Abstract

The goal of this paper is to examine the possibilities for explicitly feminist work in engineering and engineering education. What does it mean in engineering contexts to take a feminist perspective, and how might this influence the profession and society? We seek to establish an under- standing of feminist perspectives in the engineering community broadly to recognize the connectedness of all forms of social injustice. Thus feminist visions of engineering might address a broad set of concerns such as militarism, racism, and global economic inequality as well as sexism and heterosexism. Our exploration of three feminist frameworks within engineering generates a set of questions for future research and institutional transformation.

Bio

Donna Riley is an associate professor and a founding faculty member in the Picker Engineering Program at Smith College, where she also serves on the program committee for the Study of Women and Gender. She holds a PhD in Engineering and Public Policy from Carnegie Mellon University and a BSE in Chemical Engineering from Princeton. Her current research focuses on implementing and assessing feminist and critical pedagogies in engineering classrooms. Riley’s recent book is Engineering and Social Justice (Morgan and Claypool, 2008). She can be reached at driley@.smith.edu.

Alice L. Pawley is an assistant professor in the School of Engineering Education and an affiliate faculty member in the Women’s Studies Program at Purdue University. Dr. Pawley has a BEng. in chemical engineering from McGill University, and an MS PhD in industrial engineering with a minor in Women’s Studies from the University of Wisconsin- Madison. She is co-PI on Purdue University’s ADVANCE initiative, through which she is incorporating her work on metaphors into better understanding current models of women’s underrepresentation in the context of Purdue, and creating new models via institutional ethnography. Her past research has focused on using the metaphor of a boundary as a tool to better understand how faculty determine what counts as engineering, and to identify how engineering might be understood as a gendered discipline. She can be reached at apawley@purdue.edu

Jessica Tucker is a Science and Technology Policy Fellow through the American Association for the Advancement of Science. She currently works in the Department of Health and Human Service’s Office of Medicine, Science, and Public Health. Previously, she was a visiting assistant professor and Fellow in Stony Brook University’s Department of Technology and Society. While at Stony Brook, she studied the impacts of various courses that incorporate ethics, social justice, or social responsibility issues on undergraduate students’ interest in and awareness of the social impacts of engineering. Dr. Tucker received a PhD in chemical engineering from Carnegie Mellon University and a BSE in chemical engineering from Princeton University. She can be reached at jessmtuck@gmail.com.

George D. Catalano is a professor of Mechanical Engineering at the State University of New York at Binghamton, where he holds joint appointments in the Departments of Mechanical Engineering and Bioengineering and serves as the director of the university-wide honors program. Dr. Catalano earned his doctoral and master’s degrees in aerospace engineering at the University of Virginia and his bachelor’s degree also in aerospace engineering at Louisiana State University. In addition to his technical research in turbulent fluid mechanics, Dr. Catalano maintains a research interest in engineering education. He has published two books related to engineering and social justice: Engineering Ethics: Peace, Justice and the Earth (Morgan and Claypool 2006) and Engineering, Poverty and the Earth (Morgan and Claypool 2007). He can be reached at catalano@ binghamton.edu

Acknowledgments

The authors would like to thank the FIE conference special session and workshop participants from 2004–2008, and previous FIE participants who identified as feminists and opened the door to ongoing conversations. This material is based partly upon work supported by the National Science Foundation under Grant No. 0448240. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

References

Adam, Alison. 2001. “Heroes or Sibyls? Gender and Engineering Ethics.” IEEE Technology and Society Magazine (Fall): 39–46.

Alcoff, Linda, and Elizabeth Potter, ed. 1993. Feminist Epistemologies. New York: Routledge.

Baillie, Caroline. 2006. Engineers within a Local and Global Society. San Rafael, CA: Morgan and Claypool.

2008. “Engineering and Social Justice in Practice: Developing Capacity in Low Income Cooperatives in Buenos Aires from Waste Plastic and Fibre.” Paper presented 7th Engineering for Social Justice and Peace Workshop, April, Northampton, MA.

Bix, Amy S. 2004. “From ‘Engineeresses’ to ‘Girl Engineers’ to ‘Good Engineers’: A History of Women’s U.S. Engineering Education.” NWSA Journal 16(1): 27–49.

Boff, Leonardo, and Phillip Berryman 1997. Cry of the Earth, Cry of the Poor. Maryknoll, NY: Orbis Books.

Catalano, George. D. 2006. Engineering Ethics: Peace, Justice, and the Earth. San

Rafael, CA: Morgan and Claypool.

</p><p>———, and Caroline Baillie. 2006. “Engineering, Peace and Social Justice: A Revolution of the Heart.” Paper presented ASEE Annual Conference, June, Chicago, IL.

</p><p>Chinn, Pauline. 2002. “Asian and Pacific Islander Women Scientists and Engineers: A Narrative Exploration of Model Minority, Gender, and Racial Stereotypes.” Journal of Research in Science Teaching 39(4): 302–23.

</p><p>Cowan, Ruth S. 1983. More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave. New York: Basic Books.

</p><p>Crenshaw, Kimberlé. 1994. “Mapping the Margins: Intersectionality, Identity Politics, and Violence Against Women of Color.” In The Public Nature of Private Violence, ed. Martha Fineman and Roxanne Mykitiuk, 93–118. New York: Routledge.

</p><p>Darder, Antonia, Marta Baltodano, and Rodolfo D. Torres, eds. 2003. Critical Pedagogy Reader. New York: Routledge.

</p><p>Dieter, George E. 1991. Engineering Design: A Materials and Processing Approach. 2nd ed. New York: <a href="/groups/collections/McGraw" class="wiki missing">McGraw</a>-Hill.

</p><p>Downey, Gary. 2005. “Are Engineers Losing Control of Technology? From ‘Problem Solving’ to ‘Problem Definition and Solution’ in Engineering Education.” Trans <a href="/groups/collections/IChemE" class="wiki missing">IChemE</a>, Part A 83(A6): 583–95.

</p><p>Dryburgh, Heather. 1999. “Work Hard, Play Hard: Women and Professionalization in Engineering—Adapting to the Culture.” Gender and Society 13(5): 664–82. Dym, Clive, and Patrick Little. 2008. Engineering Design: A Project-Based Introduction. 3rd ed. New York: John Wiley and Sons.

</p><p>ESJP. 2009. “Engineering, Social Justice, and Peace Wiki.” Accessed 4 May 2009. .

</p><p>Essed, Philomena. 2001. “Towards a Methodology to Identify Converging Forms of

Everyday Discrimination.” Paper presented 45th Session of the United Nations Commission on the Status of Women, March, New York. New York: United Nations, 2001. Accessed 17 March 2007. .

</p><p>Faulkner, Wendy. 2000. “Dualisms, Hierarchies, and Gender in Engineering.” Social Studies of Science 30(5): 759–92.

</p><p>Fausto-Sterling, Anne. 1992. Myths of Gender: Biological Theories about Women and Men. 2nd ed. New York: Basic Books.

</p><p>———. 2000. Sexing the Body: Gender Politics and the Construction of Sexuality. New York: Basic Books.

</p><p>Fineman, Martha Albertson. 2005. “Averaging at the Edges.” Foreword in Bodies in Revolt: Gender, Disability, and a Workplace Ethic of Care, ed. Ruth O’Brien, xii–xvii. New York: Routledge.

</p><p>Foor, Cynthia. E., Susan E. Walden, and Deborah A. Trytten. 2007. “‘I Wish that I Belonged More in this Whole Engineering Group’: Achieving Individual Diversity.” Journal of Engineering Education 96(2): 103–15.

</p><p>Foucault, Michel. 1980. “Truth and Power.” In Power/Knowledge: Selected Inter- views and Other Writings 1972–1977, ed. Colin Gordon, 131–33. New York: Pantheon.

</p><p>Frehill, Lisa M. 2004. “The Gendered Construction of the Engineering Profession in the United States, 1893–1920.” Men and Masculinities 6(4): 383–403.

</p><p>Freire, Paulo. 1970. Pedagogy of the Oppressed. Trans. M. B. Ramos. New York: Seabury Press.

</p><p>Frontiers in Education. 2009. “Frontiers in Education Clearinghouse.” Archives of FIE Conference Proceedings (includes multiple articles from the authors and others on feminist pedagogies in engineering education). Accessed 4 May 2009. .

</p><p>Fujimura, Joan H. 1996. Crafting Science: A Sociohistory of the Quest for the Genetics of Cancer. Cambridge, MA: Harvard University Press.

</p><p>Gilligan, Carol. 1982. In a Different Voice: Psychological Theory and Women’s Development. Cambridge, MA: Harvard University Press.

</p><p>Hacker, Sally L. 1981. “The Culture of Engineering: Woman, Workplace, and Machine.” Women’s Studies International Quarterly 4(3): 341–53.

</p><p>———. 1989. Pleasure, Power, and Technology: Some Tales of Gender, Engineering, and the Cooperative Workplace. Boston: Unwin Hyman. Haraway, Donna. 1988. “Situated Knowledges: The Science Question in Feminism and the Privilege of the Partial Perspective.” Feminist Studies 14(3): 575–99.

</p><p>Harding, Sandra G. 1986. The Science Question in Feminism. Ithaca, NY: Cornell University Press. ———. 1991. The “Racial” Economy of Science. Bloomington: Indiana University Press.

</p><p>———. 2004. The Feminist Standpoint Theory Reader: Intellectual and Political Controversies. New York: Routledge. Hill Collins, Patricia. 1990. Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment. Boston, MA: Unwin Hyman.

</p><p>hooks, bell. 1984. Feminist Theory from Margin to Center. Boston, MA: South End Press.

</p><p>———. 1994. Teaching to Transgress: Education as the Practice of Freedom. New York: Routledge.

</p><p>———. 1995. “Feminism: A Transformational Politic.” In I Am Because We Are: Readings in Black Philosophy, ed. Fred L. Hord and Jonathan Scott Lee, 329–37. Amherst: University of Massachusetts Press.

</p><p>Howard Hughes Medical Institute. 2005. “Where Are the Women Scientists?” Howard Hughes Medical Institute News, August 19. Accessed 2 June 2008. .

</p><p>Johnson, Lawrence. 1993. A Morally Deep World: An Essay on Moral Significance and Environmental Ethics. Cambridge, Eng.: Cambridge University Press.

</p><p>Kessler, Suzanne J. 2001. “The Medical Construction of Gender: Case Manage- ment of Intersexed Infants.” In Theorizing Feminism: Parallel Trends in the Humanities and Social Sciences, ed. Anne C. Herrmann and Abigail J. Stewart,

135–57. Boulder, CO: Westview Press.

</p><p>Kolko, Beth E. 2000. “Erasing @race: Going White in the (Inter)Face.” In Race

in Cyberspace, ed. Beth E. Kolko and Lisa Nakamura, 213–32. New York: Routledge. Lerman, Nina, Ruth Oldenziel, and Arwen P. Mohun, eds. 2003. Gender and Technology: A Reader. Baltimore, MD: Johns Hopkins University Press.

</p><p>Longino, Helen E. 1996. “Can there be a feminist science?” In Women, Knowledge, and Reality: Explorations in Feminist Philosophy, ed. Ann Garry and Marilyn Pearsall, 251–63. New York: Routledge.

</p><p>Lugones, Maria. 2003. Pilgrimages/Peregrinajes: Theorizing Coalition against Multiple Oppressions. Lanham, MD: Rowman and Littlefield. Luke, Carmen, and Jennifer Gore. 1992. Feminisms and Critical Pedagogy. New York: Routledge.

</p><p>Martin, Emily. 1991. “The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles.” Signs 16(3): 485–501.

</p><p>Martin, Mike, and Roland Schinzinger. 2005. Ethics in Engineering. 4th ed. New York: <a href="/groups/collections/McGraw" class="wiki missing">McGraw</a>-Hill.

</p><p>Marx, Karl 1845. 1976. Collected Works of Karl Marx and Friedrich Engels, 1845–47, Vol. 5: Theses on Feuerbach, The German Ideology and Related Manuscripts. New York: International Publishers.

</p><p><a href="/groups/collections/McCall" class="wiki missing">McCall</a>, Leslie. 2005. “Managing the Complexity of Intersectionality.” Signs: Journal of Women in Culture and Society 30(3): 1771–1800.

</p><p>Mies, Maria, and Vandana Shiva. 1993. Ecofeminism. Atlantic Highlands, NJ: Zed Books.

</p><p>Mohanty, Chandra. 2003. Feminism without Borders: Decolonizing Theory, Practicing Solidarity. Durham, NC: Duke University Press.

</p><p>National Academy of Engineering, Center for Engineering, Ethics, and Society. 2008. “Engineering Social Justice, and Sustainable Community Development. Workshop, Washington DC, October.” Accessed 2 May 2009. .

</p><p>National Research Council, Committee on Women in Science and Engineering. 1994. Women Scientists and Engineers Employed in Industry: Why So Few? Washington, DC: National Academy Press.

</p><p>Noddings, Nell. 1984. Caring: A Feminine Approach to Ethics and Moral Education, Berkeley, CA: University of California Press.

</p><p>Oldenziel, Ruth 2000. “Multiple-Entry Visas: Gender and Engineering in the US, 1870–1945.” In Crossing Borders, Building Bridges: Comparing the History of Women Engineers 1870s-1990s, ed. Anne Canel, Ruth Oldenziel, and Karin Zachmann, 11–49. Amsterdam: Harwood Academic Publishers.

</p><p>Pantazidou, Marina, and Indira Nair. 1999. “Ethic of Care: Guiding Principles for Engineering Teaching and Practice.” Journal of Engineering Education 88: 205–12.

</p><p>Pawley, Alice L. 2004. “The Feminist Engineering Classroom: A Vision for Future Educational Innovations.” Paper presented American Society for Engineering Education National Conference &#38; Exposition, June, Salt Lake City, UT.

</p><p>———. 2007. “Drawing the Line: Academic Engineers Negotiating the Boundaries of Engineering.” <a href="/groups/collections/PhD" class="wiki missing">PhD</a> diss., Industrial and Systems Engineering, University of Wisconsin-Madison, Madison.

</p><p>———. Forthcoming. “Universalized Narratives: Patterns in How Faculty Describe ‘Engineering.’” Journal of Engineering Education 98(3).

</p><p>———. 2009. “Why Would that Even Be Using the Word ‘Engineering’ on That? Categorizing Engineering Narratives as Boundary Work to Subvert Engineering towards Social Justice.” School of Engineering Education, Purdue University. Draft Manuscript submitted to Engineering Studies.

</p><p>Pharr, Suzanne. 1988. Homophobia: A Weapon of Sexism. Inverness, CA: Chardon Press.

</p><p>Rana, Shruti. 2009. “Fulfilling Technology’s Promise: Enforcing the Rights of Women Caught in the Global High-Tech Underclass. In Women, Science, and Technology: A Reader in Feminist Science Studies, ed. Mary Wyer, Mary Barbercheck, Donna Giesman, Hatice Orun Ozturk, and Marta Wayne, 322–43. New York: Routledge.

</p><p>Riley, Donna. 2003. “Employing Liberative Pedagogies in Engineering Education.” Journal of Women and Minorities in Science and Engineering 9: 137–58.

</p><p>———. 2008. Engineering and Social Justice. San Rafael, CA: Morgan and Claypool. Schiebinger, Londa.1997. “Creating Sustainable Science.” Osiris 12: 201–16. Scott, Joan W. 1986. “Gender: A Useful Category of Historical Analysis.” American Historical Review (Dec.): 1053–75. Spanier, Bonnie B. 1995. Im/Partial Science: Gender Ideology in Molecular Biology. Bloomington: Indiana University Press. Stonyer, Heather. 2002. “Making Engineering Students—Making Women: The Discursive Context of Engineering Education.” International Journal of Engineering Education 18(4): 392–99.

</p><p>Subramaniam, Banu. 2009. “The Aliens Have Landed! Reflections on the Rhetoric of Biological Invasions.” In Women, Science, and Technology: A Reader in Feminist Science Studies, ed. Mary Wyer, Mary Barbercheck, Donna Giesman, Hatice Orun Ozturk, and Marta Wayne,133–42. New York: Routledge.

</p><p>Tong, Rosemarie. 1998. Feminist Thought: A More Comprehensive Introduction. Boulder, CO: Westview Press.

</p><p>Tonso, Karen. 2007. On the Outskirts of Engineering: Learning Identity, Gender and Power via Engineering Practice. Rotterdam: Sense Publishers.

</p><p>Trescott, Martha M. 1983. “Lillian Moller Gilbreth and the Founding of Modern Industrial Engineering.” In Machina Ex Dea: Feminist Perspectives on Technology, ed. Joan Rothschild, 23–237. Elmsford: Pergamon Press.

</p><p>Tronto, Joan. 1993. Moral Boundaries: A Political Argument for an Ethic of Care. New York: Routledge.

</p><p>Tucker, Jessica, and David Ferguson. 2007. “Work in Progress—Incorporating Ethics and Social Responsibility in Undergraduate Engineering Education.” Paper presented 37th ASEE/IEEE Frontiers in Education Conference, October, Mikwaukee, WI.

</p><p>Upchurch, Meg, and Simona Fojtova. 2009. “Women in the Brain: A History of Glial Cell Metaphors.” NWSAJ 21(2).

Valian,Virginia. 1998. Why So Slow? The Advancement of Women. Cambridge, MA: MIT Press.

</p><p>Vesilind, Aarne, ed. 2005. Peace Engineering: When Personal Values and Engineering Careers Converge. Woodsville, NH: Lakeshore Press.

</p><p>Wajcman, Judy. 1991. Feminism Confronts Technology. University Park: Pennsylvania State University Press.

</p><p>Waste for Life. 2009. “Weblog Journal of Activities in Buenos Aires: 2007–2009.” Accessed 4 May 2009. .

</p><p>Warren, Karen J. 2000. Ecofeminist Philosophy: A Western Perspective on What It Is and Why It Matters. New York: Rowman and Littlefield.

</p><p>Werner, David, and PROJIMO. 1998. Nothing About Us Without Us: Developing Innovative Technologies for, By and With Disabled Persons. Palo Alto, CA: Health Wrights.

</p><p>Cite this work

Researchers should cite this work as follows:

Alice L. Pawley (2010), “Feminisms in Engineering Education: Transformative Possibilities”, <https://cleerhub.org/resources/60>