

# JOURNALIST'S RESOURCE

Knowledge-based reporting

## Science reporting syllabus: Covering the environment, technology and medicine

Science reporting is in a moment of extreme transition: Popular science writing is experiencing a renaissance at precisely the moment that traditional media outlets are jettisoning specialized reporters. This creates tremendous opportunity and tremendous challenges. This course makes sure students are prepared to meet those challenges.

### Course objective

This course is designed to acquaint reporters with all aspects of science reporting and writing. It will train participants to view new breakthroughs and discoveries with skepticism and will give students a working knowledge of many of the main areas of science coverage, including the environment, artificial intelligence, and human interaction with technology. There will be lessons on social media, online writing, news and feature writing, and writing long-form narratives.

### Learning objectives

The syllabus is designed to strengthen students' core competencies in several areas:

- Determining what sources and outlets can be trusted to discuss controversial or unproven claims.
- Learning which questions will elicit meaningful responses.
- Understanding that choosing *not* to cover a story can be just as important an editorial decision as deciding how to cover it.
- Evaluating what type of form a journalist is most comfortable with and seeking out ways to work in that form.

### Course design

This course will focus on developing toolkits for evaluating science stories in addition to learning about some specific issues or controversies. It is designed as a workshop course for between 10 and 15 students. An integral part of the course is analyzing and critiquing other students' work.

## Readings

### Required books

- Deborah Blum, Mary Knudson and Robin Marantz Henig, editors, *A Field Guide for Science Writers*, 2005.
- William Zinsser, *On Writing Well*, 1976.
- Elise Hancock, *Ideas into Words: Mastering the Craft of Science Writing*, 2003.
- Darrell Huff, *How to Lie With Statistics*, 1954.
- Daniel Kahneman, *Thinking Fast and Slow*, 2011.

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## Optional books

There will be multiple readings from these books during the semester.

- John Allen Paulos, *Innumeracy: Mathematical Illiteracy and its Consequences*, 1990.
- Seth Mnookin, *The Panic Virus*, 2011.

## Recommended reading

Depending on the instructor, these may or may not be discussed during the semester. They all serve as excellent illustrations of first-rate science writing covering a variety of topics and styles.

- Siddhartha Mukherjee, *The Emperor of All Maladies*, 2011.
- David Quammen, *The Song of the Dodo*, 1996.
- Charles Darwin, *The Voyage of the Beagle*, 1839.
- James D. Watson, *The Double Helix*, 1968.
- Tom Wolfe, *The Right Stuff*, 1979.
- Rachel Carson, *Silent Spring*, 1962.
- Richard Holmes, *Age of Wonder*, 2010.
- Carl Sagan, *Cosmos*, 1980.

## Assignments

There will be three shorter written assignments, one oral presentation, and one ongoing writing project tied to a final paper. Students are also expected to comment on their classmates' writing.

### Short assignments

Each short assignment must be done in the style of a newspaper, magazine or blog post. Students can choose which style to employ for each assignment, but they must do all three styles.

- News story of 750 to 1,250 words about a new discovery.
- News story of 750 to 1,250 words about a scientific controversy.
- Feature story of 1,250 to 2,000 about a scientist *or* a book review of 1,250 to 2,000 words.

### Oral presentations

Beginning in week four, one student will “reverse engineer” a science story from that week’s news. These presentations should take roughly 15 minutes and will include discussion of structure, shortcomings and strategies used to draw in readers. Students will let the instructor and their classmates know which article they will be critiquing during the class prior to their presentations.

### Final assignment

One longer piece of between 3,500 and 5,000 words. Topics will be finalized by the end of week five. Beginning in week seven, students will maintain a blog and social media discussions about their topic in a way that does not detract from their final project.

### Weekly schedule and exercises (13-week course)

The assumption of this syllabus is that the course will meet twice a week. It is also assumed that students will have completed at least one basic reporting class before taking this course.

## Week 1: Introduction to science journalism

Good science journalism should properly convey a sense of wonder and discovery. Lewis Thomas, a physician who became one of the most eloquent interpreters of the natural world, provides a touchstone even today, almost 20 years after his death.

### Class 1: Drawing readers into stories about arcane subjects

#### Readings:

- Lewis Thomas, *Lives of a Cell: Notes of a Biology Watcher*, 1978: “Lives of a Cell,” “Germs,” “Death in the Open.”
- Roger Rosenblatt, [“Lewis Thomas.”](#) *New York Times Magazine*, November 21, 1993.

### Class 2: What is science writing?

Discussion will address whether there is a difference between writing about science and science writing. The second half of this class will be set aside to discuss students’ story pitches for their first assignment.

#### Readings:

- *Field Guide*, chapters 1, 4-6: “Finding Story Ideas and Sources,” “Writing Well About Science: Techniques From Teachers of Science Writing,” “Taking Your Story to the Next Level,” and “Finding a Voice and a Style.”
- *Ideas into Words*, chapters 1-2: “A Matter of Attitude,” “Finding Stories.”
- *On Writing Well*, chapters 1-7: “The Transaction,” “Simplicity,” “Clutter,” “Style,” “The Audience,” “Words,” “Usage.”

## Week 2: Contextualizing numbers and memories

### Class 1: Pitfalls to avoid when reporting on statistics

Discussion will focus on training students to make sure the crucial questions are being asked and not the ones a given source wants you to focus on. Students should practice communicating complicated numerical data clearly and effectively.

#### Readings:

- *How to Lie with Statistics*.
- *Innumeracy*: Introduction, chapters 1, 4-5.
- *Field Guide*, chapter 3: “Understanding and Using Statistics.”
- Journalist’s Resource, [“Statistical Terms Used in Research Studies; a Primer for Journalists.”](#)

### Class 2: How reliable is memory?

Discussion will focus on why it is best to be as skeptical of memory as you would be of data presented out of context. Also, assignment 1 is due in class; essays should be distributed electronically to every member of the class.

#### Readings:

- Alan Scoboria, et al. [“The Effects of Prevalence and Script Information on Plausibility, Belief, and Memory of Autobiographical Events.”](#) *Applied Cognitive Psychology*. 2006; Vol. 20, 1049-64.
- Tracy Desjardins and Alan Scoboria. [“’You and Your Best Friend Suzy put Slime in Ms. Smollett’s Desk’: Producing False Memories with Self-relevant Details.”](#) *Psychonomic Bulletin & Review*. 2007, 14(6), 1090-95.
- Eugene Subbotsky. [“Can Magical Intervention Affect Subjective Experiences? Adults’ Reactions to Magical Suggestion.”](#) *British Journal of Psychology*. 2008; 00, 1-22.

## Week 3: Science and the public

### Class 1: Issues facing science journalists and public attitudes about science

#### Readings:

- Stuart Allen, [“Introduction: Science Journalism in a Digital Age,”](#) *Journalism*, October 2011 12: 771-777.
- National Science Board, *Science and Engineering Indicators 2012*, chapter 7: [“Science and Technology: Public Attitudes and Understanding.”](#)

### Class 2: Improving public understanding of science

#### Readings:

- Ian Hargreaves, et al. [“Towards a Better Map: Science, the Public and the Media,”](#) *Economic and Social Research Council*, 2003.
- Matthew C. Nisbet and Chris Mooney. [“Framing Science.”](#) *Science*. 2007; 316(5821): 56.

## Week 4: The dangerous allure of cognitive biases

### Class 1: Awareness of cognitive biases

Discussion will focus on being aware of cognitive biases in sources' and scientists' work and how to be on the lookout for researchers looking for exactly what they found. Start of oral presentations (one student per class until complete).

#### Readings:

- Martin Hilbert, "[Toward a Synthesis of Cognitive Biases: How Noisy Information Processing Can Bias Human Decision Making.](#)" *Psychological Bulletin*, March 2012, Vol. 138(2), 211-237.
- Kimberlee Weaver, Stephen Garcia, Norbert Schwarz, and Dale Miller, "[Inferring the Popularity of an Opinion from Its Familiarity: A Repetitive Voice Can Sound Like a Chorus.](#)" *Journal of Personality and Social Psychology*, Vol. 92(5): 821-833.

### Class 2: Guarding against cognitive biases

Discussion will focus on guarding against cognitive biases and examining how they may negatively influence reporting and writing. Assignment 2 due in class.

#### Reading:

- Daniel Kahneman, *Thinking Fast and Slow*.

## Week 5: Covering controversy 1: Scientific studies

### Class 1: MMR vaccine and autism, part 1

Discussion will focus on one of the most infamous shoddy studies of the past several decades: Andrew Wakefield's *Lancet* paper on a possible link between the MMR vaccine and autism. This week's readings will include contemporaneous critiques of Wakefield's work. Topic for final assignment due in class.

#### Readings:

- *Field Guide*, chapter 2: "Reporting from Science Journals."
- Andrew Wakefield, et al. "[Ileal-lymphoid-nodular Hyperplasia, Non-specific Colitis, and Pervasive Developmental Disorder in Children.](#)" *The Lancet*, 1998; 351, 637-41 (retracted).
- Andrew Wakefield. "[Autism, Inflammatory Bowel Disease and MMR Vaccine.](#)" *The Lancet*, 1998; 351(9106), 908.
- M.A. Afzal, et al. "[Absence of Measles-virus Genome in Inflammatory Bowel Disease.](#)" *The Lancet*, 1998; 351(9103), 646-47.
- Robert Chen and Frank DeStefano. "[Vaccine Adverse Events: Causal or Coincidental?](#)" *The Lancet*, 1998; 351(9103), 611-12.

### Class 2: MMR vaccine and autism, part 2

This week's readings will focus on later examinations of Wakefield's work and discussion will focus on the media's role in perpetuating this "controversy." It will also look at some of its repercussions. Students should finalize topics for final papers.

#### Readings:

- *The Panic Virus*, chapters 8-9: "Enter Andrew Wakefield" and "The *Lancet* Paper."
- Jeffrey P. Baker, "[Mercury, Vaccines and Autism: One Controversy, Three Histories.](#)" *American Journal of Public Health*. 2008; 98(2), 244-53.
- Liza Gross, "[A Broken Trust: Lessons from the Vaccine-Autism Wars.](#)" *PLoS Biology*. 2009; 7(5), e100014-e100026.
- Michael Smith, et al. "[Media Coverage of the Measles-Mumps-Rubella Vaccine and Autism Controversy and Its Relationship to MMR Immunization Rates in the United States.](#)" *Pediatrics*. 2008; 121(4), e836-e843.

## Week 6: Covering controversy 2: Too good to check?

### Class 1: Morgellon's disease

Discussion will focus on the psychology, ethics and sociology around illness and false claims.

#### Readings:

- Brigid Schulte, "[Figments of the Imagination.](#)" *The Washington Post*. January 20, 2008.
- Brigid Schulte, "[Post Magazine Live Discussion: Morgellons Disease.](#)" [washingtonpost.com](#), January 22, 2008.
- *The Panic Virus*, chapter 7: "Help! There Are Fibers Growing Out of My Eyeballs."

### Class 2: Introduction to blogging

Discussion will focus on best practices and techniques for blogging about discoveries, studies and news events.

#### Readings:

- Recent posts at [Nature.com](#) blogs
- [Wired Science](#) blogs
- "[Cosmos and Culture.](#)" NPR science and society blog
- [Discover Magazine](#) blogs

Second assignment due in class.

## Week 7: The politicization of science: Climate change, energy

### Class 1: Informed and uninformed opinions

Discussion will focus on the ways in which social, political and thought leaders impact scientific debates regardless of their scientific standing or savvy. Students should begin to blog and have social-media discussion about subject of final paper.

#### Readings:

- John A. Krosnick, et al., [“The Impact of the Fall 1997 Debate about Global Warming on American Public Opinion,”](#) *Public Understanding of Science*, 2000, Vol. 9, No. 3: 239.
- William R.L. Anderegg, et al., [“Expert Credibility in Climate Change,”](#) *PNAS*, July 6, 2010, Vol. 107, No. 27, 12107-12109.
- Gordon Gauchata, [“Politicization of Science in the Public Sphere: A Study of Public Trust in the United States, 1974 to 2010,”](#) *American Sociological Review*, April 2012, Vol. 77, No. 2, 167-187.
- Robert J. Brulle, et al. [“Shifting Public Opinion on Climate Change: An Empirical Assessment of Factors Influencing Concern over Climate Change in the U.S., 2002-2010,”](#) *Climatic Change*, 2012, Volume 114, No. 2.

### Class 2: Climate change impacts and a world in transition

Discussion will continue previous week’s discussion by looking at how the planet is changing for humans, flora and fauna.

#### Readings:

- [“Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation,”](#) United Nations Intergovernmental Panel on Climate Change, 2012.
- Antonella Zanobetti, et al., [“Summer Temperature Variability and Long-term Survival among Elderly People with Chronic Disease,”](#) *PNAS*, April 9, 2012.
- Hönisch Bärbel, et al., [“The Geological Record of Ocean Acidification,”](#) *Science*, March 2, 2012, Vol. 335, No. 6072, 1058-1063.

## Week 8: Energy, natural resources and the environment

### Class 1: Reporting on energy and society

Discussion will focus on strategies for reporting on energy-related subjects with strong policy dimensions and significant implications for sustainability. Further discussion will focus on how to report on social science findings without crossing the line into advocacy. Assignment 3 due in class.

#### Readings:

- [“Fracking, shale gas and health effects: Research roundup,”](#) Journalist’s Resource, Sept. 6, 2012.
- M.A. Palmer, et al., [“Mountaintop Mining Consequences,”](#) *Science*, 8 January 2010: Vol. 327 no. 5962 148-149.
- Bryan Bollinger and Kenneth Gillingham, [“Peer Effects in the Diffusion of Solar Photovoltaic Panels,”](#) August 5, 2012.
- Christopher R. Knittel. [“Automobiles on Steroids: Product Attribute Trade-Offs and Technological Progress in the Automobile Sector,”](#) *American Economic Review*, 2012, Vol. 101, no. 7, 3368-99.

### Class 2: Biodiversity challenges and a crowded planet

Discussion will focus on how the richness of the natural world is threatened by human expansion and development, and natural resources consumption.

#### Readings:

- Bradley J. Cardinale, [“Biodiversity Loss and Its Impact on Humanity,”](#) *Nature*, June 7, 2012, 59-67.
- Samuel K. Wasser, et al., [“Influences of Wolf Predation, Habitat Loss, and Human Activity on Caribou and Moose in the Alberta Oil Sands,”](#) *Frontiers in Ecology and the Environment*, December 2011, Vol. 9, Issue 10, 546-551.
- Anne L. Balogh, Thomas Ryder, and Peter P. Marra, [“Population of Gray Catbirds in the Suburban Matrix,”](#) *Journal of Ornithology*, January 23, 2011.

## Week 9: Artificial intelligence

### Class 1: Basic concepts

Artificial intelligence is one of the areas undergoing enormous advances. This week's classes will familiarize students with basic concepts and ideas that inform the field. Today's discussion will address Turing tests and theories about why machines will (or won't) gain "intelligence."

#### Readings:

- A.M. Turing, "[Computing Machinery and Intelligence](#)," *Mind*, 1950, 59, 433-460.
- John R. Searle, "[Minds, Brains and Programs](#)," *Behavioral and Brain Sciences*, 1980.

### Class 2: Current issues

Discussion will focus on current issues in artificial-intelligence research and development. Students begin keeping a blog in class.

#### Readings:

Selections from *Understanding Artificial Intelligence*, compiled by the editors of *Scientific American* magazine.

- Kenneth M. Ford and Patrick J. Hayes, "On Computational Wings," 5-18
- Douglas B. Lenat, "Programming Artificial Intelligence," 23-29
- Geoffrey E. Hinton, "How Neural Networks Learn From Experience," 43-59

## Week 10: Humans and technology

### Class 1: Ways to write about science

This week's classes will examine some of the ways in which general assignment reporters write about science. Today's class will address three primary sources, two news stories written about one of those studies in particular, and one blog critiquing the news coverage.

#### Readings: Primary sources

- Aric Sigman, "[Well Connected? The Biological Implications of 'Social Networking.'](#)" *Biologist*, February 2009, Vol. 66, No 1, 14-20.
- Robert Kraut, et al., "[Internet Paradox Revisited.](#)" *Journal of Social Sciences*, Spring 2002, Vol. 58, Issue 1, 49-74.
- S. Byun, et al. "[Internet Addiction: Metasynthesis of 1996-2006 Quantitative Research.](#)" *CyberPsychology and Behavior*, April 2009; 12(2):203-7.

#### Readings: News coverage

- "[How Using Facebook Could Raise Your Risk of Cancer.](#)" *The Daily Mail*, February 19, 2009.
- "[Online Networking 'Harms Health.'](#)" BBC.com, February 19, 2009.
- Ben Goldacre, "[How Arik Sigman Distorts the Scientific Evidence to Mislead You.](#)" *Bad Science*, February 24, 2009.

### Class 2: "Buzz" or irresponsibility?

Discussion will focus on a *Newsweek* cover story. Is this an example of "buzzy" coverage, or is it irresponsible journalism?

- Tony Dokoupil, "[iCrazy: Is the Web Driving Us Mad?](#)" *Newsweek*, July 9, 2012.
- Vaughan Bell, "[No, the Web Is Not Driving Us Mad.](#)" Mindhacks.com, July 13, 2012.
- Maia Szalavitz, "[Does the Internet Really Make Everyone Crazy?](#)" Time.com, July 13, 2012.

## Week 11: Story structure and reverse engineering

### Class 1: The geometry and solid building blocks of a science story

Discussion will focus on how narrative stories use certain formulas and techniques to advance ideas and arguments.

#### Readings:

- Peter Hessler, [“Interview: John McPhee, the Art of Nonfiction No. 3.”](#) *Paris Review*, spring 2010, No. 192.
- David Quammen, [“Deadly Contact,”](#) *National Geographic*, October 2007.
- *Ideas into Words*, chapters 4-6: “Writing: Getting Started and the Structure,” “Writing: The Nitty Gritty” and Refining Your Draft.”

### Class 2: Deconstructing the layers of a good science story

Discussion will focus on analysis of a particular story, illuminating the relative simplicity of intellectual architecture that lies behind a long, dense narrative.

#### Readings:

- Atul Gawande, [“Letting Go: What Should Medicine Do When It Can’t Save Your Life?”](#) *New Yorker*, August 2, 2010.
- Ed Yong, [“Deconstructing Gawande: Why Narrative and Structure Are Important,”](#) *Discover Magazine* blog, August 23, 2010.

## Week 12: Types of science writing

### Class 1: Forms, conventions and science article styles

Discussion will focus on the classic shapes and styles of various types of science articles, and how to select and fit form properly to subject.

#### Readings:

- *Field Guide*, “Part III: Varying Your Writing Style.” Includes chapters on “Deadline Writing,” “Investigative Reporting,” “Gee Whiz Science Writing,” “Explanatory Writing,” “Narrative Writing,” and “The Science Essay.”
- Selections from *The Best American Science Writing 2012*.

### Class 2: The fine art of good science writing

Science writing is a demanding intellectual enterprise, but it can also be a high art form. Discussion will focus on what it takes to elevate science reporting and make pieces highly readable.

#### Readings:

- *On Writing Well*, chapters 11, 15, 20-23: “Nonfiction as Literature,” “Science and Technology,” “The Sound of Your Voice,” “Enjoyment, Fear, and Confidence,” “The Tyranny of the Final Product,” “A Writer’s Decisions.”
- Selections from *The Best American Science Writing 2012*.

## Week 13: Fact-checking with sources

### Class 1: Journalism ethics in complex fields; the journalist-scientist relationship

One of the largest debates in science journalism over the past several years has been whether reporters should share parts of their stories with scientists in their efforts to make sure they understand the issues at hand. The *Chicago Tribune*'s Trine Tsouderos became the centerpiece of this discussion after her appearance on a podcast by a Columbia University virologist. Discussion will focus on students' thoughts about the topic.

#### Readings:

- *This Week in Virology*, "[Live at ICAAC in the Windy City.](#)" 2011, No. 149, featuring Trine Tsouderos, science reporter for *Chicago Tribune*.
- David Kroll, "[Trine Tsouderos on This Week in Virology: When Do You Fact-Check Article Content with Sources?](#)" *Take as Directed*, September 19, 2011.
- Seth Mnookin, "[Guardian Ends Run of Smart Science Journalism Discussions with Scientists' Self-Congratulatory Essay about Peer Review.](#)" PLOS Blogs, October 12, 2011.

### Class 2: Final thoughts on science reporting, good process and perpetual perils

Wrap-up discussion will summarize key takeaways and guidance for writers in the field. A reporter's daily information diet bears final scrutiny: The packaging of science — press releases and communications from institutions — are information streams that reporters on the beat should manage and approach with caution.

#### Readings:

- "[Research Chat: Andrew Revkin on Covering and Using Scholarship.](#)" Journalist's Resource, September 27, 2011.
- Amélie Yavchitz, et al. "[Misrepresentation of Randomized Controlled Trials in Press Releases and News Coverage.](#)" *PLoS Medicine*, September 2012.