UROP Library Resources

The following is a list of resources that UROP maintains in the A. French Building Undergraduate Research Opportunities Program office. They are available for check-out by the Georgia Tech community. Please contact UROP for availability. Some are available through on-line resources or the Georgia Tech library.

In addition to the following materials, UROP also subscribes to the Council on Undergraduate Research (CUR) CUR Quarterly Journal. Selected issues and articles from the journal are available online at the CUR website as well as other CUR publications. Hardcopy past issues not in UROP's library are also available for purchase through CUR and UROP. UROP has the following hardcopy issues (titles) along with those published after Fall 2009:

> June 2001 (Vol. 21, No. 4) – Undergraduate Research in the Humanities and Social Sciences
> December 2001 (Vol. 22, No. 2) – Research Responsibility: A Theme for Mentoring Undergraduates
> June 2004 (Vol. 24, No. 4) – Creating Time for Research
> June 2005 (Vol. 25, No. 4) – Field-Based Research Involving Undergraduates
> September 2005 (Vol. 26, No. 1) – Window on America: Bringing Home Interdisciplinary Research
> December 2005 (Vol. 26, No. 2) – Undergraduate Research That Serves the Community
> March 2006 (Vol. 26, No. 3) – Integrating Research into the Curriculum
> June 2006 (Vol. 26, No. 4) – Focus on Bio2010
> September 2006 (Vol. 27, No. 1) – Corporate Partnerships
> December 2006 (Vol. 27, No. 2) – Focus on Undergraduate Research Offices
> June 2007 (Vol. 27, No. 4) – Risk Management
> Fall 2007 (Vol. 28, No. 1) – Models of Undergraduate Research
> Winter 2007 (Vol. 28, No. 2) – Models of Undergraduate Research
> Spring 2008 (Vol. 28, No. 3) – Challenges for Early Career Faculty
> Summer 2008 (Vol. 28, No. 4) – Focus on Undergraduate Research Communities
> Fall 2008 (Vol. 29, No. 1) – Undergraduate Research: An Early Start
> Winter 2008 (Vol. 29, No. 2) – Undergraduate Research in the Arts and Humanities
> Spring 2009 (Vol. 29, No. 3) – Assessing Outcomes
> Summer 2009 (Vol. 29, No. 4) – Undergraduate Research that Informs Public Policy
> Fall 2009 (Vol. 30, No. 1) – How to Talk with Administrators about Undergraduate Research

∗ **Adviser, Teacher, Role Model, Friend. On Being a Mentor to Students in Science and Engineering.**
6th ed. Washington, D.C.: National Academy Press, 2005.

This is a guide for those who are likely to be mentoring someone - whether it's students, post-docs, junior faculty, or grad students. It offers different ways to be a good mentor with examples for specific situations at the different levels of undergrad, grad student, post doc, and junior faculty. While some are obvious, some are not - which is what makes it a valuable book for mentors to review. The book is divided into chapters explaining the different roles that a mentor may have and how to tailor the mentor's behavior based on that particular function. For example, there are chapters on being a faculty advisor, acting as a career advisor, as a teacher of skills (of communication - written and verbal, informal, people, teamwork, etc) and finally as a role model. In the chapter on mentor as a career advisor, tips on writing letters of recommendation are presented. The resources section at the end of the book has several good mentoring references listed, arranged by topic. This is another great starting book for those who are just starting to be a mentor and who need a little more focused guidance on what the roles are of a mentor and how to apply them. While this short guide is published by the National Academies Press with a focus on being an effective mentor in science and engineering, it contains mentoring help that is applicable to all disciplines.

Available From: UROP Office

✷ **Endnote X1, Bibliographies Made Easy**. Thomson Corporation, 2007.

Endnote is a program to organize references and citations and to insert and format bibliographies in documents. UROP has a booklet on "Getting Started Guide for Windows" using EndNote X1. This guide instructs on both how to install, upgrade, and uninstall the program as well as how to use it to upload references to the program. GT has a site license that is available through the GT OIT department (http://www.oit.gatech.edu/software/overview.cfm). The GT Library offers training classes periodically on the use of Endnote http://www.library.gatech.edu/calendar/libcalendar.php. Endnote also has "webinars" of several different topics several times a month with a live person guiding you through the learning process. Topics include: building your library, using cite while you write, how to use Endnote Web, and more advanced classes to included Styles and open Q&A sessions. http://endnote.com/training/

Available From: UROP Office
http://www.endnote.com/support/helpdocs/ENX1GettingStartedGuide.pdf

✷ **"Frontiers: The Interdisciplinary Journal of Study Abroad and the Forum on Education Abroad Present a Special Issue: Undergraduate Research Abroad."** Frontiers. Ed. Brian Whalen2008.

This special issue of the Frontiers Journal contains an introduction entitled "Overseeing Study Abroad Research: Challenges, Responsibilities, and the Institutional Review Board" and presents examples of research by undergraduates through papers written by students about the research they conducted while abroad:
'The Cultural Implications of Primary Health Care and the Declaration of Alma-Ata: The Health District of Kedougou, Senegal'; 'The Faces of Globalization: The Recovered Factories Movement of Argentina'; 'France Says "Non": Elites, Masses, and the Defeat of the European Constitutional Treaty'; 'We Could Be Heroes: Mythico-History, Diasporic Nationalism, and Youth Identity Among Tibetan Refugees in Nepal'

Available From: UROP Office
http://www.frontiersjournal.com/frontiersvolxvispr08.htm

✷ **Integrating Research into Undergraduate Education: The Value Added**. Integrating Research into Undergraduate Education: The Value Added. November 2004. The National Science Foundation and the Woodrow Wilson National Fellowship Foundation, 2004.

This is a conference proceedings booklet that contains the contents of the two-day conference. In addition to the plenary and other welcoming and introductory speeches, it also presents the break-out sessions. Within these break-out session sections, an introduction to the topic is presented and then the summary of the results of the discussion is also described. Breakout session topics included: 1) Bringing research to the classroom - at the institutional level and within fields and majors, 2) Applying principles of learning in diverse undergraduate educational settings (institutional context and disciplinary and interdisciplinary context), 3) Addressing the challenges face with respect to undergraduate education, (4) Providing a quality research-based undergraduate education: critical challenges of the next five years, 5) Incorporating principles of learning into undergraduate education. While not necessarily a primary reference, this could be valuable to read for ideas on what other have done and experienced.

Available From: UROP Office
http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1b/c7/7c.pdf

∗ Alley, Michael. **<u>The Craft of Scientific Presentations : Critical Steps to Succeed and Critical Errors to Avoid</u>**. New York: Springer, 2003.

The author uses as examples of good and poor presenters very famous 'science' names, such as Einstein, Oppenheimer, Boltzmann, Bohr - (I assumed so that the reader can feel that if these big names had problems/strengths then it's ok for me to be learning). In addition, he continually comes back to the space shuttle *Challenger* explosion as examples of ways to not present information and the potential consequences of not being a good presenter of information. He focuses on the most critical errors that occur in presentations but is very good at stating an error and then the proper way to fix the problem. In doing so, he is able to cover in depth the big pitfalls that presenters typically make, but does not over-write about them, either. The presentation format primarily discussed is an oral PowerPoint style presentation, but there is an appendix chapter on poster presentations and designing posters effectively. The book covers structuring your talk in depth, how to prepare the speaking part of the presentation, why and how to tailor the talk to the expected audience (especially if it is a mixed audience of experts and non-experts), effectively using visual aids (from overheads to PowerPoint -type slides to models and demonstrations), creating effective, visually pleasing slides has several practical tips, and oral delivery. The chapter "Critical Error 5" should definitely be read by anybody preparing an oral presentation and may be read alone. This is best for those who have given at least one presentation or who has a first presentation prepared and who has practiced delivering it formally so that the book's suggestions make sense and allow for self-critique or for those who have seen a few presentations - both good and bad.

Available From: UROP Office, GT Library

∗ Ambos, Elizabeth L., et al. "**Geoscience Field Studies at California State University at Long Beach: Urban Applied Research with a Community Focus**." <u>Council on Undergraduate Research Quarterly</u> Vol. 26 Iss. 2 (2005): pp. 56-61.

The authors present a model of field-based undergraduate research in the geosciences at California State University, Long Beach that takes advantage of what might be termed a hybrid model for field experiences: combining one to two weeklong field excursions to remote locations with daylong field trips to "urban pockets of wilderness" within a one-to two-hour drive from SCULB. What is distinctive about this model is its reliance on field-based projects that have strong roots in community interest, and/or support and engagement from state or regional parks and nature preserves.

Available From: UROP Office

∗ Baker, Nancy L., and Hulling, Nancy. **<u>A Research Guide for Undergraduate Students</u>**. 6th ed. New York: The Modern Language Association of America, 2006.

This guide to conducting library research was specifically written for the needs of undergraduate students by two experienced university librarians. This guide provides a large number of very up-to-date techniques on conducting very focused searches using university catalogs, databases, primary sources, and others so that your undergraduate's research time is well-spent. While not written in a 'preachy' tone, the authors do stress throughout how and why not to use non-professional web sites when conducting research - mostly by stressing how it is a 'time waster'. While this is written for conducting English and American Literature specific research papers, everything in this guide is easily applied to the other disciplines and would be helpful for all majors at Georgia Tech.

Available From: UROP Office

∗ Blauth, James R., and Schrum, David P. "**Service Learning and Field Research at the University of Redlands: Desert Restoration in Joshua Tree National Park**." <u>Council on Undergraduate Research Quarterly</u> Vol. 26 Iss. 2 (2005): pp. 63-65.

The University of Redlands launched a research project that involves both biological and chemical analyses and that seeks to get students started in research earlier in their college careers. The project has an applied research or service emphasis in that they want to initiate ecological restoration of a disturbed desert wash in Joshua Tree National Park to reverse and limit the effects of ongoing foot traffic. This is a long-term project that offers a number of different ways for students to make contributions to the project while exposing students to field research.

Available From: UROP Office

* Bodenbender, Brian E. "**Multidisciplinary Field Investigation: Using Shared Logistics to Increase Research Productivity**." <u>Council on Undergraduate Research Quarterly</u> Vol. 25 Iss. 4 (2004): pp. 156-161.

In many ways, off-campus field studies are ideal learning opportunities. What could be better for students than a learning experience that offers excitement, adventure, travel, and immersion in a subject for weeks at a time in a setting away from everyday distractions, diversions, and responsibilities? The things that make fieldwork so memorable for students, however, raise unique challenges for faculty members. Beyond being responsible for supervising students' research activities, in a field research project the faculty member also becomes responsible for a majority of the everyday logistical decisions that students would normally make on their own, up to, and occasionally including, when and where to eat, sleep, and go to the bathroom. Meeting the basic needs of the field crew is obviously an indispensable part of fieldwork, but logistical demands can divert faculty time, attention, and energy away from the research that is the crew's primary purpose. One way to decrease a research project's logistical overhead is to share the load by having two or more faculty members supervise multiple research projects at a single field site. The authors have taken this approach in a collaborative research project, "Paleoenvironmental Characterization of a Dinosaur Site in the Morrison Formation of the Bighorn Basin, Wyoming," funded by the National Science Foundation's Research Experiences for Undergraduates program. The field locality is near Shell, Wyoming (population 50) along the western slope of the Big Horn Mountains on property administered by the Bureau of Land Management (BLM). The project engages each participant in field and laboratory work directed toward our overarching goal - to develop a broad understanding of the ancient environments and fossils represented at the site. Participants, either individually or in pairs, collaborate with faculty to design research projects that focus on specific aspects of the fossils, sediments, or sedimentary rocks at the site.

Available From: UROP Office
http://www.cur.org/Quarterly/jun05/BodenDemko.pdf

* Booth, Wayne C., Colomb, Gregory G., and Williams, Joseph M. **<u>The Craft of Research</u>**. Chicago Guides to Writing, Editing, and Publishing. 2nd ed. Chicago: University of Chicago press, 2003.

This book discusses how to write a research paper, perform the literature background research, and finally construct and revise an effective paper. While a bit longer than other reference books on 'how to write' this is very comprehensive and offers practical suggestions and more importantly examples of how to choose and narrow down to an effective topic and how to determine if your topic is applied versus pure research with an explanation of the distinction between the two which is something that may confuse beginner researchers. The examples throughout the book are what I find most valuable as it offers the reader a true format and guide to writing well about research and demystifies the process. The revising section is also very informative and acts as a real guide through the revising process. This book is a great tool especially for students writing longer research papers and theses, but will be equally effective for those writing shorter research papers. It is written with examples from the humanities to the sciences and so is appropriate for any student from any major/college. I found this very valuable and would recommend to any student, grad student, or post doc struggling with writing.

Available From: UROP Office

* Bowman, Kirk S., and Jennings, Ashley. "**Pura Vida: Using Study Abroad to Engage Undergraduate Students in Comparative Politics Research**." <u>PS: Political Science & Politics</u> Vol. 38 Iss. 01 (2005): pp. 77-81.

Political science undergraduate students often have a difficult time understanding the processes and methods of social science research. The foci of courses in comparative politics such as Latin American Politics or European Politics are typically descriptive information, concepts and theories, and an overview of the principal debates and research findings. This stands in sharp contrast to undergraduate pedagogy in the natural sciences, where laboratory sections supplement classroom activities. For example, biology students learn the basics of the discipline in the classroom, and simultaneously use the tools and methods of scientists in the lab to replicate elementary experiments. This multi-method approach not only reinforces the students' understanding of biological concepts, but also gives them an appreciation for how their professors spend their time and the challenges, pleasures, and limitations of academic research.

Available From: UROP Office
http://journals.cambridge.org.www.library.gatech.edu:2048/action/displayAbstract?aid=285545

∗ Boyd, Mary K., and Wesemann, Jodi L., eds. **<ins>Broadening Participation in Undergraduate Research: Fostering Excellence and Enhancing the Impact</ins>**. Washington, DC: Council on Undergraduate Research, 2009.

Engaging undergraduate students in research, scholarship, and creative activity is a proven and powerful practice for enhancing educational outcomes and expanding frontiers of knowledge. This book is a rich collection featuring institutions that are maximizing the impact of this practice by including: underrepresented ethnic and racial minorities, students with disabilities females, students of lower socioeconomic status, first- and second-year students, and others not traditionally involved in the development of new knowledge. Examples of high-quality, inclusive programs from community colleges, primarily undergraduate institutions, minority-serving institutions, comprehensive universities, and research universities will help faculty, staff, and administrators enhance: the lives of their students, the direction of their scholarship, and the impact of their disciplines and institutions. Practical strategies for building sustainable programs include: Design and Implementation of Plans, Leading Change, and Maximizing Investments of the respective school's program.

Available From: UROP Office

∗ Cheesman, Kerry L., et al. "**Facilitating Research with Undergraduate Students: Role of the Science Department Chair**." <ins>Council on Undergraduate Research Quarterly</ins> Vol. 22 Iss. 2 (2001): pp. 76-80.

The roles and ways that department chairs can facilitate research with undergraduates. Seven ways are discussed, including finding and allocating resources, interacting with administration, setting the example, and helping faculty retool.

Available From: UROP Office

∗ Clarke, Cheryl A. **<ins>Storytelling for Grantseekers: The Guide to Creative Nonprofit Fundraising</ins>**. San Francisco, CA Jossey-Bass (John Wiley & Sons, Inc.), 2001.

This is a thorough guide to writing grant proposals and is very helpful for those just starting out in proposal writing, with a twist on how to develop a compelling narrative using storytelling that is more like reading a compelling newspaper article rather than fluff or a dry legal document. For those new to proposal-writing, the first three chapters address how to collect necessary information for a solid proposal; screen funders for a good donor-project match; and manage your relationship with a potential funder. The four middle chapters address storytelling in the narrative. They are great advice for beginning writers yet speak to next-level professionals hoping to coax their own style. Sample proposal text is very often excellent. The final three chapters cover budget description and the basics of how to format and package the proposal. Each is thorough, easy to understand and helpful. The author makes good points about an environmental scan to place your project in context for the reader and to strengthen your case; that the key need must be your clients' not your institution's; and how to make good use of data for reinforcement.

Available From: UROP Office

∗ Cooper, Gregory, Elmes, David G., and Stewart, Jeanine S. "**Issues in Teaching Ethics to Undergraduates**." <ins>Council on Undergraduate Research Quarterly</ins> Vol. 22 Iss. 2 (2001): pp. 55-56.

The task of educating young scientists about research ethics may seem daunting, but consider the disservice done to them by tacitly fostering the belief that scientific research really is managed and executed as cleanly as we would like it to be. This article discusses ways that Washington and Lee University has tried to teach ethics.

Available From: UROP Office

∗ Davis, Larry E., and Eves, Robert L. "**The Natural History of a Modern Carbonate Ecosystem: Field Studies That Integrate Undergraduate Research**." <u>Council on Undergraduate Research Quarterly</u> Vol. 25 Iss. 4 (2005): pp. 175-179.

The author describes a field research semester consisting of an 8 week content development and a 10 day research based field experience at the Gerace Research Center, San Salvador Island, Bahamas.

Available From: UROP Office

∗ Edwards, Natalie, and Hogarth, Christopher. "**Using Short-Term Study Abroad to Further Undergraduate Research**." <u>Council on Undergraduate Research Quarterly</u> Vol. 29 Iss. 2 (2008): pp. 14-17.

This article describes a program at Wagner College called "Expanding Your Horizons" where in January the professor and students travel abroad and pursues research (in this case Paris in Literature, Art and Film) and then the professors teach a class in the spring semester that emanates from the January research experience. The professors worked with the students who went on the trip in conducting and writing research projects throughout the spring semester.

Available From: UROP Office

∗ Firmage, David H., Tietenberg, Thomas H., and Cole, F. Russell. "**Research-Based Learning in an Introductory Environmental Studies Course**." <u>Council on Undergraduate Research Quarterly</u> Vol. 25 Iss. 4 (2005): pp. 191-200.

Detailed description of class and assessment of an introductory environmental studies class taught with the focus on including hands-on research experiences rather than the traditional lecture-discussion found in introductory environmental studies classes. Includes week-by-week guide for assigned case study - research project

Available From: UROP Office

∗ Friedland, Andrew J., and Folt, Carol L. <u>**Writing Successful Science Proposals**</u>. New Haven: Yale University Press, 2000.

This guide to writing successful science research proposals presents writing the research proposal as a very doable and attainable process. It explains many of the unknowns such as how to organize the proposal, what to include in each section, how to further expand your ideas regarding significance statements and linking objectives and hypotheses, choosing titles, and rethinking, revising and resubmitting if the proposal request is declined. This guide is perfect for all new researchers, from undergraduates to post-docs, starting their career and required to write a formal research proposal.

Available From: UROP Office, GT Library

∗ Gordon, Gary. "**Undergraduate Research in Mathematics: Lafayette College's Reu**." <u>Council on Undergraduate Research Quarterly</u> Vol. 28 Iss. 1 (2007): pp. 6-11.

The author details how he has organized a NSF Summer REU program in mathematics research at Lafayette College, PA. He describes how participants were chosen, how project topics emerged, what mentors considered a successful project, how the undergraduates were assigned or chosen for specific research projects, logistics and evaluation of the program. Lafayette College has had a NSF Summer REU program for mathematics since the early 1990's through 2010 (when current funding ends).

Available From: UROP Office

∗ Graham, Kate J., and Johnson, Brian J. "**Some Simple Suggestions for Improving the Research Environment**." <u>Council on Undergraduate Research Quarterly</u> Vol. 24 Iss. 4 (2004): pp. 154-157.

> The authors describe some simple suggestions that their department uses to facilitate and increase the quality and impact of their research with available resources. These are divided into four topics: cooperation and collaboration among faculty is valuable; efforts to improve student efficiency in the lab; efforts to increase resources; and efforts to recognize hard work and achievement. All of these are discussed with a focus on best use of limited and valuable time of each faculty member who is mentoring undergraduate research students.
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> Available From: UROP Office

∗ Hakim, Toufic M. **<u>At the Interface of Scholarship and Teaching: How to Develop and Administer Institutional Undergraduate Research Programs</u>**. Washington, DC: Council on Undergraduate Research, 2000.

> This booklet is geared more for faculty/staff who want to develop a campus-wide undergraduate research program where one does not exist. It discusses some of the obstacles that may be encountered, attitudes toward undergraduates and undergraduate research, and administration and faculty buy-in. While brief and to-the-point, it has little relevance to the individual faculty at Georgia Tech who desires to learn more how to start their own individual research program including undergraduate researchers. It is more applicable for those who desire to become an undergraduate research office program developer at a college institution that does not have a formal program (like Georgia Tech's UROP office).
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> Available From: UROP Office

∗ Handelsman, Jo, et al. **<u>Entering Mentoring: A Seminar to Train a New Generation of Scientists</u>**. First (paperback edition) ed: Itchy Cat Press (paperback edition), 2005.

> This seminar and curriculum maintains the belief that effective mentoring can be learned, but not taught. Good mentors discover their own objectives, methods, and style by mentoring. And mentoring. And mentoring some more. Most faculty learn to mentor by experimenting and analyzing success and failure. The goal of the seminar outlined in this curriculum is to accelerate the process of learning to be a mentor. The seminar provides mentors with an intellectual framework to guide them, an opportunity to experiment with various methods, and a forum in which to solve mentoring dilemmas with the help of their peers. Discussing mentoring issues during the seminar provides every mentor with experiences of working with diverse students, tackling a range of mentoring challenges, and considering a myriad of possible solutions. UROP encourages working through this curriculum either individually or through the formation of groups.
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> Available From: UROP Office, Online
> www.hhmi.org/grants/pdf/labmanagement/entering_mentoring.pdf

∗ Howery, Carla B. "**Promoting Undergraduate Research in Sociology**." <u>Council on Undergraduate Research Quarterly</u> Vol. 21 Iss. 4 (2001): pp. 163-167.

> Infusing undergraduate research training is a challenge for sociology, as it is for other disciplines. This article identifies some of the challenges of research in the undergraduate sociology curriculum and describes two major projects, sponsored by the American Sociological Association (ASA), that seek to improve the way we prepare undergraduates for sociological research. Both projects center on the department as the locus for change. Only through the collective efforts of colleagues can departments meet the challenges outlined here.
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> Available From: UROP Office

✱ Jakubowski, Henry, and Jianping, Xie. "**An Innovative and Reciprocal Undergraduate Summer Science Exchange Program between the US and China**." <u>Council on Undergraduate Research Quarterly</u> Vol. 28 Iss. 1 (2007): pp. 12-17.

Students from College of Saint Benedict and St. John's University traveled to Southwest University, China where they partnered with undergraduate science students for six weeks to conduct science research under the direction of a faculty member from SWU and with the help of SWU graduate students. After this, the CSB/SJU students and the SWU partners returned to SCB/SJU to conduct another six weeks of research under the direction of CSB/SJU faculty. Both sets of students had the chance to receive the intercultural benefits of a study abroad program and to participate in science research in two different countries in a way that addresses the main reasons that discourage science students from study abroad programs.

Available From: UROP Office

✱ Kanigel, Robert. **<u>Apprentice to Genius : The Making of a Scientific Dynasty</u>**. Johns Hopkins pbk. ed. Baltimore: Johns Hopkins University Press, 1993.

This book tells the stories of how one strong mentor can further influence the behaviors and scientific lives of several generations of world famous and successful researchers. Specifically, this book details the lives of a set of biomedical researchers, beginning with James Shannon to Bernard Brodie, who had employed Julius Axelrod (Nobel Prize), who was mentor to Solomon Snyder (Lasker Prize), who mentored Candace Pert. The interwoven stories of how each of these people came to work together or be linked together in a 'genealogy' show the more human messy side of scientific research. This is a very interesting book to read, especially from a historical perspective. It is very well written with a flow to the story that makes it difficult to put down and very understandable to those not in the biomedical research field. While these stories show the reality of working in different labs - the politics, the fight for research credits, how mentoring relationships can change and evolve and end (sometimes dramatically), it also emphasizes the importance of mentoring and encouraging the next generation of researchers.

Available From: UROP Office

✱ Karukstis, Kerry K., and Elgren, Timothy E., eds. **<u>Developing and Sustaining a Research-Supportive Curriculum: A Compendium of Successful Practices</u>**. Washington, DC: Council on Undergraduate Research, 2007.

This publication, from the Council on Undergraduate Research, is designed to share successful practices that enable faculty and institutions to design, implement, and sustain a research-supportive curriculum. The volume focuses on three broad areas: curricular elements and teaching and learning strategies that develop critical research skills, curricular infrastructure that enhances a research-supportive curriculum and administrative contributions that initiate and sustain a research-supportive curriculum. Authors across disciplines and from a variety of types of institutions have contributed over 30 chapters and 50 "highlights" describing curricular approaches, methods and techniques developed for their courses and programs of study to enhance the research experience of stude3nts and the research culture of their institutions. Topics include curricular approaches to build research skills such as inquiry-based laboratories and interdisciplinary courses and programs, institutional infrastructure and assessment practices that promote a research-supportive curriculum, and the role of the faculty and the administration in nurturing a curriculum to support a research culture. Specific examples of known practices at particular institutions are included in each chapter. This compendium of successful curricular and institutional practices to develop critical research skills emphasized the importance of the collective efforts of the undergraduate community to integrate research and education. By collecting and disseminating a variety of mechanisms that are effective means of creating a research-supportive undergraduate curriculum, the Council on Undergraduate Research aims to encourage faculty and institutions to continue to seek creative, useful, and significant ways to promote "learning through research".

Available From: UROP Office

∗ Kauffman, Linda R., and Stocks, Janet E., eds. **<u>Reinvigorating the Undergraduate Experience</u>**. Washington, DC: Council on Undergraduate Research (CUR), 2004.

This compendium contains individual chapters written by specific colleges who have implemented undergraduate research programs. Topics include strengthening and broadening UG research efforts on campus, establishing social science UG research program, encouraging UG research across disciplines, UG research at research universities, assessment of UG research programs, developing supporting and assessing curricula that utilizes in class research experiences, and UG research into communities beyond the college. These are very helpful as they talk about experiences that current faculty and staff have had with establishing and improving existing undergraduate research programs - both at the individual research group scale to the institutional level.

Available From: UROP Office, Online
http://www.cur.org/Publications/AIRE_RAIRE/toc.asp

∗ Keller, Harold W. "**Undergraduate Research Field Experiences: Tree Canopy Biodiversity in Great Smoky Mountains National Park and Pertle Springs, Warrensburg, Missouri**." <u>Council on Undergraduate Research Quarterly</u> Vol. 25 Iss. 4 (2005): pp. 162-167.

The author describes a field research project that involved three phases: the Adventure phase (learning rope climbing and sampling techniques), the Laboratory Phase (analysis of tree canopy biota), and Publication phase. The author takes the reader through the complete process, from grant writing, to the actual field research, and to the final summary of results.

Available From: UROP Office

∗ Kinkead, Joyce. **<u>Valuing and Supporting Undergraduate Research</u>**. New Directions for Teaching and Learning Vol. 93. San Francisco: Jossey-Bass Publishers, 2003.

This is a special issue from the journal "New Directions for Teaching and Learning" edited by Joyce Kinkead devoted to discussing undergraduate research and institutional attitudes towards supporting undergraduate research and consists of 7 separate articles. The article titles are: "Learning through Inquiry: An Overview of Undergraduate Research" (Joyce Kinkead); "The Boyer Commission Report and its Impact on Undergraduate Research" (Wendy Katkin); "Undergraduate Research at the Research Universities" (Carolyn Ash Merkel);"A Research-Across-the-Curriculum Movement" (Mitchell R. Malachowski); "Undergraduate Research at Two-Year Colleges" (Jorge A. Perez); "Interdisciplinary Research: The NCUR-Lancy Awards (David F. Lancy); "What One Faculty Member Does to Promote Undergraduate Research" (David F. Lancy). While these are well written, because they were published in 2003 and the topics discussed relate to what has happened primarily in the late 1990's to 2002, some of the material presented regarding analysis of undergraduate programs and community involvement is dated as much has changed in the ensuing years. However, for those who are interested in a recent historical perspective on undergraduate research, the effect of the Boyer Report/Commission on undergraduate research at research universities in the years immediately following its recommendations, and background on undergraduate research being conducted at primarily undergraduate institutions (PUI's) and community colleges these articles can provide this background.

Available From: UROP Office, GT Library
http://www3.interscience.wiley.com.www.library.gatech.edu:2048/journal/104527789/issue

∗ Klinkner, Philip A. "**The Arthur Levitt Public Affairs Center at Hamilton College: A Social Sciences Laboratory**." <u>Council on Undergraduate Research Quarterly</u> Vol. 21 Iss. 4 (2001): pp. 168-169.

The real test for those attempting to expand the role of research in undergraduate education is to come up with programs and opportunities that undergraduates will find rewarding, stimulating, and enjoyable. The Arthur Levitt Public Affairs Center at Hamilton College in Clinton, NY has attempted to make undergraduate research more rewarding, stimulating and enjoyable by providing opportunities so that student researchers can present their finding to a larger audience and to shape the public debate on those issues. Among the programs that we conduct are public opinion surveys, policy seminars, and public contracts for research topics from state and local government agencies for students to analyze.

Available From: UROP Office

∗ Knowles, Richard, and Cochran, Phil. "**Mandatory Undergraduate Research in a Biology Curriculum since 1936**." <u>Council on Undergraduate Research Quarterly</u> Vol. 26 Iss. 1 (2005): pp. 40-43.

> This article discusses the requirement for biology majors to complete an undergraduate research project. It reviews a program by Saint Mary's University of Minnesota in hopes that it can serve as a model to those wishing to include such a requirement to their programs.

> Available From: UROP Office

∗ Lipson, Charles. <u>**Cite Right : A Quick Guide to Citation Styles--Mla, Apa, Chicago, the Sciences, Professions, and More**</u>. Chicago Guides to Writing, Editing, and Publishing. Chicago: University of Chicago Press, 2006.

> This book is exactly what the title suggests - a comprehensive reference on how to cite various resources (books, journals, newspapers, newsweeklies, etc) using the different citation styles. The different styles are described in a separate chapter for each style and include: the Chicago; MLA (humanities); APA (social sciences, education, engineering, and business); AAA (anthropology and ethnography); CSE (biological sciences); AMA (biomedical sciences, medicine, and nursing); ACS (chemistry); Physics, Astrophysics, and Astronomy citations; Mathematics and Computer Science Citations; Bluebook Legal; and ALWD Legal citations. This organization makes it a handy reference for all majors and for professors in determining what style might be the most appropriate for their field.

> Available From: UROP Office

∗ Lipson, Charles. <u>**How to Write a Ba Thesis : A Practical Guide from Your First Ideas to Your Finished Paper**</u>. Chicago Guides to Writing, Editing, and Publishing. Chicago: University of Chicago Press, 2005.

> This book is written in an informal style that makes the presented goal of writing a BA thesis appear to be manageable. Do not skip over the introduction and the "how to use this book" chapter as it sets up a very nice timeline plan and guide on most effectively using this reference. I would emphatically recommend this book as a great book to have and follow along with when trying to write your thesis. Its tone is non-threatening, non-preachy, and comforting. The book touches on all aspects of writing without feeling tedious - hitting the parts that students are most worried about (the actual how to start, how to organize, how to write) while focusing less attention on what other guides typically cover in depth (i.e. citation styles, grammar). A great chapter to read is a chapter on problems that a student may face while writing and how to potentially solve them. For mentors, that chapter could be effective in understand difficulties that you may observe your student encountering in his process.   This is what makes it a valuable reference - and demonstrates the author's obvious personal knowledge of what students are thinking and are experiencing when writing a thesis. The only minor criticism that I have is that the author does use some dated cultural references, albeit short ones, that current undergraduates may not appreciate, but these are typically not essential to understanding the point that the author is making and do not detract from the usefulness of the book.

> Available From: UROP Office

∗ Luyben, Paul D. "**Field Studies in Applied Behavior Analysis and Direct Instruction**." <u>Council on Undergraduate Research Quarterly</u> Vol. 26 Iss. 2 (2005): pp. 66-68.

> This article describes several field-based learning opportunities that the author provides to students at SUNY Cortland. The author offers opportunities to conduct community service learning projects with the HotShotReaders program in which college students use Direct Instruction programs in the schools as well as with a field study in applied behavior analysis where students employ behavioral principles and methods to improve the lives of people with disabilities. He recently added two more field experience options: an opportunity for superior students to do an observational study of behavior in the natural environment and for a few students to work intensively with children with autism in an integrated preschool program. The author describes how he organizes and coordinates these.

> Available From: UROP Office

* Macrina, Francis L. **<u>Scientific Integrity : Text and Cases in Responsible Conduct of Research</u>**. 3rd ed. Washington, D.C.: ASM Press, 2005.

Best read one chapter at a time, each chapter is strongly focused on one topic specific to ethical decisions that arise in conducting research. Also, in order to stimulate further discussion of the subject, each chapter has case studies and questions to assign for further written or oral discussions at the end of each chapter. Chapter topics are very relevant especially to the sciences, however several may be applicable to engineering, the social sciences, and possibly the humanities. The first two chapters introduce the concept of scientific integrity with examples of poor decisions and a brief history on some scientific misconduct and the different philosophies of ethics. The third chapter reviews acceptable behavior of mentors. Other chapters thoroughly discuss authorship and peer review, use of humans and animals in biomedical experiments, genetic technology and scientific integrity, and record keeping. The chapters on managing competing interests, collaborative research, and ownership of data and intellectual property are relevant to fields beyond the sciences. Finally, this book includes two appendices that supply surveys and student exercises that can be used as an accompaniment to the chapter discussions. Overall, this is a very well-written and fascinating text on ethics and scientific integrity that is accessible to all researchers.

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* McDavid, James C., and Hawthorn, Laura R. L. **<u>Program Evaluation and Performance Measurement, an Introduction to Practice</u>**. Thousand Oaks, CA: Sage Publications, Inc, 2006.

This text offers a conceptual, as well as practical, introduction to program evaluation and performance measurement for public and non-profit organizations. It covers topics in a detailed fashion, making it a useful guide for practitioners who are constructing and implementing performance measurement systems, as well as for students. Authors James C. McDavid and Laura R. L. Hawthorn guide readers through conducting quantitative and qualitative program evaluations and needs assessments, as well as constructing and implementing performance measurement systems. Key Features: Highlights the importance of sound professional judgment throughout the book and the final chapter offers ways that evaluation professionals can develop their professional judgment; Integrates performance measurement into evaluation practice to demonstrate how these skills are important foundations for performance measurement and essential for building program evaluation expertise; Discusses the realities of organizational politics and balances the importance of good evaluation methods with the resource and organizational constraints that almost always affect the choices evaluators make as they do their work; Provides reader friendly checklists to underscore key points. Program Evaluation and Performance Measurement is designed for advanced undergraduate and graduate courses in program evaluation, performance measurement, and performance management. The book does not assume a thorough understanding of research methods and design, making it an ideal text for students in Public Administration and Management, Social Work, the health professions, and other disciplines where research methods are not a central focus.

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* McKemie, Jean , and Naples, David. "**Including Undergraduate Research in the Mathematics Curriculum**." <u>Council on Undergraduate Research Quarterly</u> Vol. 26 Iss. 3 (2006): pp. 128-132.

This article describes St. Edward's University's method of including research in the mathematics curriculum. The incorporate research through a four-semester sequence of one credit hour courses: Research Methods, Undergraduate Research (take twice) and Senior Seminar. The sequence typically begins in the fall semester of the junior year and ends in the spring semester of the senior year. Students work with one faculty member (faculty mentor) throughout the entire sequence which they believe is a key feature for maximum student gain.

Available From: UROP Office

∗ Merkel, Carolyn A., and Baker, Shenda M. **How to Mentor Undergraduate Research**. Washington, DC: Council on Undergraduate Research (CUR), 2002.

This booklet from the Council on Undergraduate Research (CUR) offers a brief, but thorough, overview of mentoring undergraduate student research. This is a great first resource to look at when getting started with undergraduate researchers. Some of the topics discussed are expectations of the student and what the mentors should expect from their students. In addition, the basic tenets of undergraduate research mentoring are discussed - the value of undergraduate research, the differences between summer and school year research, and what mentoring should involve. Finally, there are practical bullet-point guides to make introducing your UG student to your and his/her research project and research group.

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∗ Mickley, G. Andrew, Kenmuir, Cynthia, and Remmers-Roeber, Dawn. "**Mentoring Undergraduate Students in Neuroscience Research: A Model System at Baldwin-Wallace College**." The Journal of Undergraduate Neuroscience Education (JUNE) Vol. 1 Iss. 2 (2003): pp. A28-A35.

While this article is entitled for neuroscience research, it is equally relevant for all science and engineering labs in establishing an undergraduate research lab experience. Most helpful is the appendix where the authors provide their guidelines/rules for working in the laboratory. Especially to note is how the list is written in the positive and not a list of "Do Not do this".

http://www.funjournal.org/downloads/MickleyA28.pdf
http://www.funjournal.org/

∗ National Academy of Sciences (U.S.). Committee on the Conduct of Science., and NetLibrary Inc. **On Being a Scientist Responsible Conduct in Research**. Washington, D.C.: National Academy Press, 1995.

This is a relatively short booklet (online - about 25 pages) that discusses the responsibilities that a scientist (any researcher - from undergraduate to Nobel Prize winner) has in being an ethical scientist. Topics are introduced and reviewed; a short case study is then presented to allow for further discussion. Topics include: use of experimental techniques and data, how to treat various conflicts of interest, issues that arise in publishing reporting data and results such as acknowledging proper credit to researchers involved in the experiments as well as citing sources and plagiarism, the different types of errors in science and publishing - termed "honest errors" (those not from negligence or misconduct, but simple human error), "negligence errors" (ex. from sloppy research techniques), and "deceptive errors" (falsification and/or fabrication of data and plagiarism), and how to report ethical issues observed or suspected. This would be a great booklet to include in a starting packet for your new undergraduate research assistant to read and review. The different case studies would then allow you to encourage discussion (with your undergraduate researcher or within lab group meetings) about ethical situations that may arise that are specific to events that might occur in your lab. It is also a great 'refresher' for more experienced lab personnel.

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http://www.library.gatech.edu:2048/login?url=http://www.netlibrary.com/urlapi.asp?action=summary&v=1&bookid=1033
 http://www.nap.edu/catalog.php?record_id=12192#toc

∗ Perelman, Leslie C., Paradis, James, and Barrett, Edward. **The Mayfield Handbook of Technical & Scientific Writing**. Mountain View, Calif.: Mayfield Pub. Co., 1998.

The handbook acts as a reference guide to everything about technical and scientific writing - from the structure and planning of different document types to how to construct sentences. One nice thing about this handbook is how the authors frequently will give a 'rule' and then show examples of 'bad' usage and comparative 'good' usage of that specific example. The authors even do this when comparing weak versus improved paragraph examples. Chapter 3 "Elements of Technical Documents" is very useful in writing research reports as it breaks down and then explains what should be in each section of a paper (abstract, introduction, materials and methods, conclusion, etc). This can be a great help for those students who seem to be struggling with the concept of writing a more professional scientific report/paper/thesis. While this isn't a book written to be read in one sitting, but to be used more as a reference when writing difficulties arise (whether getting started or revising), it is a very valuable reference to refer students to use when encountering needing writing help. It has chapters on mechanics of writing (such as acronyms, inserting equations, and capitalization), punctuation, parts of sentences, nouns, verb order, and sentence structure. There is a chapter on proper usage of commonly misused words with explanations of which is most appropriate in specific instances (such as good/well, accept/except, and affect/effect/impact). That chapter alone is worth recommending this book to your student when revising papers.

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http://www.mhhe.com/mayfieldpub/tsw/home.htm

∗ Plummer, Ben. "**The Senior Scientist as a Resource for Mentoring Undergraduate Research**." Council on Undergraduate Research Quarterly Vol. 22 Iss. 2 (2001): pp. 74-75.

The author is a recipient of the Camille and Henry Dreyfus Foundation Senior Scientist Mentors grant. The author's experiences mentoring undergraduates in science research is briefly described, from how students find out about faculty and projects to final results of the students' work (i.e. publication of journal article).

Available From: UROP Office

∗ Ramón y Cajal, Santiago. **Advice for a Young Investigator**. Cambridge, Mass: MIT Press, 1999.

This book was written originally in 1897 by Ramon y Cajal, a noteworthy researcher in the biology/medicine field from Spain. In this, he offers advice, wisdom, and his thoughts on how a young investigator (i.e. a new researcher) can succeed in research. Despite being written a century ago, this text remains relevant today and offers practical suggestions for the new researcher (as well as more experienced ones).

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http://www.library.gatech.edu:2048/login?url=http://www.netlibrary.com/urlapi.asp?action=summary&v=1&bookid=422

∗ Schultz, Jeffery R. "**The Transformational Process of Mentoring**." Council on Undergraduate Research Quarterly Vol. 22 Iss. 2 (2001): pp. 72-73.

Good and effective mentoring can be distilled to be a transformational process that is personalized, intentional, organized, and assessable.

Available From: UROP Office

∗ Stamatoplos, Anthony. "**An Annotated Bibliography of Faculty Mentoring of Undergraduate Research**." Council on Undergraduate Research Quarterly Vol. 26 Iss. 2 (2005): pp. 84-89.

An annotated bibliography of faculty mentoring of undergraduate research.

Available From: UROP Office

∗ Strunk, William, and White, E. B. **The Elements of Style**. 4th ed. Boston: Allyn and Bacon, 2000.

The classic book on writing styles and appropriate English grammar is very useful in reinforcing proper writing skills. In fourteen small pages, the writer is able to become familiar with the most common difficulties in English grammar and writing. That alone makes this book worth consulting. However, in addition, this book also offers a chapter on "Elementary Principles of Composition", "Words and Expressions Commonly Misused", "A Matter of Form" on writing sentences to have the greatest effect on the reader with the minimum of words, and "An Approach to Style (with a list of reminders)". This last chapter focuses on writing a document as a whole with such reminders as: "write in a way that comes naturally", "do not overwrite", "do not overstate" and with explanations of how to avoid or improve with each reminder. This is a great book for a brief explanation of English grammar and writing. For a more thorough discussion of sentence structure another book like "Style Lessons in Clarity and Grace" by Williams or other similar books would be more useful.

Available From: UROP Office

∗ Tufte, Edward R. **The Cognitive Style of Powerpoint**. Cheshire, Conn.: Graphics Press, 2003.

This individually published chapter from Tufte's book "Beautiful Evidence" describes PowerPoint's pitfalls in the way it is currently used as a way to pass along pertinent complicated data and analysis as an alternative to technical reports. He focuses on the use of the bullet point format, graphics, and animation schemes. He explains his belief that MS PowerPoint simplifies and over-simplifies topics so that the important information can be overlooked as meaningless. He uses the Columbia re-entry explosion in 2003 as a very pointed example. This section of the book is very useful in illustrating a number of points of what PowerPoint Presentations should not do. It was surprising to learn that the average PowerPoint slide is of very low quality in terms of number of words and effectiveness of displaying graphics when using the templates or under normal use. It offers little specific guidance on crafting effective PowerPoint slide presentations. Unfortunately, he does not offer any distinctive practical alternative to PowerPoint as a method of presentation communication in a typical talk. However he does suggest that the best presentation would be on MS Word in the form of a 4 pg booklet that is written (with sentences) and graphic illustrations, distributed and read by the audience members who he then leads in a discussion and analysis of the booklet. Other current alternatives may be LaTex. This is an interesting analysis of PowerPoint and how it is being used currently, but does not provide a truly practical guide to craft an effective presentation. This is also is a chapter in the book "Beautiful Evidence" by Tufte (2006). http://finder.library.gatech.edu/vufind/Record/806065

Available From: UROP Office

∗ Tufte, Edward R. **Envisioning Information**. Cheshire, Conn. (P.O. Box 430, Cheshire 06410): Graphics Press, 1990.

Tufte takes a slightly more academic approach in discussing how information can be graphically displayed in this book when compared to his "The Visual Display of Quantitative Information". However in the layering and separation chapter he offers several examples of how to make your information stand out instead of having the gridlines and organizational table parts of your graphic seem more prominent than your data. Also briefly discusses 'chart junk' while the proper use of color is discussed in 'color and information' with some practical rules on pg 82.

Available From: UROP Office, GT Library

∗ Tufte, Edward R. **The Visual Display of Quantitative Information**. 2nd ed. Cheshire, Conn.: Graphics Press, 2001.

This textbook style book demonstrates with a number of historical and modern examples of uses of graphics to tell a statistical story. These encourage the reader to further reflect on their own use of graphical statistics to improve the story that they are trying to tell. The book starts with a historical background on how relatively modern uses of graphs are compared with the history of mathematics. It then goes into discussing graphical integrity - making sure that the graphs do not perpetuate lies and do tell the complete story. Elegant graphics are used as examples throughout. A key point that he makes throughout is that statistical graphmaking does not have to be boring, but that one needs to remember that the purpose of a graphic is to describe the data and draw the reader's attention to the importance of that data and so, excess use of gratuitous ink, decorations that clutter the graph (including chart lines) is to be avoided and how to realize when it is sometimes better to present your data as a table. This is a good text to use to demonstrate well designed and poorly designed graphics especially with regards to telling the entire truth and proportion distortion in graphical design and presentation. It also is very handy for examples of how to design effective graphics for Powerpoint oral presentations, poster presentations, for reports, papers, and proposals.

Available From: UROP Office, GT Library

∗ Turabian, Kate L. **A Manual for Writers of Research Papers, Theses, and Dissertations : Chicago Style for Students and Researchers**. Chicago Guides to Writing, Editing, and Publishing. 7th ed. Chicago: University of Chicago Press, 2007.

The Seventh edition of the Kate L. Turabian *A Manual for Writers* has been revised by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams (authors of *The Craft of Research* (also reviewed) to update this writing classic with the changes since the 6th edition and to also include a beginning section entitled "Research and Writing: from Planning to Production" adapted from their book *The Craft of Research*. This manual is divided into 3 parts: Part I: Research and Writing: From Planning to Production; Part II: Source Citation; and Part III: Style. Part II: Source Citation gives examples of how to cite a large variety of sources, from unpublished sources (such as dissertations) to interviews to the more common, but equally puzzling at times journals and electronic media. Part III: Style chapters include the topics of proper punctuation, spelling, plurals, possessive words, how to abbreviate, how to write titles of people and organizations, quotation rules and formats, Also handy is the appendix which details proper paper/thesis/dissertation formatting with examples. This book is a great single source reference for those writing longer papers, dissertations, and theses as it has in depth but concise chapters on the main problems and questions that a writer may have when completing a major academic writing project. The citation source style is the Chicago Method style and contains all of the updates from the more comprehensive *The Chicago Manual of Style*, 15th Edition, 2003.

Available From: UROP Office, GT Library

∗ Williams, Joseph M. **Style : Ten Lessons in Clarity and Grace**. 8th ed. New York: Pearson Longman, 2005.

This book is good to use as an addition to discussion on individual topics in writing more clearly. However, I did not really like it for use as a simple reference book for authors to go through to quickly refresh and/or learn writing and grammar rules as it felt very wordy. However, it would be useful when read thoughtfully and at a slow pace. It is not a book to be read through quickly. This takes a textbook approach (as it is used and was developed for a college level class in writing by the author), but this can be beneficial as it starts logically at the beginning and progresses through teaching his style of editing with each chapter building upon the previous one. It does contain practice exercises with a number of examples. He focuses on the sentence and at the end the paragraph level of making coherent thoughts and demonstrates how to do so. It has a chapter/appendix on punctuation which is always a good thing to review.

Available From: UROP Office

∗ Wisker, Gina. **The Good Supervisor : Supervising Postgraduate and Undergraduate Research for Doctoral Theses and Dissertations**. Palgrave Study Guides. New York: Palgrave Macmillan, 2005.

This book is very valuable as it takes a close look at how to be an effective supervisor on the day-to-day level of interacting with your students (whether grad, undergrad, or post-doc). It specifically addresses most issues that will come up in supervising your undergraduate student and offers practical ideas on how to approach problematic and puzzling situations. While parts of the terminology refer directly to a UK system and draws on some British examples it is still relevant to the US educational system. Offers specific techniques of and verbal cues to help students along their research journey beyond the lab work, how to guide them along and help them process the information they are acquiring.

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∗ Wittner, David G. "**Making History: Developing a Research Tradition with Utica College's History Majors**." Council on Undergraduate Research Quarterly Vol. 28 Iss. 1 (2007): pp. 29-32.

The History Project is the capstone experience for Utica College's history majors, where students engage in original research on significant themes in local history. Conceived during the academic year 1999-2000, the History Project began as a one semester research methods and historiography course and has evolved into a two course sequence undertaken during the junior and senior years. Students learn historiography, historical research methods, conduct primary research, write a professional quality journal-length article, and work as a class to edit a journal. Papers are blind reviewed and selected for an annual Utica College publication. The challenges encountered and the solutions are presented in this article.

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∗ Young, Gregory. "**Interdisciplinary Research Seminars in the Arts and Humanities at Montana State University**." Council on Undergraduate Research Quarterly Vol. 29 Iss. 2 (2008): pp. 30-33.

The author gives examples of how Montana State has instituted Interdisciplinary Undergraduate Research seminars where undergraduates have the opportunity to make connections between disciplines but also to conduct original research in areas not often explored in classic classroom classes. He reviews four classes - Musi-Tecture, a music-architecture class; Music and Economics, Music and Literature, and Music and Sculpture. This is one example of how to expand undergraduate research to students in the arts and humanities in larger numbers than just one student working with one faculty.

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