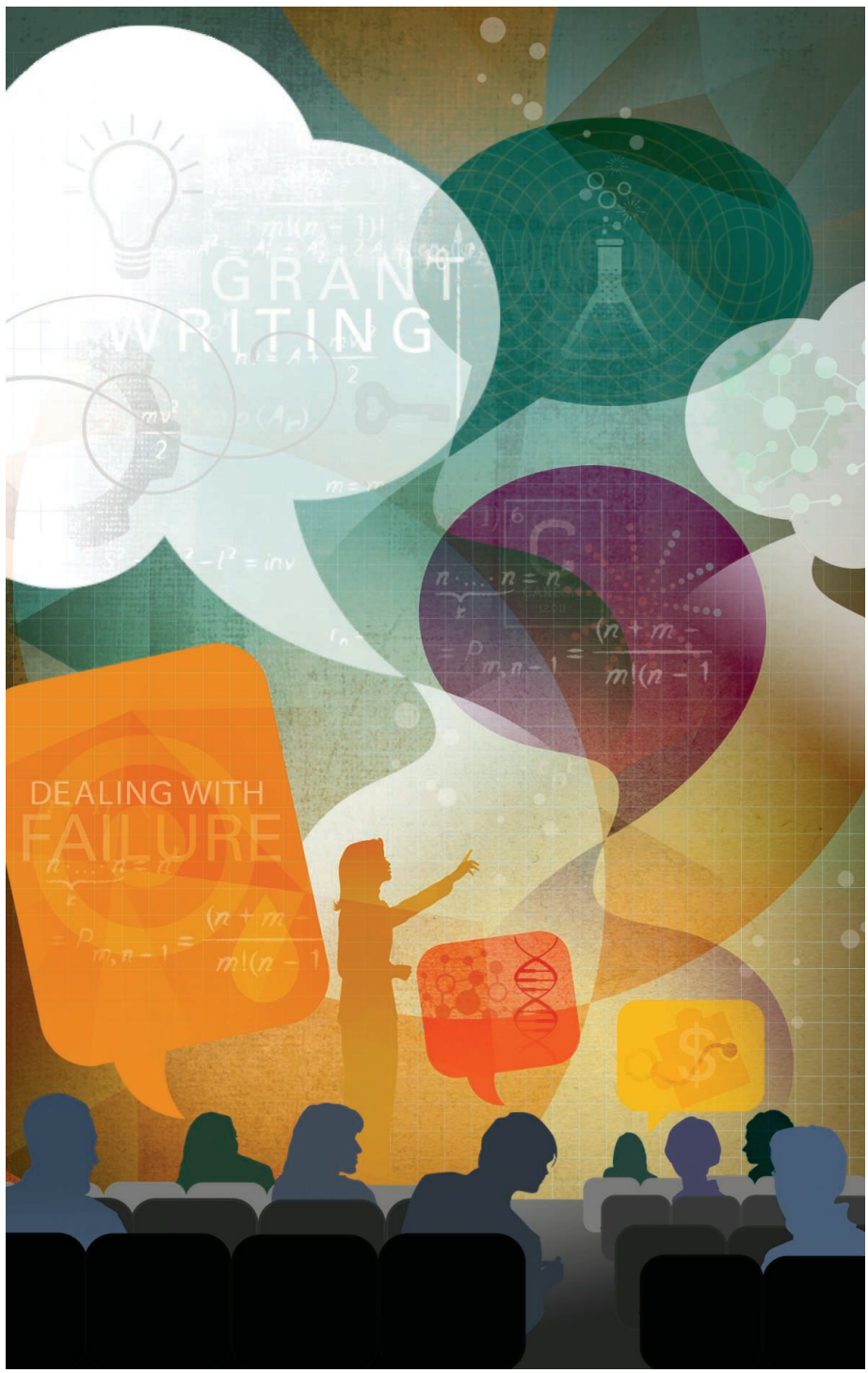

ILLUSTRATION: STEPHANIE DALTON COWAN; PHOTOS COURTESY OF THE AUTHORS

Minor skills introduced include the efficient brewing of strong coffee, task layering on Google calendar, and organizing Internet time for optimal productivity. Additionally, you will have access to Mindr to match you with a compatible graduate advisor. All students will be equipped with a BS radar upon completion of the course. Required reading: Ph.D. comics, #WhatShouldWeCallGradSchool.

Anna Beiler

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PSY516: DEALING WITH FAILURE

Think you have dealt with real failure as an undergrad? Think again. This advanced course analyzes the frustration, depression, and questioning-of-life-choices that accompany the months or years of repeated experimental failures you can expect to encounter in your scientific career. Through this course, you will develop helpful strategies for dealing with inevitable setbacks. Topics include setting realistic goals, building a supportive network of colleagues and mentors, learning from your mistakes, keeping your end goal in mind, and having fun along the way. The summative project is a personalized action plan for reevaluating demoralizing failures as opportunities that enable future growth. ***Yonatan Lipsitz***

Institute for Biomaterials and Biomedical Engineering, University of Toronto, Toronto, ON M5S 3E1, Canada.
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PSY549: YOU PROBABLY WON'T SAVE THE WORLD

This class is designed to set realistic expectations for you in your career, allowing you to skip the disenchantment phase and focus instead on your talents. Through presentations and peer-to-peer learning, you will learn that the world's problems are complex and require many, many dedicated scientists to tackle them, of which you will be only one. Learn how you can use your research or your teaching to improve, and even transform, the lives of people around you, and begin to build the skills to be satisfied with that. Prerequisites include Your Spouse Probably Won't Be a Supermodel. ***Toni Lyn Morelli***

Department of Environmental Conservation, University of Massachusetts, Amherst, MA 01035, USA. E-mail: morelli@umass.edu

COMMUNICATIONS

COM101: DON'T TALK NERDY TO ME: COMMUNICATING WITH THE PUBLIC

...In this class, public relations managers from the industry will share their insights into conveying the right message at the right time through the right channel, and we will coach communication skills by role-playing. Through effective communication, you can build the bridge connecting the ivory tower with society.

Kun-Hsing Yu

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COM201: HOW TO DESIGN CATCHY POSTERS AND WRITE ENGAGING ARTICLES

One of the fundamental aspects of a scientist's work is to present research results. This causes a bit of a problem when it comes to poster design (have you seen those walls of text?), PowerPoint presentations (ever fall asleep while reading your own slides?) or crazy-difficult articles that give you a headache. Let's stop that! In this course, we will drill writing, designing, and presenting so that no one ever falls asleep when confronted with your data.

Ilona Kotlewska

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STATISTICS AND LOGIC

STL13: BREAKING BIOLOGISTS' ARITHMOPHOBIA

13.1. NUMBERS: Learn that numbers are not adversaries to biologists and why numbers are an absolute necessity when studying biological systems....
13.2. ARITHMOPHOBIA: Discuss the fear of numbers, with particular emphasis on how biologists and clinicians are terrorized by anything remotely numerical.
13.3. STATISTICS: Learn that statistics is a tool for solving problems, not a problem itself, that $P < 0.05$ isn't a catchphrase or a style statement, that standard error is not an error in the data, that ANOVA and t tests are not interchangeable, and that the term significance has deeper meaning.
13.4. SOFTWARE: Explore the idea that using statistical software packages without knowing statistics is not an alternative to knowing statistics.

Gunjan Guha

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STL210: SCIENCE IN THE REAL WORLD: LEARNING TO LOVE IT MESSY

Scientific researchers often strive to find "clean" questions: Does treatment X cause effect Y? To do so, we need to carefully control our experiment and isolate our test subjects from all confounding factors. Unfortunately, in the real world, everything is a confounding factor and isolation is functionally impossible. This class will teach you how to cope when normal experimental practices cannot yield significant, interpretable answers. By using Big Data, qualitative research, natural experiments, and inductive logic, you will be prepared to address even the most confounding real-world problem. You will also learn how to communicate your results, without excessive over-qualification and undue focus on potential error. Despite the messiness of the world, science outside the laboratory can still lead to useful conclusions. Science in the Real World 210 will show you the way.

Colin W. Murphy

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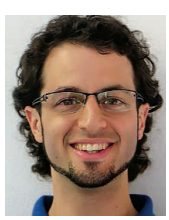
Editor's Note: NextGen Climate America is not affiliated with Science*'s NextGen VOICES survey.*



STL227: HOW TO QUESTION

Science is all about questions: What are the fundamentals of natural phenomena? How can we improve our quality of life? Other courses cover the knowledge we've already acquired and focus on taking the next logical step. But how can we prepare ourselves to ask the questions nobody has asked before? In this course, you will

analyze the questioning process as you study a historic panorama of questions that generated a paradigm change in science. Activities will train you to use creativity and to look at problems and solutions from different perspectives. Better questions, better science.

Rolando Manuel Caraballo

Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Ciudad Autónoma de Buenos Aires, 1428, Argentina. E-mail: rcaraballo@qi.fcen.uba.ar

STL666: SCIENTIFIC SKEPTICAL THINKING

Learn to think like a skeptical scientist through an exploration of literature ranging from primary sources, newspaper and magazine articles, television, and talk radio, to blogs and memes on social media. Various logical fallacies and common misconceptions will be dissected so as to be easily recognizable. You will learn to debunk false claims in a concise and meaningful way. Finally, you will take a tour of common pseudoscience manifestations existing today....

Keah Schuenemann

Meteorology Program, Earth and Atmospheric Science Department, Metropolitan State University of Denver, Denver, CO 80217-3362, USA. E-mail: kschuene@msudenver.edu

COMPUTER SCIENCE

CPS198: DIGITAL LIBRARY ORGANIZATION

In today's digital world, scientists must maintain vast and ever-growing libraries of journal article PDFs. If there is no organizational system in place, these files often retain their original unhelpful names, such as "7320.full.pdf," and get hopelessly scattered throughout a computer system. In this course, you will learn to use citation management software to automatically rename and sort journal article PDFs based on useful metadata, such as author last names and year of publication. As an added bonus, you will learn to use the same software to insert citations and automatically generate bibliographies in any citation style.

Rosa Li

Department of Psychology and Neuroscience, Center for Cognitive Neuroscience, Duke University, Durham, NC 27708, USA. E-mail: rosa.li@duke.edu

CPS201: STONE-AGE TECHNOLOGY: COMPUTERS FROM THE 1990S AND 2000S

Scientists are often forced to deal with restrictive budgets and old computer equipment. In this course, learn about the ancient technology of our parents and grandparents in order to cope with the devices you may be required to use in the pursuit of knowledge. Topics include mice with rubber balls, dot matrix printers, cathode-ray tube monitors, floppy disks, and many more.

Aric Campling

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LABORATORY SCIENCE

LBS101: THE JOY OF SCIENCE

Do you think of science as complicated jargon and formulas to be memorized? What if a science course could be about curiosity and discovery? In this new hands-on course, you will use state-of-the-art science equipment to investigate real research questions. Your findings will contribute to current research projects and to the advancement of scientific knowledge. You will learn how to formulate research questions, identify suitable methods, analyze your data, and communicate your findings. The hands-on activities will align with online study material that provides the theoretical knowledge for the course. Experience the joy of science!

Beat A. Schwendimann

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LBS201: MACGYVER IT!

Can't figure out how to remove that pesky stir bar that just won't come out with the retriever? Rusty clamp won't hold your flask properly in the oil bath? Rotavap won't hold its vacuum? Temperature keeps creeping up on that water bath? Still see some solid on that filter paper from the Buchner that won't come off? Want to learn how to construct a glove box from cardboard and duct tape? Have no worries! This course will show you all the lab tricks to being a super-savvy chemist that the textbooks don't mention!

Masha G. Savelieff

Life Sciences Institute, University of Michigan, Ann Arbor, MI 48109, USA. E-mail: savelief@umich.edu

LBS501: HOW TO SET UP YOUR VERY OWN 500 SQUARE FEET OF LAB SPACE

Congratulations! You just got hired as an assistant professor. Your new lab has nothing but walls and old benches. Do you know which cylinder regulator you need for the incubators? Oh, yes, you need that "thingy." The huge Sorvall centrifuge will be left on the floor when delivered. Those tips aren't compatible with those pipettes: They will fall off right into your cell suspension. Do you know how and where to order liquid nitrogen? For everything you took for granted in your graduate lab, there's a specific diameter, catalog number, and safety regulation. Required course materials: measuring tape, wrench.

Irina Tiper

Department of Microbiology and Immunology, University of Maryland School of Medicine, Baltimore, MD 21201, USA. E-mail: itiper@umaryland.edu

BUSINESS AND FINANCE

BSF101: GRANT WRITING

The objective of this course is to provide you with the necessary skills to effectively market your scientific ideas to funding agencies and grant review panels. This foundation course will therefore be essential for survival as a scientist in an era of limited research funding. Topics will include developing professional connections, understanding reviewer psychology and bias, memorizing detailed grant instructions and guidelines, and maximizing page use and space in proposals. Course will be graded as pass/fail. However, only 10% of the students will pass during each term. Course can be repeated indefinitely.

Michael G. Kemp

Department of Biochemistry and Biophysics, University of North Carolina, Chapel Hill, NC 27599, USA. E-mail: michael_kemp@med.unc.edu

CREDITS: (MASHA G. SAVELIEFF) AIME MAGIERA. SENSORY RESEARCH: OTHER PHOTOS COURTESY OF THE AUTHORS

BSF301: RESEARCH FUNDING

...This course is designed to prepare you...to find, apply for, and secure research funding. Differences between fellowships, grants, and awards will also be covered. Guest speakers from local and international funding agencies will participate in the lectures. You will propose a funding application project as summative assessment.

Marie-Caroline Lefort

Bio-Protection Research Centre and Library, Teaching and Learning, Lincoln University, 7647, Christchurch, New Zealand.
E-mail: Marie-Caroline.Lefort@lincolnuni.ac.nz

BSF329: BUSINESS MANAGEMENT: FISCAL REALITIES OF SCIENCE

This course lays a foundation of basic business management for running a laboratory. Specifically, this course will include creating a business plan that aligns your budget with the pursuit of your hypotheses and the management of a fiscally responsible laboratory. Whereas most of your coursework focuses on core scientific principles, methodologies, and hypotheses driving scientific inquiry, this course will help you lay the fiscal framework to ensure your research stays within your fiscal boundaries. This course will also explore developing and working with intellectual property, common avenues of commercialization, and working with commercial partners. Mastering the fundamentals of fiscal responsibility will prepare you for a subsequent course in entrepreneurship. ***E. Loren Buhle Jr.***

Global Customer Success, Model N, Princeton, NJ 08540, USA. E-mail: lorenbuhle@gmail.com

BSF346: TRANSLATING RESEARCH INTO A COMMERCIAL PRODUCT

This course introduces the steps required to translate lab (i.e., in vitro) research into a viable commercial product. You will learn about intellectual property protections, development costs, attracting venture capital, and making inventions commercially viable. You will analyze real-world examples of products that have been commercialized from basic research and discuss how to attract grant funding from the government and private sources to develop products. The opportunities and challenges of interacting with companies as a graduate student will be emphasized. ***Ajay Kashi***

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SUBMIT NOW:
THE SCIENTIST'S TOOLBOX

Add your voice to *Science*! Our new NextGen VOICES survey is now open:

Name and describe a currently nonexistent invention that would make you a more effective scientist. Your invention can be realistic, futuristic, or comical, and it can aid you in any aspect of your scientific process or career.

To submit, go to http://scim.ag/NG_14

Deadline for submissions is 13 February. A selection of the best responses will be published in the 3 April issue of Science. Submissions should be 100 words or less. Anonymous submissions will not be considered.

CAREERS

CAR501: SO YOU THINK YOU CAN BE A PI?

Prerequisite: academic excellence at the undergraduate level and an extensive publication profile at the Ph.D. level.
MODULE 1: Coping with no longer experimenting on a daily basis
MODULE 2: One style of supervision does not suit all—embracing the broad spectrum of personalities and ability levels of your research students
MODULE 3: Is everyone a competitor—what's happening to openness in solving important and interesting problems?
MODULE 4: Workplace politics—juggling the often disparate objectives of administrators, students, colleagues, and executives
MODULE 5: Hope—rediscovering the joy of scientific research ***Anthony O'Mullane***

School of Chemistry, Physics, and Mechanical Engineering, Queensland University of Technology, Brisbane, QLD 4001, Australia.
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CAR502: TRANSLATING COMPETENCIES

So often graduate programs guide students toward an academic career, when in fact fewer than 23% of science Ph.D.s will take that road, according to recent NSF data. Most of those students will end up finding careers in other sectors such as government, industry, or NGOs. This course will enable graduate students to translate the academic achievements you spend years toiling to obtain (e.g., published results) into competencies that fit the jargon and framework (e.g., project management) of these other sectors in order to be both appreciated and understood by human resources and hiring offices.

Sarah M. Anderson

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CAR503: PI OR BUST: LIFE BEYOND ACADEMIA

Can I be something other than a PI when I grow up? How do I decide what I want to do (even if I can be a PI)? How do I look my Ph.D. supervisor in the eye after moving over to the dark side (i.e., industry or god forbid, patent law)? This course will give you a broader perspective on job options outside of academia, with guest lectures from talented people who chose to go elsewhere. The pros and cons of each job and its accompanying lifestyle will be discussed. ***Noa Sher***

Bioinformatics Service Unit, University of Haifa, Haifa, 3498838, Israel. E-mail: nsher@univ.haifa.ac.il

INTERDISCIPLINARY CAPSTONE

INT600: SCIENCE WITHOUT BORDERS

Every research project has multiple facets, and expertise in each one of them is nearly impossible. This seminar exposes students to diverse ways of thinking and expertise through the inception and completion of interdisciplinary collaborative projects in small teams. Each stage of project development will be presented to the class. These presentations will offer the opportunity to share and discuss disciplinary dogmas that shape ethics, theories, methodology, and analysis. Tackling issues from multiple experts' points of view will allow for a more holistic approach in a world where everything is connected.

Félicia Olmeta-Schult

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NextGen's course catalog

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