

**Research Project Topics for Women and Mathematics Fall 2012 (updated 9-17-12)\***  
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**Choose a topic that really intrigues you!** Note: A notation such as “[MM/Real Variables]” indicates appropriate for math major or minor/and a recommended MATH course prerequisite.

### **I. Mathematical Investigations**

**Sophie Germain and her ‘eponymous’ primes** Delve more deeply into Germain’s life and her work in chapter 11 of Krantz (2010). Follow up with the references given at the end of the chapter, explicate the math in the chapter and do some of the early exercises at the end of the chapter, then challenge yourself with one of the projects outlined at the end of the exercises. [MM/Abstract Algebra]

1. Krantz, S. (2010). Sophie Germain and the attack on Fermat's last problem. In *An episodic history of mathematics: Mathematical culture through problem solving* (pp. 195-206). USA: Mathematical Association of America.

**Maria Agnesi and her Calculus book** Read Maria Agnesi’s *Analytical Institutions* (1801). Recall that her project of translating Newton’s *Principia* into Italian was initiated as a text for her younger siblings. With what mathematical topics does her book begin? Work some of her max/min problems (See #30 and #32 in Katz (2008). Approach these problems from multiple perspectives.)

1. Agnesi, M. G., Hellins, J., & Maseres, F. (1801). *Analytical institutions*. Taylor and Wilks. Retrieved from Internet Archive:  
<http://archive.org/details/analyticalinsti00masegoog>
2. Katz, V. J. (2008). *A history of mathematics: An introduction* (3rd ed.). Addison-Wesley Longman, Inc.

**Geometric Constructions Using Paper Folding Techniques #1** Learn how to use paper folding to illustrate geometric constructions such as similar triangles, equilateral triangles, parabolas, trisecting an angle, and dividing a length into ‘n’ equal parts in Hull (2006). Some of these projects are applicable to middle-school and high-school classrooms!

1. Hull, T. (2006). *Project origami: Activities for exploring mathematics*. A. K. Peters.

**Geometric Constructions Using Paper Folding Techniques #2** Use Grace Young’s book to direct your investigations. Find connections to the K-12 classroom. Internet search: Patty paper geometry, Key Curriculum Press, NCTM and Math Forum.

1. Serra, M. (1994). *Patty paper geometry*. Emeryville, CA: Key Curriculum Press.
2. Young, G. & Young, W. (1970). *Beginners’ book of geometry* (reprint). Bronx, NY: Chelsea Publishing Co.

**The arithmetic-geometric mean** Explain the arithmetic-geometric mean, derive some of its properties, and discuss its applications. Trace its connections to well-known and obscure mathematicians. Among the latter falls John Landen the publisher of the *Ladies’ Diary*. Look at Almkvist & Berndt (1998).

1. Almkvist, G., & Berndt, B. (1998). Gauss, Landen, Ramanujan, the arithmetic-geometric mean, ellipses, pi and the Ladies' Diary. *The American Mathematical Monthly*, 95(7), 585-608.

**What was the mathematics in The Ladies Diary?** Begin with “The Ladies’ Diary or Woman’s Almanack” (Perl, 1979) to investigate the mathematical content. Use the references in this article find out more about the typical education and societal norms of the time period. Also see Leybourn (1817) for the entire contents of the *Ladies’ Diary*. Examine some of the problems, find your own solutions and explain the solutions given. (Vol. 1, page 36, problem 36 is interesting if you have completed a History of Mathematics course.)

1. Leybourn, T. (Ed.). (1817). *The mathematical questions proposed in the Ladies’ Diary: And their original answers, together with some new solutions, from its commencement in the year 1704 to 1816* (Vols. 1-4). London: J. Mawman & W. Glendinning.
2. Perl, T. (1979). The ladies' diary or woman's almanack, 1704-1941. *Historia Mathematica*, 6(1), 36-53.

**Who was Miss Mullikin and what is her mathematical nautilus?** [MM/Real Variables] Read *Who Was Miss Mullikin?* (Bartlow & Zitarelli, 2009). Then develop your understanding of the mathematical concepts (connected sets in one and two dimensions) and present the results that appeared in Anna Mullikin’s dissertation (1922). Who was her thesis advisor? Why is he a controversial figure in the world of mathematics?

1. Bartlow, T. L., & Zitarelli, D. A. (2009, February). Who was Miss Mullikin? *American Mathematical Monthly*, 116(2), 99-114. Retrieved from <http://maa.org/spotlight/mullikin/dissertation.html>
2. Cole, F. N. (1919). The October meeting of the American Mathematical Society. *Bulletin of the American Mathematical Society*, 26, 145-151.
3. Lennes, N. J. (1905-1906). Curves in non-metrical analysis situs. *Bulletin of the American Mathematical Society*, 12, 284.
4. Mullikin, A. M. (1922). Certain theorems relating to plane connected point sets. *Transactions of the American Mathematical Society*, 24, 144-162.

**Solving the 3 impossibility problems of antiquity: Squaring the circle, trisecting an angle and duplicating the cube.** A significant amount of new mathematics was motivated by these three problems, which are impossible to solve with a finite number of constructions using only a straightedge and compass. The various approaches involve conic sections (350 BCE), mechanical devices (230 BCE) and special curves (450BCE through 1659 CE). There are multiple projects possible within this topic. [Strong Math Background/Precalculus and High School Geometry]

**Combine crafts and mathematics.** Choose either “Socks with Algebraic Structure” (Belcastro & Yackel, 2008b) (group theory) or “(K)not Cables, Braids” (Belcastro & Yackel, 2008a) (group theory and topology) and learn how these mathematical topics appear in needlework crafts. In addition to the mathematics, you can investigate the controversy over a review of the book (Bayer, 2010). [MM/Abstract Algebra] And

you can make a historical connection between scientific women and the craft tradition in Schiebinger (1991). Also comment on the participation of the football player Rosie Grier in needlework crafts (use Google).

1. Bayer, M. (2010, January-February). Book review: Making mathematics with needlework: Ten papers and ten projects. *AWM Newsletter*, 40, 20-23. Retrieved from <http://www.drivehq.com/file/df.aspx?isGallary=true&shareID=8755087&fileID=75113544>  
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2. Belcastro, S., & Yackel, C. (2008). (K)not cables, braids. In *Making mathematics with needlework*. A. K. Peters.
3. Belcastro, S., & Yackel, C. (2008). Socks with algebraic structure. In *Making mathematics with needlework: ten papers and ten projects*. A. K. Peters.
4. Schiebinger, L. L. (1991). Scientific women in the craft tradition. In *The mind has no sex?: Women in the origins of modern science* (pp. 66-101). USA: Harvard University Press.

**Sophie Germain, Condorcet, the French Revolution and 18<sup>th</sup> century feminism** This project explores mathematical and historical connections between Sophie Germain and Condorcet, Condorcet's contribution to mathematics in the area of voting methods and his role as the leading supporter of women's rights in the 18th century. As background, read: (1) Musielak (2012) which refers to Condorcet (check the index), (2) Condorcet (1790) and (3) Nall (2008). As part of this project: (1) describe (a) the Condorcet method of voting, its advantages and disadvantages, (b) his role in the French Revolution, (c) how he may have influenced Sophie Germain (what exactly is the evidence of a connection between them), (2) give your view of his essay on the political rights of women after reading it, and (3) indicate how Jeff Nall's paper (read only after finishing your reading) adds to your understanding of this work.

1. Condorcet. (1790). On the admission of women to the rights of citizenship. In *The first essay on the political rights of women* (A. D. Vickery, Trans.). Letchworth: 1912. Retrieved from <http://www.keele.ac.uk/history/currentundergraduates/tltp/SUFFRAGE/DOCUMENT/PLEAWOMA.HTM>
2. Musielak, D. (2012). *Sophie's diary: A mathematical novel* (2nd ed.). USA: Mathematical Association of America, Inc.
3. Nall, J. (2008). Condorcet's legacy among the philosophes and the value of his feminism for today's man. *Essays in the Philosophy of Humanism*, 16(1), 51-70. Retrieved from [http://essaysinhumanism.org/08Nall\\_Condorcet.pdf](http://essaysinhumanism.org/08Nall_Condorcet.pdf)

## II. Issues for Future Teachers

**Math Anxiety** This is a large topic. Start with (1) Jackson & Leffingwell (1999). This research investigated the types of instructor behavior that created or exacerbated anxiety. In addition, the authors wanted to determine the grade levels (K-college) in which mathematics anxiety first occurred in these students.; (2) Greg Fiore in *The Mathematics Teacher* (1999). Then see Frankenstein (1984). (This article states misconceptions about learning and gives suggestions for overcoming them. It would be very appropriate

for a future teacher to read. It contains an excellent annotated bibliography.) *Defeating Math Anxiety* (Kitchens, 1995) has excellent information on how to develop good mathematical study skills. *Math Curse or Math Anxiety?* Stuart (2000) explores the phenomenon of math anxiety in a group of elementary school students and discusses strategies to reduce math anxiety. Also see *The I Hate Mathematics Book* (Burns, 1975). (This book is full of mathematical activities for kids and grownups. Anyone planning to teach school should know about this book.) Also, see Ho et al. (2000).

1. Burns, M. (1975). *The I hate mathematics book*. Boston: Little Brown and Company.
2. Fiore, G. (1999, May). Math-abused students: Are we prepared to teach them? *The Mathematics Teacher*, 92(5), 403-406.
3. Frankenstein, M. (1984). Overcoming math anxiety by learning about learning. *Mathematics and Computer Educaion*, 18(3), 169-180.
4. Ho, H., Senturk, D., Lam, A. G., Zimmer, J. M., Hong, S., Okamoto, Y., . . . Wang, C. (2000, May). The affective and cognitive dimensions of math anxiety: A cross-national study. *Journal for Research in Mathematics Education*, 31(3), 362.
5. Jackson, C., & Leffingwell, R. (1999, October). The role of instructors in creating math anxiety in students from kindergaten through college. *The Mathematics Teacher*, 92(7), 583.
6. Kitchens, A. (1995). *Defeating math anxiety*. Richard D. Irwin, Inc.
7. Stuart, V. (2000, January). Math curse or math anxiety? *Teaching Children Mathematics*, 6(5), 330.

**Math Doesn't Suck: How to Survive Middle School Math** by Wonder Years' actress Danica McKellar (2008) has a provocative title. Check accuracy of claims about gender differences on the book's website and examine the mathematical explanations that appear in the book for accuracy and "best practice." See posts on this topic from August 2007 on RUME and POD Listserves <http://listserv.nd.edu/cgi-bin/wa?A2=ind0708=pod=D=16976> <<http://listserv.nd.edu/cgi-bin/wa?A2=ind0708&L=pod&O=D&P=16976>> <http://listserv.nd.edu/cgi-bin/wa?A1=ind0708=pod#119> <<http://listserv.nd.edu/cgi-bin/wa?A1=ind0708&L=pod#119>>

Examine some of the mathematical explanations in McKellar's 3 more recent books (are they better than that in the first book or not) *Kiss my Math* (2009), *Hot X: Algebra Exposed* (2011) and *Girls Get Curves: Geometry Takes Shape* (2012). How has the general public responded to her books (Take a look at amazon.com)?

1. McKellar, D. (2008). *Math doesn't suck: How to survive middle school math*. New York, NY: Penguin Group, Inc.
2. McKellar, D. (2009). *Kiss my math: Showing pre-algebra who's boss*. New York, NY: Penguin Group, Inc.
3. McKellar, D. (2011). *Hot X: Algebra exposed*. New York, NY: Penguin Group, Inc.

4. McKellar, D. (2012). *Girls get curves: Geometry takes shape*. New York, NY: Penguin Group, Inc.

**Stereotype Threat** Explore this topic at greater depth. See Spencer, S. (1999), and also the series of 4 talks give at UCLA Center for Study of Women during 2011, which can be found on YouTube. Additionally, more recent papers are:

Bonnot & Croizet (2007), Good, Aronson, & Harder (2008), Kiefer & Sekaquaptewa (2007), Oswald & Harvey (2000), and Pronin (2004).

1. Bonnot, V., & Croizet, J. C. (2007). Stereotype internalization and women's math performance: The role of interference in working memory. *Journal of Experimental Social Psychology, 43*(6), 857-866.
2. Good, C., Aronson, J., & Harder, J. A. (2008). Problems in the pipeline: Stereotype threat and women's achievement in high-level math courses. *Journal of Applied Developmental Psychology, 29*(1), 17-28.
3. Keifer, A. K., & Sekaquaptewa, D. (2007). Implicit stereotypes and women's math performance: How implicit gender-math stereotypes influence women's susceptibility to stereotype threat. *Journal of Experimental Social Psychology, 43*(5), 825-832.
4. Oswald, D., & Harvey, R. (2000). Hostile environments, stereotype threat, and math performance among undergraduate women. *Current Psychology, 19*(4), 338-356.
5. Pronin, E. (2004). Identity bifurcation in response to stereotype threat: Women and mathematics. *Journal of Experimental Social Psychology, 40*(2), 152-168.
6. Spencer, S., Steele, C., & Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology, 35*, 4-28.

### **How equal is the education that boys and girls receive?**

See Sadker & Sadker (1994), the American Association of University Women (AAUW) report (1992), and Corbett, Hill, & St. Rose (2008). View the AAUW videos *Girls Can* and *Girls in the Middle: Working to Succeed in School*

1. AAUW. (1992). *How schools shortchange girls: Executive summary*. USA: The American Association of Women Educational Foundation. Retrieved from <http://www.aauw.org/learn/research/upload/hssg.pdf>
2. Corbett, C., Hill, C., & St. Rose, A. (2008). *Where the girls are: The facts about gender equity in education*. USA: The American Association of University Women Educational Foundation. Retrieved from <http://www.aauw.org/learn/research/upload/whereGirlsAre.pdf>
3. Sadker, M., & Sadker, D. (1994). *Failing at fairness how America's schools cheat girl*. New York, NY: Charles Scribner's Sons.

**III. Various Aspects of Math/Science Gender Issues** Base your project on one of the following resources or ideas, using the suggested aspect or an idea of your own.

**Gender differences in the careers of academic scientists and engineers** What are the gender differences in career outcomes and what influence does family characteristics (i.e., married? children?) have on the outcome? What did *Chronicle of Higher Ed* publish about this topic within the last few years? What implications does this have? Personalize this report by interviewing some faculty. See Bentley & Wise (2004).

1. Bentley, J. T., & Wise, D. E. (2004). *Gender differences in the careers of academic science and engineers: Special report*. Retrieved from National Science Foundation : <http://www.nsf.gov/statistics/nsf04323/pdf/front.pdf>

**Mathematics and Gender from a Feminist Perspective** Start with: "Gender and Mathematics from a Feminist Standpoint" by Damarin (1995) and "Redefining the 'Girl Problem' in Mathematics" by Campbell (1995).

1. Campbell, P. B. (1995). Redefining the "girl problem in mathematics". In W. G. Secada, E. Fennema, & L. B. Adajian (Eds.), *New directions for equity in mathematics education* (pp. 225-241). Cambridge: Cambridge University Press.
2. Damarin, S. K. (1995). Gender and mathematics from a feminist standpoint. In W. G. Secada, E. Fennema, & L. B. Adajian (Eds.), *New directions for equity in mathematics education* (pp. 242-257). Cambridge: Cambridge University Press.

**Is there a boys' crisis in education?** Nearly 60% of college students are women. Have girls advanced educationally at the expense of boys? To start, see Sommers (2000). What does the AAUW report say on this topic? See Corbett, Hill, & St. Rose (2008). (See also the short article in AAUW *Outlook* Spring/Summer 2008)

1. Corbett, C., Hill, C., & St. Rose, A. (2008). *Where the girls are: The facts about gender equity in education*. USA: The American Association of University Women Educational Foundation. Retrieved from <http://www.aauw.org/learn/research/upload/whereGirlsAre.pdf>
2. Sommers, C. H. (2000). *The war against boys: How misguided feminism is harming out young men*. New York, NY: Simon and Schuster, Inc.

**Examining and Changing Classroom Culture** See the following: Wickett (1997), Jacobs (1997), and Koontz (1997).

1. Jacobs, J. E. (1997). Creating a gender-equitable multicultural classroom using feminist pedagogy. In J. Trentacosta, & M. J. Kenney, *Multicultural and gender equity in the mathematics classroom: The gift of diversity (1997 yearbook)* (pp. 107-114). Reston, VA: National Council of Teachers of Mathematics.
2. Koontz, T. (1997). Know thyself: The evolution of an intervention gender-equity

program. In J. Trentacosta, & M. J. Kenney, *Multicultural and gender equity in the mathematics : The gift of diversity (1997 yearbook)* (pp. 186-194). Reston, VA: National Council of Teachers of Mathematics.

3. Wickett, M. (1997). Uncovering bias in the classroom: A personal journey. In J. Trentacosta, & M. J. Kenney, *Multicultural and gender equity in the mathematics classroom: The gift of diversity (1997 yearbook)* (pp. 102-106). Reston, VA: National Council of Teachers of Mathematics.

### **Errors in Scientific Thinking and Approaches** Compare and contrast Gould (1981) and Tavis (1992)

1. Gould, S. J. (1981). *The mismeasure of man*. New York, NY: W. W. Norton & Company, Inc.
2. Tavis, C. (1992). *The mismeasure of woman*. New York, NY: Simon & Schuster, Inc.

### **Overlapping Concerns of Multicultural and Gender Equity** See Trentacosta & Kenney (1997), and Secada, Fennema, & Adajian (1995).

1. Secada, W. G., Fennema, E., & Adajian, L. B. (Eds.). (1995). *New directions for equity in mathematics education*. Cambridge: Cambridge University Press.
2. Trentacosta, J., & Kenney, M. J. (1997). *Multicultural and gender equity in the mathematics classroom: The gift of diversity (1997 yearbook)*. Reston, VA: National Council of Teachers of Mathematics.

### **Feminist Science -- What is it? Does it exist?**

Some hold the viewpoint that women's perspectives and contributions have been different from men's in science and therefore have set new directions or made unexpected discoveries. Explore this concept in:

- Schiebinger (2008)
- Gibbons & Koppel (1993)
- Barinaga & Gibbons (1993)

For a more philosophical view of this question consult (Section 5 of) Anderson (2012).

1. Anderson, E. (2012). Feminist epistemology and philosophy of science. In E. Zalta (ed.), *The Stanford Encyclopedia of Philosophy (Fall 2012 Edition)*. Retrieved from <http://plato.stanford.edu/archives/fall2012/entries/feminism-epistemology/>
2. Barinaga, M., & Gibbons, A. (1993). Feminists find gender everywhere in science. *Science*, 260(5106), 392-393.
3. Gibbons, A., & Koppel, T. (1993). Is there a female style in science? *Science*, 260(5106), 384-391.
4. Schiebinger, L. L. (Ed.). (2008). *Gendered innovations in science and engineering*. Stanford, CA: Stanford University Press.

**Equitable Instruction for Hispanics** See Seceda, Ortiz-Franco, Hernandez, & De La Cruz (1999). Then see Gutstein, Lipman, Hernandez, & de los Reyes (1997).

1. Gutstein, E., Lipman, P., Hernandez, P., & de los Reyes, R. (1997). Culturally relevant mathematics teaching in a Mexican American context. *Journal for Research in Mathematics Education*, 28(6), 709-737. Retrieved from <http://www.radicalmath.org/docs/1997JRME.pdf>
2. Secada, W. G., Ortiz-Franco, L., Hernandez, N. G., & De La Cruz, Y. (Eds.). (1999). *Changing the faces of mathematics: Perspectives on Latinos*. Reston, VA: National Council of Teachers of Mathematics.

**Equitable Instruction for African Americans** See Strutchens, Johnson, & Tate (2000). Then see Ladson-Billings (1997)

1. Ladson-Billings, G. (1997). It doesn't add up: African American students' mathematics achievement. *Journal for Research in Mathematics Education*, 28(6), 697-708.
2. Strutchens, M., Johnson, M. L., & Tate, W. F. (Eds.). (2000). *Changing the faces of mathematics: Perspectives on African Americans*. Reston, VA: National Council of Teachers of Mathematics.

### **Is the situation for women in mathematics worse than in the other sciences?**

See the article by Paul Selvin in the March 13, 1992 issue of *Science* and the response to it in the July 17, 1992 issue of *Science* signed by 18 women mathematicians. Also see the special issue of the *Notices* of the American Mathematical Society (Vol. 38, no. 7) on the status of women mathematicians published in September 1991 and the most recent update in the August 2004 *Notices* "Has the Woman in Mathematics Problem Been Solved?" by Allyn Jackson. What did David Bressoud (past President of MAA) say about losing women from mathematics in his September 2009 Launchings blog – We are Losing Women from Mathematics?

1. D. Bressoud. (2009, September). We are losing women from mathematics. [Blog Entry]. Retrieved from [http://www.maa.org/columns/launchings/launchings\\_09\\_09.html](http://www.maa.org/columns/launchings/launchings_09_09.html)
2. Jackson, A. (2004). Has the women-in-mathematics problem been solved? *Notices of the American Mathematical Society*, 51(7), 776-783.
3. Selvin, P. (1992). Profile of a field: Mathematics. *Science*, 255(5050), 1380-1381.

### **Film & TV Representations of Mathematically Talented Women**

What are some recent films and TV shows that depict mathematically talented women? How are they represented (positively, negatively, stereotypically)? What do people learn about mathematically talented women from film and TV representations? Begin this project with an informal survey of your peers, and summarize what you hear in writing and present some quantitative data as well. Add your own perceptions. Then consult Greenwald & Thomley (2009).

1. Greenwald, S. J., & Thomley, J. (2009, Jan-Feb). Mathematically talented women in film



and television: A summary of the last five years. *Association for Women in Mathematics Newsletter*, 39(1), 8-12. Retrieved from <http://www.drivehq.com/folder/p8755087/1751135115.aspx>

### **Why might Physics be the most difficult science for women to gain equity?**

Begin by reading Wertheim (1997), and then look at what the American Institute of Physics has to say.

1. Wertheim, M. (1997). *Pythagoras' trousers: God, physics, and the gender wars*. New York, NY: W. W. Norton & Company, Inc.

### **IV. Historical Investigations**

**Catholic enlightenment and modern science** Using Mazzotti (2007) as a starting point, explore how Enlightenment Catholics modified tradition in an effort to reconcile aspects of modern philosophy and science with traditional morality and theology. How are the Jesuits viewed in this book? Also see Feingold (2004).

1. Mazzotti, M. (2007). *The world of Maria Gaetana Agnesi, mathematician of God*. Baltimore, MD: The John Hopkins University Press.
2. Feingold, M. (2004). *The Newtonian moment: Isaac Newton and the making of modern culture*. New York: Oxford University Press.

**Maria Agnesi and the 18<sup>th</sup> Century Debate Concerning the Education of Women** Maria Agnesi was considered a child prodigy by some, able at a very early age to present orally, in Latin, arguments on topics of interest to adults. Read Agnesi, Faini, de' Rossi, & de' Ricovrati (2007). Summarize the arguments against educating women. Summarize Agnesi's rebuttal to those arguments. What additional points or arguments can you add to hers, drawing on what you have learned in the course, in other courses, or experienced in the 21<sup>st</sup> century? What sort of an "attitude" or "pose" did she adopt as she began her essay? Find another question to pose and answer about this topic.

1. Agnesi, M. G., Faini, D. M., de' Rossi, A. S., & de' Ricovrati, A. (2007). *The contest for knowledge: Debates over women's learning in eighteenth-century Italy*. R. Messbarger & P. Findlen (Eds.). (R. Messbarger & P. Findlen, Trans.) Chicago: University of Chicago Press. (Originally published in 2005).

**Historical and Literary Perspectives on Sofia Kovalevsky** Sofia (Sonia) Kovalevsky was not only a mathematician of great renown, but an author of her own biography, *A Russian Childhood* (1978) and of a novella, *Nihilist Girl* (2001). Read these two books and consult Koblitz (1993). Find out more about the historical period of her lifetime (post-Crimean war, 1850-1891). Present a synthesis of the forces acting on SK's generation, class and gender. How are these revealed in her novella? In her life? Why did SK abandon math for literary work in the later years of her short life? What other questions and observations do your explorations of her work and her time bring forth?

1. Kovalevskaya, S. V. (2001). *Nihilist girl*. (N. Kolchevska & M. Zirin, Trans.). New York, NY: Modern Language Association of America. (Original work published in 1985).
2. Kovalevskaya, S. (2010). *A Russian childhood*. B. Stillman (Ed.). (B. Stillman, Trans.) .

New York, NY: Springer-Verlag. (Original work published in 1978).

3. Koblitz, A. H. (1993). *A convergence of lives: Sofia Kovalevskaia, scientist, revolutionary*. New Brunswick, NJ: Rutgers University Press.

**The Girl's Own Book and The Boy's Own Book** These books, first published in 1834 and 1829, respectively, were written to provide games, puzzles, and activities for girls and boys, respectively. These little "gems" offer many ways to compare and contrast the experiences, education, and expectations of 19<sup>th</sup> century boys and girls in the United States.

1. Child, L. (1991). *The girl's own book*. Bedford, MA: Applewood Books.
2. Clarke, W. (1995). *The boy's own book*. Bedford, MA: Applewood Books.

**Influences of the 17<sup>th</sup> and 18<sup>th</sup> centuries on the place of women in science** See Schiebinger (1991) and Feingold (2004).

1. Feingold, M. (2004). *The Newtonian moment: Isaac Newton and the making of modern culture*. New York: Oxford University Press.
2. Schiebinger, L. L. (1991). *The mind has no sex?: Women in the origins of modern science*. USA: Harvard University Press.

**Further examine the work and life of Emilie du Chatelet** Begin with Terrall (1995) and Zissner (1998 & 2001). Describe the challenges she faced in learning and doing science as a woman in the 18<sup>th</sup> century. What approaches did she take to these and how successful was she? How/when was her work made public and what was the reaction to it? See <http://www-history.mcs.st-and.ac.uk/References/Chatelet.html> for more references. Schiebinger (1991) and Feingold (2004) may also be relevant.

1. Feingold, M. (2004). *The Newtonian moment: Isaac Newton and the making of modern culture*. New York: Oxford University Press.
2. Schiebinger, L. L. (1991). *The mind has no sex?: Women in the origins of modern science*. USA: Harvard University Press.
3. Terrall, M. (1995). Emilie du Chatelet and the gendering of science. *History of Science*, 33(3), 283-310.
4. Zissner, J. P. (1998). Emilie du Chatelet: Genius, gender and intellectual authority. In H. L. Smith (Ed.), *Women writers and the early modern British political tradition* (pp. 168-190). Cambridge: Cambridge University Press.
5. Zinsner, J. P. (2001, May). "Translating Newton's 'Principia': The marquise du Chatelet's revisions and additions for a French audience." *Notes and Records of the Royal Society of London*, 55(2), 227-245.

**Pioneering Women in America Mathematics: The Pre-1940s PhDs.** Read Green & LaDuke (2009) and compare and contrast the issues they identify for these women (educational opportunities, career patterns) with our historical women mathematicians from this course using both their essays and their biographical entries.

1. Green, J., LaDuke, J. (2009). *Pioneering women in American mathematics: The pre-1940 PhD's*. USA: American Mathematical Society.

**History of women in computing** Examine all the materials (video, print, and power point) from *Top Secret Rosies* and look up the biography of Grace Murray Hopper and her role in computing. How was her experience similar to/different from other women studied in this course?

1. Erickson, L. (n.d.) Top secret rosies: The female computers of World War II. Retrieved from <http://www.topsecretrosies.com/>
2. Beyer, K. W. (2009). *Grace Hopper and the invention of the information age*. Massachusetts Institute of Technology.

## V. Special Issues: Minority Women, Scientific Couples, Nobel Prize Winners

**Minority Women Mathematicians** How many are there? Who are they? What special problems did/do they face? How are they able to overcome them? See the following:

- The most up to date data is probably found in the National Science Foundation (NSF) report (2011), a compilation of the latest data drawn from a wide variety of sources.
- Kenschaft (2005)
- Henrion (1997)
- Kenschaft (1981)
- Jones (1991)
- Newell, Gipson, Rich, & Stubblefield (1980)

See also: Medina (2004)

Finally, somewhat outdated but worth a look is Clewell & Anderson (1991). Check out "Related Links" from this item on ERIC:

[http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?ERICExtSearch\\_SearchValue\\_0=ED347222&ERICExtSearch\\_SearchType\\_0=no&accno=ED347222](http://www.eric.ed.gov/ERICWebPortal/search/detailmini.jsp?ERICExtSearch_SearchValue_0=ED347222&ERICExtSearch_SearchType_0=no&accno=ED347222)

1. Clewell, B. C., & Anderson, B. (1991). *Women of color in mathematics, science and engineering: A review of literature*. Washington, DC: Center for Women Policy Studies.
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3. Jones, E. (1991). A minority woman's viewpoint. In P. Kenschaft (Ed.), *Winning women into mathematics*. Mathematical Association of America.
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5. Kenschaft, P. C. (2005). *Change is possible: Stories of women and minorities in mathematics*. USA: American Mathematical Society.
6. Medina, H. A. (2004, August). Doctorate degrees in mathematics earned by Blacks, Hispanics/Latinos, and Native Americans: A look at the numbers. *Notices of the American Mathematical Society*, 51(7), 772-775. Retrieved from <http://www.ams.org/notices/200407/comm-medina.pdf>
7. National Science Foundation. (2011). *Women, minorities, and persons with disabilities in science and engineering: 2011*. National Science Foundation.
8. Newell, V., Gipson, J., Rich, L. W., & Stubblefield, B. (Eds.). (1980). *Black mathematicians and their works*. Ardmore, PA: Dorrance and Co.

**Investigate Husband and Wife Teams** Pycior, Slack, & Abir-am (1996) looks at this issue from several perspectives. It includes articles on Nobel Prize winning couples (there are 3); on couples who began as student-instructor pairs; mutually supportive couples; couples whose relationships devolved into dissonance; and a comparison across disciplines. See also AWIS (1996) which is devoted to Dual Career Couples. Einstein and Maric OR the Curies are good choices to study from the *Creative Couples* book. For Einstein and Mileva Maric, also see Holton (1994); Troemel-Ploetz (1990); Chapter 13 in Pycior et al. (1996); Renn & Schulmann (1992); and Gabor (1996). Also, see our library for recent videos. For the Curies, see Chapter 1 in Pycior et al. (1996) and find additional material. A more modern example can be found amongst astronomers, for example, the Shoemaker-Levy team. For any of these couples see the introduction and the epilogue to Gabor (1996).

1. AWIS. (1996). *Association for Women in Science Magazine*, 25(4).
2. Gabor, A. (1996). Epilogue. In *Einstein's wife: Work and marriage in the lives of five great twentieth-century women* (pp. 289-292). USA: Penguin Group, Inc.
3. Gabor, A. (1996). Introduction. In *Einstein's wife: Work and marriage in the lives of five great twentieth-century women*. USA: Penguin Group, Inc.
4. Gabor, A. (1996). Mileva Maric Einstein. In *Einstein's wife: Work and marriage in the lives of five great twentieth-century women* (pp. 1-32). USA: Penguin Group, Inc.
5. Holton, G. (1994, August). Of love, physics and other passions: The letters of Albert and Mileva. *Physics Today*, 47(8), 23.
6. Pycior, H. M., Slack, N. G., & Abir-am, P. G. (Eds.). (1996). *Creative couples in the sciences*. New Brunswick, NJ: Rutgers University Press.
7. Renn, J., & Schulmann, R. (Eds.). (1992). *Albert Einstein and Mileva Maric: The love letters*. (S. Smith, Trans.) Princeton, NJ: Princeton University Press.
8. Troemel-Ploetz, S. (1990). Mileva Einstein-Maric: The woman who did Einstein's mathematics. *Women's Studies International Forum*, 13(5), 415-432.

**Dual Career Couples (sometimes called the two-body problem)** A faculty member with a spouse domestic partner or significant other who is also interested in an academic career faces additional challenges in finding a successful career in academia, even more so if the spouse's disciplinary area is the same as the faculty members. How many women mathematicians (scientists or engineers) find themselves in this situation? What options are available to them, what issues do they face if hired together, what help is available to them to find positions together? Find national trends and recommendations in: (1) Higginbotham (2012); (2) Michelle R. Clayman Institute for Gender Research (2008); and (3) *Wolf-Wendel, Twombly, & Rice (2003)*. What is recommended or common practice relative to hiring dual career couples at LMU?

1. Higginbotham, A. (2012). *Recommendations on partner accommodation and dual career appointments*. American Association of University Professors. Retrieved from <http://www.aaup.org/AAUP/comm/rep/dual.htm>
2. Michelle R. Clayman Institute for Gender Research. (2008). *Dual-career academic couples: What universities need to know*. Stanford University. Retrieved from [http://gender.stanford.edu/sites/default/files/DualCareerFinal\\_0.pdf](http://gender.stanford.edu/sites/default/files/DualCareerFinal_0.pdf)
3. Wolf-Wendel, L., Twombly, S. B., & Rice, S. (2003). *The two-body problem: Dual-career-couple hiring practices in higher education*. Baltimore, MD: The Johns Hopkins University Press.

**Nobel Prize Winning Women** (and why is there no Nobel in Mathematics? What is the equivalent of the Nobel in Mathematics and has a woman ever received it?)

- McGrayne (2001)
  - Garding & Hormander (1985)
  - Crawford (1984)
1. Crawford, E. T. (1984). *The beginnings of the Nobel institution: Science prizes, 1901-1915*. Cambridge: Maison des Sciences de l'Homme and Cambridge University Press.
  2. Garding, L., & Hormander, L. (1985). Why is there no Nobel Prize in mathematics? *Mathematical Intelligencer*, 7(3), 73-74.
  3. McGrayne, S. B. (2001). *Nobel Prize women in science: Their lives, struggles, and momentous discoveries* (2nd ed.). National Academic Press.

## VI. Action Research on topics suggested by the instructors or on your own question

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