

TOXIC SEXES PERVERTING POLLUTION AND QUEERING HORMONE DISRUPTION

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ABSTRACT

Engaging in debates about sex changes in animals as a consequence of environmental endocrine pollution, this essay uses a dynamic model of sex described by Malin Ah-King and Sören Nylin (2010) to show how hormones and their environmental disruption can be understood as part of an ongoing process of sexing. The deleterious effects of material culture—the objects we encircle ourselves with, the food we eat, the water we drink, the medicines we take, the hygienic products we use—become part of the process of sexing. Side-stepping the now entrenched debates about the socially or biologically constructed nature of sex, sex might be better understood as a dynamic emergence with environment, habitat, and ecosystem, and made toxically so within the context of pollution. Combining feminist and queer studies of sex, gender, and sexuality with a critical but engaged approach to biology, this essay claims toxicity as one of the current conditions of sex in the contemporary moment. The intent is to broaden our understanding of humans' and animals' shared vulnerability and explore potential sites for coming to terms with the environmental catastrophe that we are already living in.

INTRODUCTION

Endocrine disruption, as attended to in this essay, is a toxic, expressive, and politically problematic form of corporal-environmental interaction that unravels sex determination; “endocrine disruptive compounds” (EDCs) prompt unruly thresholds of sexual emergence and modes of morphological upheaval. “Toxic sex,” this paper’s title, is not a root-bound forecast—disaster does not await us—rather it is a

reminder that we are already living in ruination. “Toxic sex” foregrounds sex as an ongoing process influenced by endocrine disruptive chemicals, describing our shared vulnerability to one another; our bodies are open to the planet.

Guided by Stacy Alaimo (2010), Celia Roberts (2007), Donna Haraway (2012), Bailey Kier (2011), and other feminists focused on environmental issues and multispecies ethics, this essay: 1) traces some popular discourses about the effects of endocrine disruption through the normative assumptions of sex and sexuality; 2) suggests a broadened understanding of pollution-induced sexual change through a dynamic model of “reactive sex” (Ah-King & Nylin 2010); and, 3) proffers an approach toward an ecological resilience that reframes the toxicity without reasserting a politics of purity. What follows is more descriptive than definitive, more entanglement than disentangled resolution. Moreover, while this paper unrests oversimplified assumptions about sex and sexual difference by “staying with the trouble” (Haraway 2012) of pollution, it also demonstrates the overwhelming need for critical apprehension of anthropogenic forces and their viral consequences on planet Earth.

EMERGING PERSPECTIVES

The Scientific Committee on Problems in the Environment (SCOPE) and the International Union of Pure and Applied Chemistry (IUPAC) have been diligently investigating the impact of endocrine active substances, which are known to alter reproduction and sexual morphology in organisms. The new SCOPE-IUPAC report says that endocrine disruption can be expected in all animals in which hormones initiate physical change, including humans. Although the importance of low-dose exposure to endocrine disruptors for increasing human disease worldwide is contested—e.g. claims of the connection between endocrine pollution and increased infertility (but see Lind & Lind 2011, 2012)—and some researchers even claim that the evidence is scarce, nevertheless, references to the large body of studies on disrupted animals are mounting (Hood 2005).

Among the agents culpable of endocrine disruption in ecosystems are: artificially produced hormones (steroids), which have been widely used as contraceptives for the last fifty years (Langston 2010); steroids are found in other treatments such as anti-inflammatory hormone cortisol (hydro-cortisone) used as an active ingredient in organ transplant anti-rejection drugs as well as asthma inhalers; estradiol and Premarin® are prescribed to medicate menopause symptoms, provide birth control, and other hormonal replacement therapies; androgens are made use of for muscle enhancement by athletes and during androgen deficiency. Other medicines, such as Paracetamol, a very common pain-relieving medicine, also have endocrine disrupting effects (Kristensen et al. 2011), as do many artificially produced chemicals, such as Bisphenol A (BPA), which is found in plastic bottles and containers, dental materials, paper receipts and food tins. Numerous studies claim that BPA elevates rates of breast and prostate cancer,

decreases sperm count, and causes reproductive problems that include early puberty as well as other neurological difficulties (Okado et al. 2008). Other agents are found in softeners in plastics, flame-retardants in clothing, electronic devices, synthetic fragrances, cleaning products, and phthalates in cosmetics. Further complicating issues of toxicity, researchers also warn about the cocktail effect—the combined impact of multiple chemicals may add up to worse effects than each substance on its own.

With regard to environmental pollution, problematically, these artificially produced hormones have a longer degrading time than more naturally occurring hormones. Sewage works are not built to filter used water from drugs and other endocrine disruptors (Naturvårdsverket 2008, Steingraber 2010). Consequently, these substances pass through water systems and end up back in our environments (Steingraber 2010). A Danish study showed that estrogen leak into aquatic environments from farming manure distributed in the soil (Kjaer et al 2007), and water analysis revealed the spread of this hormone pollution. Furthermore, 23 different kinds of medications were found in a perch caught in the Fyriså, central Uppsala, Sweden (Fick et al. 2011). In the U.S., “A U.S. Geological Survey on 140 waterways in 30 states tracked 95 different pollutants, with some surprising results: 74% of the samples contained insect repellents; 48% contained antibiotics; 40% contained reproductive hormones (e.g., birth control pill estrogen and progesterin); 32% contained other prescription drugs; and 27% had chemicals used for fragrances” (Vliet 2003).

Although endocrine disrupting pollution affects the whole world, it is relevant to ask which human populations are most exposed and where? Reports notify of banana plantation workers that become sterile, have increased cancer risk, or die from poisoning (Thrupp 1991; Henriques et al. 1997). Premature breast development in children may be due to exposure to agricultural pesticides (Ozen et al. 2012). Thrupp analyzed the causes for sterilization of banana plantation workers in Costa Rica and concluded that the determinants were “dominance of short-term profit motives, and the control over information and technology by the manufacturers (who concealed early toxicological research evidence of the reproductive hazards) and by the managers of the banana producer companies” (Thrupp 1991). The working classes in developing countries are experiencing greater exposure to weed killers, insecticides, industrial chemicals, and medications, which are banned in neighboring countries. While insecticides, such as DDT, are banned in many industrial countries, their use is continued in developing countries, and they are spread through the atmosphere. As such, endocrine disruptors disturb multiple boundaries: of sexes, generations, races, geographies, nation-states, and species (Roberts 2007).

This increasing threat of toxicity has, for good reason, prompted media attention. Many news outlets are reporting these frightening endocrine tales from our backyards. In an effort to foreground these issues—as we will describe in the following—media has gaslighted a Frankenstein metamorphosis that threatens sex

and sexuality. Rather than addressing the many other health risks associated with toxic exposure, the most sensational and polemical issues stand in for debate and critical response. It raises questions: Why is sex more central than cancer, autoimmune disease, and even death? What cultural nerves (many of which are globalized), are triggered? And, for those of us with feminist concerns, how do we reorient the debate away from essentialism, sexism, and heteronormativity?

POLLUTION PANIC

Issuing a transex panic—and here, transex takes up Myra Hird’s (2006) articulation of ‘trans’ as a biological emergence, a becoming multiple—*National Geographic* published a spate of articles with titles such as “Female Fish Develop ‘Testes’ in Gulf Dead Zone” (Than 2011), “Sex-Changing Chemicals Found in Potomac River” (Avasthi 2007), and “Animals’ Sexual Changes Linked to Waste, Chemicals” (Owen 2004), all of which champion the connection between pollution and the undermining of sexual differences (Hayward 2012). In an effort to raise awareness about the dangers of pollution, these write-ups rely on sensational titles that sound more like science fiction accounts of “gonadal deformities” and “sex mutations” than serious attention to environmental issues (Di Chiro 2010).

And the panic spreads across species boundaries. Even more political progressive organizations¹, such as Greenpeace, have warned against the effects of commonly used chemicals in “the feminization of young boys and the masculinization of girls.” Books from environmentalists are entitled: *Our Stolen Future: Are We Threatening our Fertility, Intelligence, and Survival?* (Colborn et al. 1997), *The Feminization of Nature: Our Future at Risk* (Cadbury 1998), and *Our Toxic World* (Rapp 2003). Barbara Seaman, in a book called *The Greatest Experiment Ever Performed on Women: Exploding the Estrogen Myth* (2003), writes: “Nobody can be sure whether environmental estrogens lie behind the quadrupling of infertility rates since 1965; if the sea of estrogens in which we live explains the fact that sperm counts are half of what they were in 1940; and if, like intersex fish and mutant frogs, male humans might begin to morph into women.”

For example, Rachel Carson’s now famous work on DDT—*Silent Spring* (1962)—has been advanced by Dr. Günter Dörner (1972) to say that DDT and other toxins continue to alter human reproductive systems. There are also examples of how DES (Diethylstilbestrol), a synthetic estrogen prescribed for healthy pregnancies, has led to breast cancer, infertility, intersexuality, and other health issues in children exposed in utero (Roberts 2007; Langston 2011). Environmental reports also sug-

¹During recent years, many environmentalist NGO’s have campaigned against sex-changing pollution. This raises important questions about the sexual politics of environmental movements: How is sexual normativity the basis of preservation and protection? This question requires thorough investigation.

gest a connection between endocrine-disruptors and gender identity (Hood 2005) and sexuality (Colborn et al 1996).

The Swedish Society for Nature Conservation (Svenska Naturskydds-föreningen) has recently highlighted the issue in a campaign called “Save the man!” which draws attention to the connection between endocrine disruptors and declining sperm counts, increased number of genital malformation, postponed puberty, diabetes, and obesity in humans. These calls for response reveal a central importance given to “male” bodies, and a lack of concern for women’s health problems. What is unveiled here is a preoccupation with vulnerability of masculinity, maleness, and manhood, those precious commodities of any patriarchal system. It is not to say that there isn’t a reason for action, but again, “Save the man!” occludes many more environmental and health challenges. The Swedish Society for Nature Conservation campaign book states, “phthalates seem to have a special liking for very young boys genitals” (Ohlsson et al 2012). Hence, human sex, particularly male sex, is described as under siege, endangered, and threatened.

It is true that organisms are responding to pollution in their environments (Colborn et al. 1993; Langston 2010). Polar bears, alligators, frogs, mollusks, fish, and birds: hormone-altering pollutants have affected more than 200 animal species around the world. The World Wildlife Fund (WWF) has reviewed reports showing interrupted sexual development, thyroid system disorders, inability to breed, reduced immune response, and abnormal mating and parenting behavior in wild animals. Recent media reports call out, variously, “Researcher: Pesticide ‘Castrates’ Male Frogs” (2010) and “Birth-control pills poison everyone?” (2007), and scientific reports raise alarm about estrogen pollution (Colborn et al. 1993, Kjaer et al. 2007, Bertin et al 2011). In a review of endocrine-disrupting effects, WWF states that, “The effects on female dog whelk [a predatory sea snail] are striking, as they become masculinised and grow penises” (WWF 2000). Commenting on the findings of the effect of birth-control pills on trout producing “intersex” fish with both male and female features, university biologist John Woodling says that it is “the first thing that I’ve seen as a scientist that really scared me” (quoted in “Birth-Control Pills Poison Everyone?” 2007). But again, very little attention is given to how various organisms are experiencing increased rates of disease, cancer, or loss of habitat. This returns us to the earlier problem of hyper-focusing sexual anxiety around ambiguity, variability, and changeability.

What follows is our effort to provide an alternative framework that unsettles old assumptions about sex and its transformation, while providing a less apocalyptic mode of interpreting environmental change. It is not that we are promoting pollution, but rather, offering ways for coming to terms with the real conditions of everyday life. Rather than reinvesting in purity politics—the hope of some environmental movements—we wonder how resilience and healing can occur in the context of transnational capitalism and its monstrously under-regulated dumping and pumping of various byproducts into air, water, and earth. As opposed to simply positioning oneself as an ideologue—the world is doomed unless we clean it all

up—we offer a more pragmatic, if you will, and practical theorization for understanding the organisms we are becoming and the changing nature of the ecosystems to which we belong.

REACTIVE SEXING

Across manufactured landscapes, and through chemically polluted oceans, endocrine disruption presents a challenge to how we conceptualize sex. Following out the knots in this issue, we turn to a model of sex that emphasizes sex as a dynamic processes in which organisms have more or less “open potentials” of sex, sex related characteristics, and behavior (Ah-King & Nylin 2010). Instead of thinking of sex as a nature-given dichotomy, or essentially discrete characteristic, sex is better understood as a responsive potential, changing over an individual's lifetime, in interaction with environmental factors, as well as over evolutionary time.

Many species have environmental sex determination, in which temperature, pH, or social environment (dominance hierarchies, sex ratio of group, sex of potential partner) influence an individual's sex, and sex determination mechanisms have changed between genetic and environmental sex determination multiple times during evolution (Mank et al. 2006, Ah-King & Nylin 2010). Furthermore, there are many species that sex change regularly as part of their life histories, such as shrimps, ringed worms, echinoderms, mollusks, and some fish (Munday et al. 2006). Sex change may be induced at a certain body size or age, or in response to social conditions. The timing of the sex change often appears to be an adaptive response to an individual's social and ecological environment (Munday et al. 2006). Genes for sexual characteristics are carried by both sexes, regulated by hormones, and, therefore, characteristics of both sexes are within the “potential” of most individuals; that is to say that sex changing, intersexuality and expressing characteristics of both sexes is, for many organisms, part of their species potential.

Potential: to become. Capacity: is directed toward an elsewhere, an unknown future (even if that future is un-becoming). Latin *potentialis*: from *potentia* “power,” from *potens*—“being able.” Potential is an expressive unit, force, excitation through which organisms, bodies, and environments become themselves and more. Organisms are creative responses, improvisations with, through their capacity to become with their environments (but always through the refrain of their sensoria—their ability to sense and perceive their environments and those that inhabit it) (Hayward 2010). Sex potential is just that, an opening out, responsiveness that is ontologically more dynamic than static. While some organisms have a narrow regular range of sex possibilities—their potential is more delimited—the effects of endocrine disruption provide a reworking of even these limits. In other words, while some species of fish more easily shift from female to male as an environmental response to pollution, others, such as polar bears, shift with more trouble. And yet, hormonal disruption assures changes across borders of sexes.

Considering that all animal life shares an evolutionary past, many of us also

share hormonal vulnerabilities. Hormone levels change over an individual's lifetime and are affected by lifestyle (stress, physical activity), and exogenous hormones (Roberts 2007). Even natural plant substances like phytoestrogens interact with endocrine systems of various animals (Adlercreutz 2002). Our material culture—as expressed by what objects we encircle ourselves with, the food we eat, the water we drink, the hormones we and our food industries gush into our surroundings, the air we breathe, the perfumes, soaps, shampoos and lotions we use, how we utilize our bodies—all becomes part of the process of sexing. Hence, meshing our discussion of hormone disruption with Ah-King and Nylin's ontological view of sex as a dynamic process proffers an interpretation of sex that enfolds toxification into the provocations of sexing. In this way, emerging transsex characteristics and “symptoms” can be understood as potentials rather than iterations of sexual difference. In this approach, we resonate with Bailey Kier's perspective on “shared interdependent transsex,” by which he attends to the ecologically constitutive nature of bodies: he refers to “bodies” as constant processes, relations, adaptations, and metabolisms, engaged in varying degrees of re/productive and economic relations with multiple other “‘bodies’, substances and things” (Kier 2010). In alliance with our project here, Kier's entanglement works to decenter normative assumptions about embodiment, futurity, and nature.

Human sex is responsive rather than recalcitrant to the bumptious forces of bio-industrial-chemical advances. Toxified and polluted: sexual assignments are reshaped and morphological specificity is undone (Chen 2012). Sexual differentiations are still at play, but its familiar parameters and orderings become ambiguous and uncanny; alterity between the sexes, however imagined, is unanchored. Already, sexual life as we know it is dissolving in kinds; through the unwilling transformation of toxicity and biochemical materiality, the call-and-response formation of bodies and their relations has re-dynamized corporeality. In this way, the supremacy bestowed to sexual difference—its ontological force²—is out-paced not only by social or political movements, but also by metabolizing pollutants, xenotransplanting toxicants, and intravenous banes.

RESILIENCE POTENTIALS

At the start of the 21st century, we are swamped globally by endocrine disruptors that unsettle and disarrange environments—the milieus and territories through which species emerge with each other. Species “become with”³ in principle:

²The history of medical research on hormones, Endocrinology, is permeated by conceptions of natural binomial sex differences and the naturalness of heterosexuality (see Oudshoorn 1994, Fausto-Sterling 2000, and Roberts 2007). These hetero-normative conceptions of the relationships between sex and hormones are carried on in discussions of endocrine disruption today (Roberts 2007).

³Donna Haraway (2008) troubles Deleuze and Guattari's now famous “becoming animal,”

become with habitats, resources, associations, and involvements. In this way, endocrine disruption is an unavoidable co-presence in the liveliness of organisms. It remains crucial to politically resist the continued leaching, dumping, and producing agents of hormonal disruption, but equally important is taking stock of the conditions of the present. We live within unruly effluvia and wayward discharges that promise to affect sexual, cognitive, and corporeal existence. For now, we are over our heads. The questions are: Can we engender environmental responsibility without invoking anxiety that our most intimate reproductive environments have been infiltrated by an industrial world? How do we begin to think freshly and innovatively about environmentally induced sex and body changes without reinscribing gendered biases, sexual fears, and old prejudices? How can we discuss the effects of endocrine disruptors seriously, without retelling heteronormative understandings of sexed biologies?

As Ah-King and Nylin demonstrate, seeing sex as a reaction norm, a potential, opens up for new ways of perceiving environmental sex change as a part of a developmental process, whether it occurs in species that regularly sex change or don't. That hormones are a part of our sexing process throughout life means that there is potential for arbitration and regeneration. There is no need for sex panics. Seeing sexing as an ongoing process also means that there is potential for healing and restoring. Some stages in organismal development are more vulnerable than others; some incur non-reversible changes in the physiology. Others are short-term and reversible. We know that the endocrine disrupting substances in plastic softeners are discharged from the body relatively quickly, while substances like DDT and PCB may be stored in fat tissue for decades. The DES (Diethylstilbestrol, a synthetic estrogen) prescribed to pregnant mothers still affects descendants after three generations. Temporality, here, is part of organisms' sex potentials. That is to say, sex is longitudinal and ongoing; time (within a toxic context) is part of sexing, part of its unfolding (potential) nature.

Reinvigorating the promise of transgender and queer politics: sexual difference, an engine of difference, is wrenched and retooled by toxicity and pollution, propagating variability rather than difference as usual. Neither utopic nor dystopic, toxic sex opens the realization that bodies are lively and rejoinders to environments and

with an attention to the phenomenology of prepositions. Proffering "becoming with," Haraway brings into focus Deleuze and Guattari's attention to intensity and multiplicity, while attending to the material conditions of contact, encounter, and immediacy. The preposition "with," here, is an ethical domain; meetings are built through obligations, indebtedness, and responsibility. Haraway writes, "We are all responsible to and for shaping conditions for multispecies flourishing in the face of terrible histories." "Becoming with," then, is a threshold of emergence that attends to ways in which the expressiveness of encounters envelops bodies, exchanging elements and particles of one another such that the members of the involvement become more and different.

changing ecosystems, even when those same engines of change provide exposure to carcinogens, neurotoxins, asthmagens and mutagens. “Seeing the beauty in the wounds and taking responsibility to care for the world as it is” is what we aim for here (Mortimer-Sandilands 2005).

For instance, in the Potomac River (USA), chemicals from industrial and residential sources have caused male bass to produce eggs that can be fertilized by their former gender mates. Changes in the reproductive cycle of fish can decimate populations, but as shown by these bass, evolutionary change may bring other futures than extinction. These perspectives open the realization that bodies are lively and practical responses to environments and changing ecosystems (see also Kier 2010, Di Chiro 2010). There are also examples of how deleterious effects can be reversed, like the re-establishment of the population of bald eagles after its decline due to DDT, an endocrine-disruptive chemical (Sodhi et al. 2011).

We—human and nonhuman—are living in a time of intensified exposure to toxicity where life requires reinvention (if it can) or risks extinction and disease. Things can get worse, and probably will, but life is already dire for many. We are entwined through our descent (and, possibly, our extinction), but also through our coexistence in shared environments. Nonhumans and humans are vulnerable, but also exuberant, adaptable, resilient and constantly changing in interaction with environments. We are living in environmental catastrophe, certainly some organisms will survive; perhaps only humans will not.

In an effort to critique the medial focus on threats to “natural” and normative sex and sexuality, this essay, proffers a critical perspective for understanding environmentally induced sex changes, and encouraging a counter discourse that rethinks our purity and “chemical free” ideas so as to simultaneously comprehend threat, resilience, and potential. Embodiment, which includes sex, is a process of becoming with these altered environments. Whatever futures await us, we are the future organisms that we are becoming.

REFERENCES

- Adlercreutz, H. 2002. “Phyto-oestrogens and cancer.” *Lancet Oncology* 3: 364–373.
- Ah-King, M. and S. Nylin. 2010. “Sex in an evolutionary perspective: just another reaction norm.” *Evolutionary Biology* 37: 234–246.
- Alaimo, S. 2010. *Bodily Natures: Science, Environment, and Material Self*. Bloomington: Indiana
- Avasthi, A. 2007. “Sex-Changing Chemicals Found in Potomac River.” *National Geographic News*, January 22: <http://news.nationalgeographic.com/news/2007/01/070122-sex-change.html>.
- Bertin, A., P.A. Inostroza, and R.A. Quiñones. 2011. “Estrogen pollution in a highly productive ecosystem off central-south Chile.” *Marine Pollution Bulletin* 62: 1530–1537.
- “Birth-Control Pills Poison Everyone?” 2007. *WND: America’s Independent New Network*,

- July 12: <http://www.wnd.com/2007/07/42520/>.
- Carson, R. 1962. *Silent Spring*. Boston: Houghton Mifflin.
- Chen, M. 2012. *Animacities: Biopolitics, Racial Mattering, and Queer Affect*. Durham: Duke University Press.
- Colborn, T., F.S. Vom Saal and A.M. Soto. 1993. "Developmental effects of endocrine disrupting chemicals in wildlife and humans." *Environmental Health Perspectives* 101: 378–384.
- Colborn, T., D. Dumanoski, and J. Peterson. 1996. *Our Stolen Future: Are We Threatening Our Fertility, Intelligence and Survival?—A Scientific Detective Story*. London: Little, Brown and Company.
- Di Chiro, G. 2010. "Polluted politics? Confronting Toxic Discourse, Sex Panic and Eco-normativity." In *Queer Ecologies, Sex, Nature, Politics, Desire*, eds. C. Mortimer-Sandilands & B. Erickson, 199–230. Bloomington: Indiana University Press.
- Dörner, G. 1972. *Sexualhormonabhängige Gehirndifferenzierung und Sexualität*. New York: Springer.
- Fausto-Sterling, A. 2000. *Sexing the Body: Gender Politics and the Construction of Sexuality*. New York: Basic Books, 2000.
- Fick, J., R.H. Lindberg, L. Kaj, and E. Brorström-Lundén. 2011. "Report: Results from the Swedish National Screening Programme 2010. Sub-report: Pharmaceuticals," *IVL: Svenska Miljöinstitutet*: <http://www.ivl.se/download/18.3175b46c133e617730d80008041/1326350361848/B2014.pdf>.
- Haraway, D.J. 1991. *Simians, Cyborgs and Women. The Reinvention of Nature*. New York: Routledge.
- Haraway, D.J. 1997. *Modest_Witness@Second_Millennium.Female_Man_Meets_Onco-Mouse*. New York: Routledge.
- Haraway, D.J. 2008. *When Species Meet*. Minneapolis: University of Minnesota Press.
- Haraway, D.J. 2012. "Awash in Urine: DES and Premarin® in Multispecies Response-ability." *Women's Studies Quarterly* 40(1-2) (Spring/Summer): 301–316.
- Hayward, E. 2010. "FingeryEyes: Impressions of Cup Corals." *Cultural Anthropology* 25(4): 577–599.
- Hayward, E. 2011. "When Fish and Frogs Change Gender." *Independent Weekly*, August 3: <http://www.indyweek.com/indyweek/when-fish-and-frogs-change-gender/Content?oid=2626271>.
- Helmreich, S. and T. Greenforst. 2012. "Species." *Frieze d/e* 6 (Autumn): <http://frieze-magazine.de/archiv/kolumnen/species/?lang=en..>
- Henriques, W. Jeffers, R.D. Lacher, T.E. and R.J. Kendall. 1997. "Agrochemical Use on Banana Plantations in Latin America: Perspectives on Ecological Risk." *Environmental Toxicology and Chemistry* 16: 91–99.
- Hird, M. 2006. "Animal Transex." *Australian Feminist Studies* 21(49): 35–50.
- Hood, E. 2005. "Are EDCs Blurring Issues of Gender?" *Environmental Health Perspectives* 119: 670–677.
- Kier, B. 2011. "Interdependent Ecological Transsex: Notes on Re/production, 'Transgender' Fish, and the Management of Populations, Species, and Resources." *Women & Performance: A Journal of Feminist Theory* 20(3): 299–319.
- Kjaer, J., P. Olsen, K. Bach, H. Barlebo, F. Ingerslev, M. Hansen, and B. Halling-Sørensen.

2007. "Leaching of Estrogenic Hormones from Manure-Treated Structured Soils." *Environmental Science and Technology* 41: 3911–3917.
- Kristensen, D.M., U. Hass, L. Lesné, G. Lottrup, P.R. Jacobsen, C. Desdoits-Lethimonier, J. Boberg, J.H. Petersen, J. Toppari, T.K. Jensen, S. Brunak, N.E. Skakkebaek, C. Nellemann, K.M. Main, B. Jégou, and H. Leffers. 2011. "Intrauterine Exposure to Mild Analgesics is a Risk Factor for Development of Male Reproductive Disorders in Human and Rat." *Human Reproduction* 26: 235–244.
- Langston, N. *Toxic Bodies and the Legacy of DES*. New Haven: Yale University Press.
- Lind, M., and L. Lind. 2011. "Circulating Levels of Bisphenol A and Phthalates are Related to Carotid Atherosclerosis in the Elderly." *Atherosclerosis* 218(1): 207–213.
- Mank, J. E., D.E. Promislow, and J.C. Avise. 2006. "Evolution of Alternative Sex-determining Mechanisms in Teleost Fishes." *Biological Journal of the Linnean Society* 87: 83–93.
- Mortimer-Sandilands, C. 2005. "Unnatural Passions? Notes Towards a Queer Ecology." *Invisible Culture: An Electronic Journal for Visual Culture* 9: <http://hdl.handle.net/1802/3756>.
- Munday, P.L., P.M. Buston, and R.R. Warner. 2006. "Diversity and Flexibility of Sex-change Strategies in Animals." *Trends in Ecology & Evolution* 21: 89–95.
- Naturvårdsverket. 2008. "Report: Avloppsreningsverkens förmåga att ta hand om läkemedelsrester och andra farliga ämnen." *Naturvårdsverket.se* [website], February: <http://www.naturvardsverket.se/Documents/publikationer/620-5794-7.pdf>.
- "New Campaign: Save the Man!" 2011. *Naturskyddsföreningen.se* [website], May 31: <http://www.naturskyddsforeningen.se/nyheter/ny-kampanj-radda-mannen#googtrans/en>.
- Olsson, R. (ed.), A. Froster, and M. Hedenmark. 2012. "Den flamsäkra katten: om kemikaliesamhället, hälsan och miljön. Svenska Naturskyddsföreningen."
- Okado, H. T. Tokunaga, X. Liu, S. Takayanagi, A. Matsushima, and Y. Shimohigashi. 2008. "Direct Evidence Revealing Structural Elements Essential for the High Binding Ability of Bisphenol A to Human Estrogen-Related Receptor- γ ." *Environmental Health Perspectives* 116(1): 32–38.
- Oudshoorn, N. 1994. *Beyond the Natural Body: An Archaeology of Sex Hormones*. New York: Routledge.
- Owen, J. 2004. "Animals' Sexual Changes Linked to Waste, Chemicals." *National Geographic News*, March 1: http://news.nationalgeographic.com/news/2004/03/0301_040301_genderbender.html.
- Ozen S., S. Darcan, P. Bayindir, E. Karasulu, D. Simsek, G. Simsek, and T. Gurler. 2012. "Effects of pesticides used in agriculture on the development of precocious puberty." *Environmental Monitoring and Assessment* 184: 4223–4232.
- "Researcher: Pesticide 'Castrates' Male Frogs." 2010. NPR: *All Things Considered*, March 7: <http://www.npr.org/templates/story/story.php?storyId=124422894>.
- Roberts, C. 2007. *Messengers of Sex: Hormones, Biomedicine and Feminism*. Cambridge: Cambridge University Press.
- Seaman, B. 2003. *The Greatest Experiment Ever Performed on Women: Exploding the Oestrogen Myth*. New York: Hyperion
- Sodhi, N.S., R. Butler, W.F. Laurance, and L. Gibson. 2011. "Conservation successes at

- micro-, meso- and macroscales.” *Trends in Ecology and Evolution* 26: 585–594.
- Steingraber, S. 2010. *Living Downstream: An Ecologist's Personal Investigation of Cancer and the Environment*. New York: Da Capo Press.
- Than, K. 2011. “Female Fish Develop ‘Testes’ in Gulf Dead Zone.” *National Geographic News*, May 31: <http://news.nationalgeographic.com/news/2011/05/110531-female-fish-sex-testes-gulf-dead-zone-freshwater-environment/>.
- Thrupp, L.A. 1991. “Sterilization of Workers from Pesticide Exposure: The Causes and Consequences of DbcP-induced Damage in Costa Rica and Beyond.” *International Journal of Health Services* 21: 731–757.
- Vliet, E.L. 2003. *It's My Ovaries, Stupid*. New York: Scribner
- World Wildlife Fund (WWF). 2000. “Endocrine Disrupting Chemicals: Position Statement.” *WWF Global* [website], January: http://wwf.panda.org/about_our_earth/all_publications/?4034/Endocrine-Disrupting-Chemicals-Position-Statement-2000.

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