

Our Chemical Selves

Gender, Toxics, and Environmental Health

Edited by Dayna Nadine Scott



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Foreword

Water Is Life

Josephine Mandamin

I have the habit of introducing myself the way I've been taught to speak to the Creator and to the Spirits. I acknowledge them as they stand behind me, the protectors of our nations as the Eagle clans and all the spirits that have been offered tobacco to be with us in the work that we do as Anishinabe people. I introduce myself with my Anishinabe name, Beedawsigaye of the Awassisi, which means "the one who comes with the light." My Clan is the Fish Clan, and therefore a relative to the bullhead and catfish. They are fighters and really powerful fish. I am part of that clan which I have watched in action since I was a kid. I know what they are like. They are very powerful fish. I am also a fourth-degree Midewewin person. I have entered the Midewewin lodge four times. I was stood up – meaning I was presented, acknowledged, and recognized – as an Ogichidaw in 2004 at Pipestone sundance. And so I have also been holding the three maidens' pipe for the Ogitchidaw in Pipestone.

I also want to express how privileged we are to be where we are today in terms of understanding the impacts of pollution and the poison that is around us, which is very detrimental to our health – not only our health but that of generations to come. I want to talk about the role that is given to us as Anishinabe people, and confess that I also ask 'Why me?' even though that was something that was never, never, never put to us to ask when something is given to us.

The year 2000 was when messages about the water – what's going to happen to the water – began to be talked about. And I was at a sundance

when I heard an elder talk about the water – how in thirty years from now, that water was going to cost as much as an ounce of gold. And standing there, I could not believe how it could be, because our water is so beautiful when I go to the reserve. When I go to Thunder Bay, I go to Kakabeka Falls and get my fresh water, spring water. And so I could not fathom how an ounce of water would cost as much as an ounce of gold. And I don't know today how much an ounce of gold is – maybe \$500, \$600. I cannot imagine how much it is going to be in thirty years. When the elder finished talking, he looked at the crowd and asked, “What are you going to do about it?” And that question hit me right in the heart. I felt it was directed at me. And so for two and a half to three years I went around talking to people about it, talking to other women about it. One thing he said was that women have to start picking up their bundles, doing their work. And that was another thing that I had to find out. What does a bundle mean? What is my work as Anishinabe? And I spent that time talking, encouraging women to start picking up their work. And then listening to the elder grandmothers.

Finally, in the winter of 2002, we were sitting around the house with tea, coffee, and bannock – five of us women talking about water. And I said, there has been so much happening – many people have said, “Yes, we'll do something about it,” but no one seems to be doing anything about it. And one woman said, “Lake Superior is here” – you could see it from where we were – “we can walk around Lake Superior.” And we laughed about it – how you talk about something, and you laugh about it, like it's a big joke. To see us women walking around Lake Superior. And then we talked about something else. And then came back to it. And Christine said: “A pail of water – walk around the lake with a pail of water.” And so it came to be that that's what we planned. And I know that was Easter time. And we chose Easter Sunday as the day we would start at the south shore of Lake Superior. And so we started walking. And at that time there was a mark on the ground where we started walking. There was a bunch of men and women walking behind me. Then after twenty minutes I looked back, and there was nobody there. So I was walking alone. I continued alone for the rest of the day. And we had my pickup truck, an old Chevy with an orange light on top. And a lady was driving my truck. I was walking with my staff and water pail. I asked a man where the others were, and the man said they had other things to do, they had work to do – they had positions, school, work they had to go to. So I was alone.

So the next day, we were at one of these places when an old man came and said, “We want to do the travelling song for you.” So we stopped at this plaque by the side of the road. He brought his son and grandson, and the three did a travelling song for us. And I was standing there and wondering what would become of us. Because we were standing there, and there was Lake Superior, and we were alone, and we were wondering how this was going to happen. And before the drumming finished, a car pulled up. And this old man got out of his vehicle and stood there and waited until the drumming stopped. When it finished, he came up to us and said he saw us and had to turn back and come and say that his father had said to him when he was young that there would be a time when the women would walk around the Great Lakes. And he said he was very moved by what we were doing. So he gave us an eagle feather and I put it on the pail and he left. I looked at the person with me and asked, “So does this mean we have to walk around the five Great Lakes?” Because originally it was only Lake Superior. And he said, “I don’t know.” He saw how hard it was for me to walk with the staff and pail at the same time. When we started walking with the water, we had to keep moving with it. It keeps going, like the river. And it’s like the songs. The water songs are never-ending. And we have to honour the songs as we walk.

On the third day, my friend from Saskatchewan came to help. And that helped a bit and we reached Duluth. And our Grand Chief, Eddie Benton, came to help. And there was a powwow in Duluth and we received some donations. We started with \$85 – a donation from Easter Monday. That’s all we had. We didn’t ask. We just did it. And that’s something that we have always done as Anishinabe people. We just do it, without question, without funding. Then people come out and help. All we did was ask for permission. We asked Annie Wilson and Al Hunter for their blessing. They said what we were doing was good but that we should take extra socks. That was the advice we got and that is what we did. We took stuff that we needed, the bare essentials.

Then we had Minnesota. In Minneapolis-St. Paul, a group of young people came to help us push along. Then we got to Thunder Bay. And Lake Superior – when I think of it, I think of it as very, very strong water. And it reminds me of a woman, because it is very unpredictable. Sometimes it is very gentle and kind, sometimes very powerful and overwhelming, and you do not know what to expect from one moment to another. I remember I was waiting at Old Woman Bay. The water

was beautiful and calm. I didn't see this wave coming and it almost swept me off my feet. So I always think of Lake Superior as an old woman – very powerful, very strong, unpredictable. And it has also taken many lives – you may have heard the history of Lake Superior. In 2003, we finished in thirty-six days – over a month it took us to walk around. During that time, we didn't ask for funds – we only relied on people's goodness to fill up our tank. If we had money, we'd stay at a hotel. It was a very spiritual walk. There are many things that I could tell you. How did it happen? Sometimes you question.

In 2004, we did the upper part of Lake Michigan. That Michigan walk was very telling – that was the time that we understood how our grandmothers, grandfathers – our ancestors – had left us a legacy that we are to remember. We saw many signs as we walked around the upper peninsula – we saw signs that our grandfathers, grandmothers were there. We saw the shapes, the drawings on the rocks. We saw trees showing that the elders must have been there. And it was very powerful, very beautiful. And we visited this place in Mount Pleasant. We walked that mountain. There's no mountain – I don't know why it's called mountain. And we visited a museum there, and that is where we really understood that we were really destined to do what we were doing, to be there. Because it showed us that our people were very strong, even though they had nothing. They were resilient. And then we looked at the other society. You know, what are the white people leaving for the children? We saw the destruction, the roads, the mining, the trees that are being cut – bald-headed mother. And we thought of our mother too. How she is being destroyed by the money-changers that are making money off her – the mining, for progress, for money. And so we understood that we would never do that to our children, our grandchildren that are yet to come. We would leave the message for them that we did something – that we are doing something. And the white people are leaving behind the destruction – the construction, as they call it – but it is really destruction. The mining that is gouging our mother. Her hair that is being cut. And we see women who are going through the same thing because of the radiation and the cancer that is going through our bodies. Everything that Mother Earth is going through, our women are going through – the hysterectomies, their bodies being cut out like Mother Earth. So we see that destruction is not really our way – that the white people are doing the destruction to the environment. So Lake Michigan was very telling. We saw that our work is something that is to be continued. And it was also the place

where we heard that Nestlé was selling water from Lake Michigan as spring water around the world. And we had demonstrations. We came through demonstrations where people were fighting the Nestlé bottling works. And we saw trucks that looked like milk trucks that said “Spring Water from Michigan.” And they were selling the water all over the world. And they probably still are.

And so in 2004-5, it was Lake Huron – that was when we understood how the men have to start to walk with the women – in balance. And it was in Sudbury, or in Whitefish, that we were invited to speak to a group of Chiefs and Councillors. And I spoke to them about the water walk and I did it all in the language because I knew many of them are fluent speakers. So I spoke to them about the balance of the fire and the water – how the mother, father, and son earth walk in balance. When I finished talking, no one said anything. And then the elder Gordon Waindubeins stood up and said that everything I said was true. And when we finished, we had a standing ovation from the Chief and Councillors when we were leaving the building.

The next day, we had men coming out to the highway waiting for us, to walk with us. That was the year when the men really started coming out. And yesterday I remembered the walk that we did from Sarnia to Port Huron. I remember they wouldn't let us walk to get on the other side. And Karl and Lincoln were the two who were walking with me that time and who were crossing the bridge with me with the water. But they wouldn't let us cross the bridge because the governor or someone had to be told that we were going to walk. We waited half an hour, and then out of frustration I just started walking and the two men started walking behind me. The two guards couldn't do anything. I dared them to stop me. And they wouldn't dare do anything. It took us about fifteen minutes to walk across. It didn't take long – I just sped along, with Lincoln and Karl right behind me. We got to the other side and there was a drum waiting for us – the Americans were waiting on the other side. So Lake Huron was a reminder of how men can also be good supports for us as women who care for the water because they are also life givers for us. Because they take care of us and they bring the warmth in our communities and our lives. And so we respect the men too and they come and join us in ceremonies.

When I think about how our men, our young men, boys, and young women have to carry that life within their bodies and they need to start thinking about whether they are going to pass it to their children and grandchildren – how is that going to be passed on? And the only way is

through the fire and water – they have to be water and fire keepers. And that is what we are doing here today – bringing the message to people that we must do our work. In 2006, we walked Lake Ontario. You know, a lot of nuclear waste goes through that water. We couldn't touch the water because we were afraid. We saw many deaths – many fish on the shore. When we crossed the border from Kingston into New York, one of the girls said this water is so heavy. And it was heavy – we were really tired from carrying this water. Our shoulders hurt at the end of the day. So we kept changing the water to see if it was the water. And it was the water. A year later, someone sent me an article written by scientists – they tested the water in Lake Ontario and it was labelled heavy water. We knew that the year before. It was heavy because of the mercury, the chemicals – all that stuff in the water that makes it heavy. And we did experience that. So when we think of Ontario we think of the correlation between science and the Anishinabe way of life. That we know things that it takes the white people a while to understand. They have to do a scientific study to prove what we already know. So we know we are very smart people.

In 2007, we walked Lake Erie. To be stoic, you have to be patient. And Lake Erie was where we had people come and make fun of us. They would do the war whoops when we would walk by them. Trucks would drive by and they would yell, "Get a job!" And you wanted to yell back at them but I kept telling the young women, "Don't listen to them." And we walked through a town and there would be young men walking behind the young women who were walking with the water making really sexual remarks to them. So it was really hard. Then we got to Windsor – we got to Windsor after we crossed the bridge in Detroit. Detroit was a hard walk too. We started off really early in the morning – it was still dark. We wanted to get through Detroit and to the Canadian border as early as possible. When we got there, my nephew let out a sigh of relief and said, "It's good to be home." It was really hard for them because of the racism and the work we were doing – people making fun of us. People would stop us and ask us if we were crazy – they would say, "You crazy Indians." And we were crazy. Anyone in their right mind wouldn't be doing what we were doing. So we would say, "Yes, we are crazy – crazy for the water." And they would tell us about what they were doing for the lakes – dredging. And we'd say, "Yes, you think you are doing a good thing, but we know what the dredging does to the water." And we'd talk about the dredging and how it kills all the plants under the water when they dredge. So they

think they are doing a good thing, but they don't really know what they are doing. So we were met by many people on the other side. We were met by the Anglicans, different churches. They really helped us on our way until we got to our destination again.

The next year, we walked the bottom part of Lake Michigan because we did the upper part in 2004. And that is something – I listen to my elders – when we walked Lake Michigan in 2004, my elder said, “I had a dream. I don't want to discourage you from doing all of Lake Michigan but I had a dream that something was going to happen to the water walkers if they go through Chicago.” He said, “I don't want to discourage you. I'll let you decide.” I went to my sister and said this is what our grandchief said, and she said he has always had good dreams. We decided not to do all of Lake Michigan that year. And now that I look back, I can understand. Because there were a lot of political things happening in Chicago in 2004 because of Nestlé selling the bottled water.

In 2008 when we went through Chicago, we were welcomed. Even Toyota came and lent us their hybrid vehicle because it was very hard walking through the city. In Wisconsin, Milwaukee, they also gave us a big welcome. And the young people there really gave us an overwhelming welcome to their area. They were just in awe because of what we were doing. And they promised to take care of Lake Michigan. They promised to do it for the rest of their lives – to take care of the water and protect it. And that was encouraging for us – to know that there would be young people when we're old and gray and can't do it anymore. That the next generations would be there for us.

When we finished walking Lake Michigan, we also acknowledged the young people, acknowledging the young people because they are the now generation – I don't call them the next generation. They are the ones now sitting around listening to what is happening, watching what is happening. They are very concerned – a little angry – but very concerned about what is happening to the environment, to Mother Earth, wondering what they can do about it. And that is what I ask them. I ask them what they can do about it. So they go to their own communities and think of what they can do. And I tell them how they can fast for the water. Fasting is a very powerful, spiritual way of tapping into your dreams, into Mother Earth when you sit on her, in her lap. She comes to you and you can feel her presence. When you are without food or water for four days and four nights, you can appreciate that first taste of water, first little bit of food. If all of you sitting here took your children

and families to fast, can you imagine how much less garbage there would be out there, how much less wasted food, how much less water you would use? And I usually ask people how much water did you use today? How much water did you waste today? And that makes them think of how they are using the water. How they can use the water in a good way. So they don't leave the water running – when they're brushing their teeth or showering. So there are many ways that we can look at how we are doing in protecting the water.

When we finished walking the five Great Lakes, we sat back and said we'd done it. I was at a meeting in Akwesasne near Cornwall, and Henry Lickers came up to me and said, "You are not done yet. The Great Lakes water flows down to the St. Lawrence River and to the ocean." I told my sister what he said and she said, "Why doesn't Henry Lickers walk the St. Lawrence River?" So we started in 2009. We started in Kingston and we walked the St. Lawrence River. The river reminds me of the ocean. It just gets bigger and bigger and bigger. When we stopped on the rivers, we took our time and really acknowledged the St. Lawrence River. We were told to stop at this place called Rivière-la-Madeleine" – we were told that is the place where the salt water meets the fresh water. And we ended our walk there. We'd stop every little while and taste the water but it still tasted fresh. By the time we did get there, it started to taste salty. We know how the salt water works with the fresh water. We know what salt does. It is a cleanser. I use salt when I feel really, really tired. I put Mediterranean sea salt in the bathtub for my back. You can feel the energy of the salt working on your body. So when we finished the St. Lawrence River, that was it. We took a whole year off. Then one of our eastern walkers talked about the salt water – how we need to bring it together. And so the four directions came into being. So this spring, we're going to be walking with the salt water, taking it from the East, the South, the North, the West, and the Gulf of Mexico, where all the oil has been spilled on the water. So that salt water from the four directions will be carried to the place where we started in 2003. And there will be a big celebration where we intermingle the salt water with the fresh water. Every time I think of the salt water and I look at the water, I have a feeling that it is waiting, waiting, waiting – waiting for us to go and get that water and walk with it and bring it to the centre of Lake Superior. So that is what we are going to do on the 12th of June. We are going to do a ceremony on the water to intermingle the spring water and salt water, so that it will be united. And so when people ask what is going to happen in 2012, I always

listen to my teachers. And I say, where are you going to be in 2013 – you are going to be one year older. Nothing is going to happen. It is just a new beginning. When I think about how we can – not just as Anishinabe people, as Aboriginal people, people from all walks of life – we can all do something. What can we do? We can fast. Go out there and sit on Mother Earth. Listen to her. Be with her. Be without food and water for a few days. And know what it is to be without. And I sincerely hope that politicians, the rich people, the 5 percent who are rich people, can do that someday. To be without food and water – just to know what it is like to be without for four days. And have that little drink after four days, to know that first taste of food, how precious it is. To never waste food again. And to think of the animals also. I know that they are without food. Polar bears are finding no place to rest when they're swimming in the waters. They rest on icebergs and the icebergs are almost all gone. Their food is going – the seals are going somewhere else and they cannot find the food. So we have to think of our relatives. They came to us when we needed them. That's why we have our clans – our clans are very precious to us to understand. I know what my fish clan means. I know that it is to work for the water on behalf of all my clans. I know my relatives – the bear clans – how they have responsibility for the medicines. How they go poking around Mother Earth for medicines. And so our clans are very important.

Young people have a responsibility also. They will be mothers, fathers, aunts, uncles, great-grandparents soon. And I am sure that they want what it is we want also for the next generations. To bring that spring water to our young people so they can taste the water, how beautiful it is. To see the animals, the deer running around. The moose, the rabbits, that they will not be extinct. That is a dream that I have – that they will always be around for us. At a time when we needed them, they were there for us. To take care of them, like they took care of us. Migwech.

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This text is adapted from remarks given to the Community Forum on Pollution and Action, Sarnia/Aamjiwnaang, February 2011.

Introduction **The Production of Pollution and Consumption of Chemicals in Canada**

Dayna Nadine Scott, Lauren Rakowski,
Laila Zahra Harris, and Troy Dixon

This volume explores both the processes that *produce* chemicals (and chemical pollution) and the paths of exposure to chemicals that come about through our everyday *consuming*. In other words, we take the position that the consumption of chemicals in Canada is inseparable from the generation of pollution in this country. Exposure to chemicals occurs throughout our everyday lives – in the food we eat, the air we breathe, and the products we consume; on the street, in our schools and workplaces, and in our homes. These exposures, even though they are pervasive and widespread, are also decidedly uneven in their distribution. In fact, their distribution tends to vary along familiar social gradients, with disproportionate burdens falling on low-income, racialized, and Indigenous communities. At the same time, the effects of the exposures (and the burden of managing them) appear to rest disproportionately on the shoulders of women.

The “consumption” of chemicals takes on multiple meanings in this volume. Some authors interpret it literally, focusing on the chemical inputs we consume in our food, in our drinking water, in alcoholic beverages, and in the air we breathe. Other authors talk about the consumption of chemicals through the use of everyday consumer goods that indirectly expose us to chemicals, such as bisphenol A (BPA) in plastic packaging or canned food. These authors also tackle the implications of individual “precautionary consumption,” noting the difficult choices we make daily about what to buy, which chemicals to “consume,” and which to avoid, knowing that women vary dramatically in

their capacity to engage in these practices. Some authors focus on workplace exposures, highlighting health risks to specific groups of workers and emphasizing the importance of making connections between occupational health and the environmental health movement. For still others, the “consumption” of chemicals is about the chemicals we are exposed to simply through living and breathing in our everyday living and work environments – an extension of the fact that in modern society humans rely on a variety of products, such as petroleum and plastic, the production and consumption of which inevitably result in chemical inputs to our air, water, and soil. In this chapter, we try to piece together a conceptual framework that captures each of these meanings and their interconnections.

A central aim of this volume is to expand our collective understanding of the links between social inequity, environmental risks, and the gendered division of health burdens in Canada. That the interconnections are crucial is made obvious in Josephine Mandamin’s foreword. Mandamin, the Anishinabe grandmother best known for leading the Mother Earth Water Walk, demonstrates with her words and actions – between 2002 and 2009 she led annual walks around the five Great Lakes to raise awareness of the political, ecological, social, and spiritual significance of water – that social justice and healthy ecosystems are inextricably linked. She inspires in us a collaborative spirit and a determination to formulate a general theoretical foundation that can propel us towards greater understanding of what we need to do next. Thus we attempt here to articulate a framework capable of grounding the questions and issues that bind the various and diverse contributions of the authors. By establishing an analytical basis for subsequent chapters, this introductory chapter aims to guide readers along the overall trajectory of the volume, and influence the direction of future research, thinking, and policy on gender, chemicals, and environmental health justice.

New research is steadily emerging that links exposures to certain chemicals, at very low doses and at key times, to various environmental health harms (Batt 2008-9; Cooper and Vanderlinden 2009; Eyles et al. 2011; Gray, Nudelman, and Engel 2010; Krupp 2000; Chapter 10, this volume). These key times, known as *critical windows of vulnerability* – such as during early development, puberty, and pregnancy – can have a distinctly biological, developmental, and thus gendered nature. Emerging understandings of these diffuse, nuanced, chronic effects of chemicals on our bodies directly challenge the competing notion of “thresholds” that anchors toxicology and forms the bedrock of our

regulatory approaches to toxic chemicals (Scott 2009b). The prevailing paradigm in toxicology, that “the dose makes the poison,” is starting to unravel. At least for whole categories of key chemicals, we are finding that in many cases where we thought there were thresholds for health effects, there actually may not be. The implications of this for women are enormous and are the focus of this volume.

A Feminist Political Economy of Pollution

The theoretical foundation that we seek to develop can be framed as a “feminist political economy of pollution.” In our conception, political economy is closely related to an environmental justice framework, and offers a strong basis from which to launch the remainder of the collection. At its most fundamental level, the theory interrogates systemic issues of power and ownership relating to the question of who profits from and exerts exploitative control over ecological resources, economic capital, and social labour (Gosine and Teelucksingh 2008). But we also widen the scope to allow consideration of how exploitative relationships between industrial actors and marginalized workers extend into peoples’ everyday physical realities (Gosine and Teelucksingh 2008). As Verchick (1996) explains, we are working to “shatter the walls between health, occupational, and environmental issues and re-imagine the environment in ways that directly affect [our] everyday lives” (47). In this way, the political economy of pollution focuses attention on the inseparable links between profit incentives, the unsustainable production of waste, exploitative labour practices, racialization, and differential exposure to pollutants. Besides those who experience economic disparities, the “exploited” also comprise all of those who, directly or indirectly, at times unknowingly, take on additional health risks as a result of their place in the hierarchies and contours of capitalism. Women, accordingly, are at the forefront (Rahder 2009).

Feminist activists in the environmental justice movement are increasingly turning their attention to environmental harms derived not only from air, water, or soil contamination but also from toxic workplaces, urban planning and transit decisions, and conditions in public housing, among others (Adamson, Evans, and Stein 2002). The lineage of social and environmental injustice cannot be overlooked as we traverse the territory of environments and women’s health, and the risks that have come to signify the post-industrial era. Political economists Jennifer Clapp and Peter Dauvergne outline the roots of the “political

economy of pollution,” pointing to recent waves of postwar industrialization and domination as an extension of slavery, patriarchy, colonialism, and imperialism (Clapp and Dauvergne 2005). It is becoming increasingly clear in Canada that racialized communities (Teelucksingh 2011; Nelson 2002) and Indigenous communities on reserves (Hoover et al. 2012) bear much more than their “fair share” of our environmental burdens, and that within these communities, women are disproportionately harmed (Agyeman et al. 2009; Rahder 2009; see also Wiebe 2013).

Our approach also has much in common with work in political ecology. The precepts of ecology, in fact, give a strong indication of what the overall model represents. Ecology refers to “a bounded system of dynamic interdependent relationships between living organisms and their physical and biological environment” (McMichael 1993, 40). Hence, an ecological approach can take into account the cyclical, holistic, and interdependent character of relations between bodies, chemicals, and systems of production that, in theory, should ground our understanding of life on a finite planet (McMichael 1993). During the 1970s and 1980s, however, many progressive academics began to challenge certain intellectual trends purporting to employ ecological methodologies to underestimate, obfuscate, and therefore legitimize the increasing devastation associated with human industrialization (Gray and Moseley 2005). As Leslie Gray and William Moseley aptly state in their article “A Geographical Perspective on Poverty–Environment Interactions” (2005): “Cultural ecology and ecological anthropology ... ignore[d] the role of political economy, power and history in shaping human–environmental interactions” (14). By trusting blindly in the ability of ecosystems to “correct” themselves, previous views of ecological modalities failed to capture how new, expansive, and relatively untested production methods – compounded by rising consumption and pollution rates – were irrevocably changing human health in ways that could not simply be corrected through “natural” life processes.

For these reasons, work in the political ecology mode departs from its roots in the discipline of ecology in several critical ways. As demonstrated by Neil Evernden in *The Social Creation of Nature* (1992), the theory is better able to capture “human–environmental interactions” because it recognizes that environmental health is not tangible; it cannot be readily seen or easily quantified (5). Rather, political ecologists challenge the value systems that seek to legitimize the root causes of

environmental and health damage (Evernden 1992). For example, they point out the contradiction between the scientific limits of what an ecosystem or a human body might sustainably handle, and what the arena of industrialization touts as manageable levels of chemicals and pollution.

Ronald Wright, in *A Short History of Progress* (2004), notes that a foundational premise of industrialization is the desire for endless growth and profitability. Yet, he also confronts a deeper ideological impediment that spins unrelenting resource depletion, worsening pollution, untested synthetic chemical production, and perpetual consumption as beneficial to all of humankind. Ultimately, it is the all-too-familiar victory of short-term thinking over long-term judgment, as is made beautifully clear in Peter Victor's work, challenging the notion that economic growth is necessary for human progress (Victor 2008).

This is why a feminist political economy of pollution is imperative: it contextualizes the interconnectedness of environmental health harms, chemical production, gender, and consumption within historical and structural findings. For example, when attempting to illustrate the "chains of causality" that threaten health and well-being, Gray and Moseley dissect society at multiple scales of analyses reaching across municipal, state, and global levels of governance (Gray and Moseley 2005). Besides focusing on state institutions, a political economy of pollution simultaneously assesses corporations, academic bodies, interest groups, non-governmental organizations (NGOs), and the web of overlapping interests at work between them. In other words, no actor or organization can be entirely removed from the interconnected system that provides the systemic and day-to-day impetus for health and environmental health harms to take root.

One of the fundamental starting points of this volume is the question of why some people and communities endure higher degrees of risk than others. Within the hierarchical manifestations of capitalism, categories of gender, race, culture, sexuality, religion, physical (dis)ability, and socio-economic status invariably influence the relative burden of risk (Doyle and Kennelly 2003, 25; Nelson 1990). Yet, it is crucial to begin at a structural level. This way, when coming to terms with the disproportionate health burdens that women and other marginalized groups bear in their day-to-day interactions, we avoid the tendency to focus on any particular single "chemical enemy," and are able to interrogate the systems of production that enable them to continue being produced and consumed.

In many ways, the contributions to this volume reflect the contemporary discourse and literature on gender and environmental health. We highlight the specific paths of women's exposure to chemicals through routes such as air, water, soil, and food, and through occupational exposure and consumer goods, in light of our recognition of the fact that health disparities can be structured, reinforced, and compounded by gendered factors (Buckingham and Kulcur 2009, 659). The category of "women" is not deployed without reflection. Like others working on women's health in Canada, we recognize that the category is complicated by women's many social locations shaped by processes of racialization, ethnicity, age, sex, class, sexuality, citizenship, status/migration experience, and ability (Jackson 2012). In this vein, our analysis probes beyond the boundaries of category to question and explore the ways in which the benefits and burdens of chemical exposures are distributed among women.

The definition of gender has long been a topic of debate among scholars in a wide variety of fields. The conceptual challenge centres on the distinction between gender and sex. In the most general terms, "sex" refers to the biological characteristics that distinguish women's and men's bodies, while "gender" refers to the culturally defined characteristics, differences, and roles that are socially constructed and assigned to women and men (Doyal 2001). The binaries implied by this oversimplification are, of course, false and have been productively challenged by recent social theory and social movements that have broadened our understanding of sex and gender to include intersex, transgender, two-spirited, and other culturally specific expressions of gender (Yee 2011).

The prevalent use of the term "gender" to describe both social and biological determinants of health has meant that the term is often misunderstood, misused, and highly contested. In this volume, our discussions of gender encompass both the physical and socio-cultural definitions and understandings of the term, and accept the fact that while the social and biological aspects of gender are inextricably linked, we can productively try to tease apart the ways in which contemporary pollution acts on and is influenced by both sex and gender. We consider: the social determinants of health model; cultural and policy implications of environmental harms; women's increased exposure to chemicals due to behaviour, lifestyle, and occupation; government legislation and regulation of chemical production, lifespan, and disposal; women's roles in the home and their practices in the everyday

management of contaminant exposure; the policy implications of “green consumerism” and other lifestyle modifications designed to reduce chemical consumption; and social and environmental justice approaches to understanding exposure. The treatment by selected authors of the biological aspects of health outcomes can be seen through the analyses of pathways to toxic consumption, fetal development, and women’s reproductive health; the treatment of women’s life cycles as periods of vulnerability to toxins; and women’s disproportionate cancer risks from exposure to synthetic estrogens. We can simultaneously appreciate both the biological and the socio-cultural factors that contribute to women’s vulnerability to disproportionate harms. We recognize that gender’s visibility has been compromised by factors ranging from institutional gender discrimination, to a blurring of the space between public and private realms, and to a lack of studies that consider the lived environments most regularly inhabited by women (Rahder 2009); we also recognize that in order to fully understand and discern the role that gender plays in determining women’s environmental health, we as researchers need to *see* gender (Buckingham and Kulcur 2009, 661 and 669). Doing so requires that we validate the ways in which it affects the distribution of power and resources in society, and consequently influences opportunities to engage, both individually and collectively, with policy reform (Jackson 2012; MacGregor 2006).

What Does a Feminist Method Expose?

In exploring the relationship between exposures to chemicals and women’s health, we work to unpack assumptions about gender that permeate environmental health research. At the same time, we highlight the gendered differences in women’s exposures to, experiences of, and responses to chemical contamination (Howard and Hollander 1996, 2). The gender lens is useful because it allows us to see how gender – as both a category and a lived reality – influences the ways in which we view the world around us. This includes changing the way we see environmental health issues; the types of questions we ask, the people we study, and the answers we imagine will emerge (Howard and Hollander 1996, 2). Like a flashlight in a dark and cluttered room, a gender lens exposes the *consequences* of risk in the context of the uneven and unequal world in which we live (Howard and Hollander 1996). Within environmental health research – in conjunction with political economy and environmental justice frameworks – a gender

lens enables us to investigate where gender has been overstated and where it has been ignored completely. In essence, we work to make gender *visible*.

Leipert and Reutter (2005) identify various “determinants of health” that interact to have an immense impact on the well-being of Canadian women. In this view, gender – in addition to a myriad of other factors, including education, social status, employment and work conditions, support networks, physical environment, biological and genetic factors, and culture – plays a key role in determining women’s environmental health (Leipert and Reutter 2005, 241). This perspective is echoed by Buckingham and Kulcur (2009) in their discussion of Kimberle Crenshaw’s theory of intersectionality (1991), which posits that gender and various other factors, including race, class, sexuality, and citizenship, all work together to shape women as both individual and social actors. Importantly, this perspective is one that the contributors to this volume both implicitly and explicitly support, as gender is positioned within an interlocking set of oppressions that make up the “conditions of our lives” (Combahee River Collective 1977, 264). This orientation has arguably been evident from the very roots of the women’s health movement that are hinted at by the title of this collection. *Our Bodies, Ourselves*, published in 1971 by the Boston Women’s Health Collective, examined inequalities and oppressions in all of their intersections and urged a generation of women to move past individual self-help towards collective action.

Thus, feminist political economy understands gender and class as “interrelated systems of power that work through and are continuously (re)constituted by social relations of production and reproduction” (Jackson 2012). The concept of “social reproduction” focuses attention on the critical work that is performed, primarily by women, to support life on a day-to-day basis and to foster, sustain, and encourage a new generation. It demonstrates how both paid employment and unpaid domestic labour are part of the same economic processes “of production and consumption that in combination generate the household’s livelihood” (Bezanson and Luxton 2006, 37). Capitalism as a mode of production *depends on* social reproduction, as Vosko (2002) notes, whether it is realized through the gendered division of labour performed in the home or through a transnational, racialized division of labour, as Smith and Stiver make clear in Chapter 11. Thus, throughout this volume, we examine the interconnections between women’s exposure to

chemicals and their health by “situating (multiply positioned) women in practices of production and reproduction” (Jackson 2012).

At the same time, as we work to expose how gender affects health through various socially prescribed roles, attitudes, values, behaviours, assignments of relative power, and differential levels of authority and control, our approach does not dismiss the biological differences between women and men. These differences often account for the increased burden on women’s bodies resulting from toxic chemicals in the environments in which we live. The use of a gender lens to improve conditions of environmental health and to formulate policies that reduce or eliminate chemical production must be sensitive not only to differences in the socio-cultural constructions of gender but also to differences in men’s and women’s biologies. For example, women’s unique biologies may create specific vulnerabilities during critical periods, such as during puberty, lactation, and menopause, completely apart from the burdens women experience related to the possibility that they may pass on harms from chemical exposure to their future children. Further, women experience environments in ways that are rooted in their biologies. For example, as explored in Chapter 8, the ability of environmental chemicals to alter breast tissue and contribute to the development of breast cancer influences how women workers in plastics injection moulding operations experience their workplaces. Researchers, advocates, and policy makers must recognize women’s specific embodied needs and experiences and account for biological differences, without allowing this attention to biology to lead us down a familiar path towards essentialist claims of vulnerability that can be used to undermine women’s agency and autonomy (Sturgeon 1997).

Our challenge as feminist environmental health activists is to take account of the significance of biological differences between bodies without taking those differences to be natural, or “pre-cultural” (Scott 2009a). In the context of women’s health and chemical exposures, we have to delve deeper than a simple “socialization” analysis that explains that pollution affects women differently from men because women’s roles in the environment, home, and workplace differ from those of men. This is true but it doesn’t tell the whole story. Emerging research shows that serious and important thinking remains to be done about the biological aspects of everyday chemical exposures. Turning our attention to them undoubtedly raises complex questions and tensions for feminists (Sandilands 1999), but it might point out, at a key juncture,

that there is a more complete story to be told about why a focus on gender and environmental health matters: contaminants act on bodies, and bodies are sexed (Scott 2009a).

Research in a number of disciplines, including feminist theory of the body (see Alaimo 2010), science and technology studies (see Murphy 2008), and eco-criticism (see Nixon 2011), has begun to explore the phenomena associated with the contemporary production and consumption of chemicals. Nixon's notion of "slow violence," that which "occurs gradually and out of sight, a violence of delayed destruction that is dispersed across time and space" (2), vividly evokes the porosity of borders, "from a somatic, to a bodily, to a transnational scale" (Scott 2012a, 484). As Nixon argues, and Michelle Murphy's notion of "chemical regimes of living" (2008) underscores, the "industrial particulates and effluents [that] live on in the environmental elements we inhabit and in our very bodies ... epidemiologically and ecologically are never our simple contemporaries" (8). In other words, the contemporary pollution harms that are body altering and probably generational in character produce afflictions experienced today – cancer, reproductive problems, developmental difficulties – that could be tied to presently occurring, continuing exposures, or they could be latent manifestations of exposures long past.

Increasing attention to these possible intergenerational impacts of everyday chemical exposures, and the related field of epigenetics, gives rise to the sense that synthetic chemicals in our bodies exhibit "embodied, ongoing percolations" (Nixon 2011, 67) beyond our own lives (Collins 2007). The suspected intergenerational effects of the exposures draws on ideas central to feminist theory of the body and Stacy Alaimo's notion of "trans-corporeality, describing movement and exchange between and across human bodies and nonhuman nature" (2010). According to Michelle Murphy (2008, 696):

The intensification of production and consumption in recent decades has yielded a chemically recomposed planetary atmosphere to alarming future effect, while it has penetrated the air, waters, and soils to accumulate into the very flesh of organisms, from plankton to humans. Not only are we experiencing new forms of chemical embodiment that molecularly tie us to local and transnational economies, but so too processed food, hormonally altered meat, and pesticide-dependent crops become the material

sustenance of humanity's molecular recomposition. We are further altered by the pharmaceuticals imbibed at record-profit rates, which are then excreted half metabolized back into the sewer to flow back to local bodies of water, and then again redispersed to the populace en masse through the tap. In the twenty-first century, humans are chemically transformed beings.

Murphy's reference to "alarming future effect" raises the prospect of today's chemical consumption reaching forward, into future generations. These intergenerational equity aspects of our current production and consumption of chemicals have been brought forcefully to the fore by Indigenous activists in Canada. On the Aamjiwnaang First Nation reserve, where the environmental health effects of living beside a major petrochemical cluster have been well documented and include a skewed birth ratio tied to endocrine-disrupting pollution (Mackenzie, Lockridge, and Keith 2005; MacDonald and Rang 2007), the intergenerational aspects of the pollution are accepted, if not understood (Basu et al. 2013; Wiebe 2013).

Chemical Exposure and Indigenous Communities: The Aamjiwnaang First Nation

As mentioned, Indigenous communities in Canada bear more than their fair share of chemical exposures and their associated damaging health effects. The overburdened and overexposed Indigenous communities in this country present a current expression of historical racism, ongoing colonialism, and uneven power relations. Further, within these communities, women often experience both marginalization and feminization of poverty, which impact not just their exposures but also the degree of agency and autonomy they may exercise to mitigate those exposures. In fact, the experience of many Indigenous communities demonstrates the notion central to the environmental justice movement that "disproportionate burdens" are borne by the poor, racialized, and marginalized (Luke 2000).

A community that has fought back against the relentless flow of pollutants into their territory in recent years is the Aamjiwnaang First Nation, which shares an "oversaturated airshed" with Sarnia's "Chemical Valley" – Canada's largest petrochemical complex (Scott 2008; Wiebe 2013). Two members of the Aamjiwnaang community

recently launched litigation under the Canadian Charter of Rights and Freedoms to counter the persistent problem presented by the fact that the continuous, low-dose exposures to air pollutants they experience occur within legally sanctioned limits. They argue that the pollution threatens their health and violates their equality rights.¹

The risks associated with these exposures are well established. In a 1998 review of eleven Canadian cities, Health Canada confirmed that mortality increases as ambient air quality decreases (Burnett, Cakmak, and Brook 1998). The Ontario Medical Association attributed 100 extra deaths, 920 emergency room visits, and 471,000 minor-illness days to air pollution in Sarnia-Lambton alone in 2005 (OMA 2005). Further, much of the pollution in Sarnia's Chemical Valley is known to contain "persistent organic pollutants" that act as endocrine disruptors. Endocrine disruptors have structural similarities to the common sex hormones and are thought to "trick" the body into triggering metabolic, growth, and reproductive changes (Colborne, Dumanoski, and Myers 1996).

In 2001, Canada was the first country to sign and ratify the Stockholm Convention on Persistent Organic Pollutants (POPs) amid worries about the accumulation of toxic chemical residues, such as polychlorinated biphenyls (PCBs), in the breast milk of Inuit women. The convention bans the sale of the twelve most toxic POPs, the "dirty dozen," and aims to reduce their unintentional release to the point of virtual elimination. Biomonitoring data now indicate, however, that the "body burdens" of these chemicals in Canadians are still increasing, and concerns are mounting that their endocrine-disrupting effects are starting to be felt in human populations. The spotlight shines again on Sarnia's Chemical Valley, where members of the Aamjiwnaang First Nation are suffering reproductive and developmental health effects linked to exposures to endocrine disruptors, and the local industry continues to release POPs into the environment as the "unintentional" by-products of intentional economic activity, primarily petrochemical production.

The responses of community residents and advocates in Aamjiwnaang have highlighted the importance of the environmental justice movement in both adopting strategies of resistance and incorporating "precaution" (Scott 2008). The movement seeks to address the social implications of inadequate and discriminatory environmental policies and practices by empowering and educating individuals and communities who bear the greatest burdens of environmental harm. The view of environmental health risk that emerges from the environmental justice movement

construes the incidence of harm tied to pollution as not only “significant, intentional, and expected” but also inherent in our current processes of production and consumption (Scott 2008, 296).

Activists from Aamjiwnaang have adopted several strategies common to environmental justice movements to further their cause (Wiebe 2013). In particular, they have employed biomonitoring, or “body burden” testing, which measures the body’s total exposure to pollutants over time. They have also engaged in community environmental monitoring, such as through “bucket brigades.” Here, groups of residents monitor the air near refineries, chemical factories, and power plants using low-cost grab samplers (O’Rourke and Macey 2003). Their biomonitoring efforts are aimed at demonstrating that even the “safe doses” allowed by current regulations are leading to significant harms to human health, and their deployment of community environmental monitoring is intended to give the lie to the regulators’ line that current monitoring systems are adequate, when in fact they perpetuate an environment in which firms pollute beyond safe levels with little threat of punishment.

Connections between Environmental and Reproductive Justice

Activists in Aamjiwnaang and other Indigenous communities across the country are also starting to develop important links between environmental and reproductive justice issues (Hoover et al. 2012; Wiebe and Koonsmo, forthcoming). This includes attention to the limits to physical reproductive capacity brought about by environmental contamination, and disproportionate levels of reproductive system cancers – those of the breasts, ovaries, uterus, prostate, and testicles. There are obvious concerns about breast milk contamination and the cultural tensions this creates. There are also broader concerns about social and cultural reproduction as traditional and sacred sites for coming-of-age and rites-of-passage ceremonies are increasingly threatened by pollution and industry. As Hoover and colleagues argue (2012, 1648):

Concerns about the community’s ability to reproduce, whether physically through the birth of healthy children or culturally through the passing on of traditional practices, has sparked interest in the need for environmental health research. We want to expand the definition of reproductive justice to include the capacity to raise children in culturally appropriate ways. For many

Indigenous communities, to reproduce culturally informed citizens requires a clean environment.

Failures in the Current Regulatory Approach

The Aamjiwnaang First Nation example points to a major theme of this volume: that the current regulatory approach fails to capture the essence of contemporary pollution harms. In many ways, this failure derives from the fact that continuous, low-dose exposures to chemicals largely occurs within acceptable legal limits. In other words, the risk assessment approach, based on the idea of thresholds, cannot account for the possibility that chronic low levels of pollution might have real and devastating effects on human health. Further, a meaningful application of precaution in this context must properly consider the effects of pollution from multiple sources and their interactions in the body and over time. Long latency periods between exposure and health effects create scientific and legal uncertainties in linking environmental harms to any particular causal event (Scott 2012b). Most toxic substances have simply not been subjected to systematic epidemiological study, or, where studies have been done, it is often concluded that a substance “might” be hazardous (Brown 2007, 265). At the same time, a precautionary approach is warranted despite the lack of research conclusively proving all harms, given the enormous and significant health interests at stake and our continued dependence on unsustainable production and consumption.

An analysis that pays due attention to the structural and historical bases for pollution inevitably comes to rest at an explanation for the relationship between pollution and environmental health harms that finds those harms to be both chronic and intentional (Scott 2008). It understands pollution to be one of the inherent by-products of ordinary, everyday consumption and production, and it understands that devastating health harms are similarly embedded. On this account, the production of harm in the “ever expanding mosh pit of toxic chemicals” is inextricable from the production of commodities (Steingraber 2010, 103).

Our goal is to expose the political economy of pollution: to question who benefits from and who pays the price for the continued release of carcinogenic, neurotoxic, and endocrine-disrupting chemicals into the environment. Collectively, the chapters in this book begin to piece together a coherent picture. Ultimately, they bring back into focus the

role of capital, land use, colonization, race, and the state in our examination of bodies and how they are changing in the context of contemporary pollution. As Sarah Lochlann Jain (2007) states, the aim is to watch “the ways in which gender is constituted and inhabited in relation to industrial capitalism and the distribution of ... its modes of suffering” (506).

Pollution is a “fixed feature” of modern economies (Luke 2000). The production of chemicals, the making of plastics, the refining of oil, and the generation of electricity each have harm and wounding embedded in them. They represent, to a large extent, the *production of pollution*. But just as the production of chemicals, plastics, petroleum, pesticides, and more would be tied to the production of pollution, so the actual consumption of many consumer goods, such as plastics, would be tied to the production of pollution. Using the example of bottled water as explained in Chapter 8, the discarded plastic bottles accumulate in landfills, the leachate eventually ends up escaping into surface waters, which become source waters for drinking, and those endocrine-disrupting chemicals, the “gender-benders,” are literally consumed again.

The sheer number of regulatory regimes engaged by the study of the production of pollution and the consumption of chemicals in Canada is almost overwhelming. There are the provincial and territorial air and water pollution regimes, land-use planning laws and policies, waste diversion schemes, and occupational health statutes. Federally, there is a complex regime for assessing and managing the risks of toxic chemicals, and laws governing food and drugs as well as cosmetics and hazardous products. At multiple levels of governance simultaneously, we can find laws regulating the approval, use, and application of pesticides, and laws requiring the reporting and disclosure of toxics use and emissions (see this book’s Conclusion). All of this makes the point very clear: in tracking how pollution flows, there are multiple possibilities for leakage, but also for diversion and, ultimately, prevention.

The Chapters in This Volume

The study of gender and environmental health demands a truly interdisciplinary framework, and the chapters in this volume are a testament to the multifaceted nature of these issues. Nevertheless, some common themes run through them. In one way or another, all of the chapters allude to the lack of research and attention to health risks that are a

priority for women, particularly marginalized women. Each chapter also ties the unequal distribution of risk to social determinants of health, and all make reference to “precaution” and prescribe regulatory reforms with respect to governing chemicals. They also share an interest in finding ways to pull more women into decision making, to draw more attention to the circumstances in which inequalities occur, and to engage more people, institutions, and policy with change. Beyond these similarities, each chapter presents its own original angle and serves as a clear and explicit reminder that chemical consumption and environmental damage do not impact people uniformly (Buckingham and Kulcur 2009).

Part 1, with the theme of “‘Consuming’ Chemicals,” begins with the contribution of M. Ann Phillips in Chapter 1, “Wonderings on Pollution and Women’s Health.” Phillips opens with a captivating first-person account of her own daily encounters with chemicals to illuminate the many interconnections between humans and these environments. The narrative reveals the hidden exposures we experience in our everyday lives – without our consent – and the serious limitations on our abilities to predict where such exposures will occur. Phillips concludes with some strong recommendations for action. For her, there is ultimately a need to incorporate women’s experiences into further research, to increase awareness of those experiences in the crafting of policy, and to address root causes of inequity and toxicity through collaborative action and responsibility.

In Chapter 2, “Protecting Ourselves from Chemicals: A Study of Gender and Precautionary Consumption,” Norah MacKendrick focuses on the emerging practice of precautionary consumption. MacKendrick, a sociologist, conducted research that reveals how women’s motivations to practise “green consumerism” often results from a distrust of government health risk assessments for chemicals in common products. She discusses women’s often disproportionate responsibilities related to the home and the health of their families. When they engage in precautionary consumption, women choose to buy products that they hope will reduce their family’s chemical burdens and associated adverse health effects. This gendered practice offers a second tier of self-protection in response to insufficient regulatory precaution.

Importantly, MacKendrick’s study provides a platform for women to explain, in their own words, their selective consumption practices, and leads readers to reflect on their own choices and practices. The data also raise the issue of equity, as women vary in the degree to which they can

effectively perform this work, based on financial, geographical, and educational constraints, as well as adequate knowledge and access to alternatives. MacKendrick argues that these inequities ultimately undermine the success of precautionary consumption as an answer to inadequate government regulation, and points to the need for a regulatory approach that would include stricter controls on manufacturing, production, and product labelling.

Picking up on the limitations of current regulatory frameworks, Chapter 3 offers Dayna N. Scott and Sarah Lewis's exploration of "Sex and Gender in Canada's Chemicals Management Plan." The authors discuss the federal government's Chemicals Management Plan (CMP), a regulatory program meant to protect environments and human health from toxic substances. The authors reveal the ways in which the CMP is failing to protect the health of Canadians, and how disproportionate burdens of managing risk often fall on women as a result. Some key reasons for this failure include a focus on chemical risk management rather than prevention, inadequate endpoints for health risk assessment, dated assessment methodologies, significant gaps in data, and a disregard for cumulative and longitudinal effects.

Scott and Lewis provide several recommendations for improving the current policy process. In particular, they argue (1) that the CMP process must become more accessible and transparent, fully engaging the public and stakeholders in decision making; (2) that endpoints for toxicity under the CMP need to be expanded through alternative testing methods to address gendered concerns; and (3) that new data on chemical mixtures need to be generated that take into account up-to-date assessment methodologies, occupational exposures, and long-term monitoring and biomonitoring. Ultimately, the authors assert that the federal government must implement precaution meaningfully by working towards a more stringent, inclusive, and comprehensive regulatory regime for toxic chemicals.

Part 2, "Routes of Women's Exposures," begins with Jyoti Phartiyal's "Trace Chemicals on Tap: The Potential for Gendered Health Effects of Chronic Exposures via Drinking Water." This chapter, drawing on research conducted for the National Network on Environments and Women's Health by Susanne Hamm, explores the health risks associated with chronic low-level exposures to chemicals present in Canadian drinking water, and the ways in which current water regulations may fail to protect human health. The author reveals that it is possible for some chemicals to have no "safe" level of exposure, particularly during

key windows of vulnerability in a person's development, and that maximum acceptable concentration (MAC) values provided by government can still result in harm to human health.

Phartiyal discusses the challenges inherent in gathering data to reinforce these understandings, including limitations regarding long latency periods, cumulative/synergistic effects, and implications of gender. She then explores the uses and health effects of three common chemicals found at very low levels in drinking water, and provides specific case studies on contamination in the Canadian context. The chapter concludes with several policy reform recommendations, including the strengthening of federal guidelines for Canadian drinking water quality, increasing water-testing frequency, and reviewing and improving public health education and information. The author argues that health risk assessments need to take into account critical windows of vulnerability related to gender and development, that more research should be done on low-level chemical exposure, and that further bio-monitoring studies should be conducted on vulnerable populations, including women.

In Chapter 5, "Consuming DNA as Chemicals and Chemicals as Food," we move from everyday chemical exposures in drinking water to the food we eat. Bitu Amani highlights the risks associated with consuming genetically modified (GM) (novel) food. She explores recent developments in biotechnology that require further scrutiny, as they may present unknown and as yet immeasurable health risks for women based on sex and gender roles, their responsibilities in the global food chain, and their status as primary caregivers and nurturers. Amani highlights shifting food production practices resulting from advances in molecular genetics and the practice of patenting that together have spurred the growth in agrobusiness with genetically modified organisms (GMOs) and "Ready" varieties. The proliferation of novel foods and foods with novel traits therefore demands a conceptual shift in focus within critical debates that moves beyond traditional concerns over the presence of various contaminants, additives, toxins, and disease-causing agents in food to the increased risks of chemical consumption with GM foods. Amani concludes that things can change for the better if women's voices are able to penetrate agricultural decision-making mechanisms, if labelling procedures change, and if liabilities rest with producers who profit from GMO exclusivity agreements.

Chapter 6, "Consuming Carcinogens: Women and Alcohol," by Nancy Ross, Jean Morrison, Samantha Cukier, and Tasha Smith, sheds

light on the elevated rate of women's alcohol abuse, associated harms, and related cultural and policy implications. Alcohol is described as a toxic chemical. It is the second major risk factor contributing to disease in high-income countries and has been labelled by the World Health Organization as "carcinogenic to humans." Yet, as the authors make clear, the availability and social acceptance of alcohol make these dangers difficult to address.

The chapter looks at how alcohol use – even in small doses – causes distinct health harms for women and subsequent generations at a number of reproductive and developmental stages, including breast and other cancers, Fetal Alcohol Spectrum Disorder, and a weakened immune system. Women experience greater physical harm from alcohol compared with men, and have more rapid progressions of harm. Using twelve social determinants of health, the authors reveal the complex interactions between alcohol consumption, gender, and various environmental factors that might increase an individual's susceptibility. They present several policy and regulatory reforms to prevent morbidity and mortality related to alcohol, including the implementation of firmer regulations and policies governing alcohol advertising, as well as more gender-specific, evidenced-based policy, research and prevention/treatment programming, and universal screening for substance misuse.

Part 3 is called "Hormones as the 'Messengers of Gender'?" Here we allude to the orthodox high school understanding of sex and gender: that sex is determined by genetic factors (XX or XY chromosomes), and that sexual differentiation is driven by hormones. As Nelly Oudshoorn's work (1994) reveals, the "discovery" of hormones early in the twentieth century became celebrated as providing the "missing link" between genetic and physiological models of sex determination. It quickly became accepted that the "intentions of genes must always be carried through by appropriate hormones" (Oudshoorn 1994, 20). Accordingly, hormones assumed the role of the "chemical messengers" of gender.

The research on endocrine disruption is complicated by this orthodoxy. Endocrine disruption is commonly described as follows: "Certain synthetic chemicals share structural features with common sex hormones; these chemicals, or xenoestrogens, mimic hormone action in the body by binding with, and activating, available hormone receptors" (Scott 2009a). As explored in Chapter 9, since the endocrine system is understood as responsible for regulating complex and interconnected

physiological processes, synthetic chemicals that interfere with it are thought to have profound and wide-ranging effects on health. Importantly for this volume, the fact that hormones travel in the blood in very small concentrations means that even very low levels of xenoestrogens can disrupt the flow of internal communications. Accordingly, susceptibility to xenoestrogens is thought to depend highly on sex, gender, and the timing of exposures.

In Chapter 7, Maria P. Velez, Patricia Monnier, Warren G. Foster, and William D. Fraser present “The Impact of Phthalates on Women’s Reproductive Health: Current State of the Science and Future Directions.” The authors introduce the reader to advanced research on gendered exposures to phthalates, a mass-produced group of industrial synthetic chemicals ubiquitous in our surroundings. They discuss how the use of phthalates has most often gained scholarly interest for its repercussions on men’s health. Yet, as the authors attest, phthalates may just as readily affect women’s endocrine functioning, influencing their psychological, behavioural, reproductive, developmental, and emotional health as well as the health of subsequent generations. Chapter 7 examines how the study of phthalates is complicated by the multiple direct and indirect routes of exposure, leading to an uneven distribution among women depending on their social location. The authors argue that with more research, and through an exploration of progressive reforms being developed in other countries around the world, Canada can take action to prevent exposures to phthalates. They stress that, based on the precautionary principle, efforts to examine the plausible role of phthalates in women’s health need to become a priority for scientists and regulators.

In Chapter 8, Aimée L. Ward and Annie Sasco explore “Plastics Recycling and Women’s Reproductive Health.” They look at the ways in which plastics recycling – or the lack thereof – has become increasingly relevant to the study of endocrine disruption in women. Noting Canada’s dismal regulatory track record, they relate how most plastic waste ends up in landfills, incinerators, and ultimately in groundwater. They also address the diversity of chemical compounds in plastics, which complicates the recycling process and makes the finding of suitable after-markets difficult.

Ward and Sasco outline a range of gendered health risks that accompany corporate negligence around, and state indifference to, plastics recycling. For example, endocrine-disrupting chemicals found in plastic are connected to increased incidences of cancer and reproductive

health problems in women. The authors carefully consider the pros and cons of “extended producer responsibility” (EPR) and how EPR might be implemented to properly manage plastics, including changes to product design methods and the creation of after-markets to make use of plastics after their initial life. In accordance with the mantra of “reduce, reuse, and recycle,” however, they argue that we must also work on decreasing plastic consumption at the source, and on increasing the efficiency and capabilities of plastics recycling. This involves developing better waste policies and carrying out more research on identifying links to women’s reproductive health and the exposure pathways of endocrine disruptors. The authors advocate the establishment of Canadian policies that focus on the systems that produce waste, and that confront the societal and political structures that have led to the currently unsustainable production and consumption of waste.

Chapter 9, Sarah Young and Dugald Seely’s “Xenoestrogens and Breast Cancer: Chemical Risk, Exposure, and Corporate Power,” presents a formidable body of scientific data connecting escalating levels of breast cancer in Canada to the presence of xenoestrogens in our environment. The authors argue that exposure to estrogen is the most important risk factor in cancer development. This is particularly troubling given that breast cancer is the leading cause of death for middle-aged women in Canada. Young and Seely point to powerful chemical lobbyists, who represent a major obstacle to those fighting for women’s health. While operating under the mantra of “endless profitability by any means necessary,” major chemical and pharmaceutical corporations distort knowledge production through marketing schemes, sponsorships, and research funding allocations that privilege short-term treatment over long-term preventive programs.

The chapter explores the dangers of xenoestrogens and the policy changes that need to occur to protect population health. The authors guide the reader through four parts: how xenoestrogens contribute to breast cancer risk; their impacts within a social determinants of health model; the political economy of chemicals and cancer; and a refocusing of research and policy on prevention. Recommendations focus on putting the precautionary principle into practice, with the authors emphasizing the need to expand research initiatives in high-risk communities. They discuss how the federal government can play a key role in implementing appropriate regulations, a national risk reduction strategy, and education initiatives for the public. Ultimately, an upstream approach to health is advocated, making prevention the primary goal.

Part 4, “Consumption in the Production Process,” explores the unique relationship that workers have with the environment based on occupational exposures. The two chapters in this section reveal the ways in which women workers are exposed to carcinogens and/or endocrine disruptors at rates far greater than the general population. They consider how scientific assessment fails to recognize the unique burden of blue-collar workers, and the health risks associated with their jobs. The study of occupational health is an area fraught with contradiction, and occupational injury and disease often exist as a “hidden problem” (Levenstein and Wooding 2000). Both chapters discuss the intertwined legal, social, and scientific factors affecting women workers.

In Chapter 10, “Plastics Industry Workers and Breast Cancer Risk: Are We Heeding the Warnings?” Margaret M. Keith, James T. Brophy, Robert DeMatteo, Michael Gilbertson, Andrew E. Watterson, and Matthias Beck examine the nature and extent of plastics workers’ occupational exposures to carcinogenic and endocrine-disrupting chemicals (EDCs). The chapter presents research on how women working in the plastic injection moulding industry, and particularly in the auto parts sector, are at higher risk of developing breast cancer. By consolidating scientific literature, primary research, and the stories and observations of workers themselves, they elucidate the types of pollution found in automobile factory settings, the historical failures of government to properly regulate workplace exposures, and the adverse health impacts women workers experience as a result. The authors argue that the invisibility of blue-collar workers in policy development reinforces gender and class discrimination.

The chapter emphasizes the inadequacy of existing workplace chemicals testing, particularly given new research on how exposure, even at extremely low levels, can be harmful, and given questions about exposures to complex mixtures. Accordingly, the authors argue that there is a need to re-evaluate the guidelines and regulatory standards for occupational health. There is also a need to acknowledge the connection between workplace exposures and elevated levels of breast cancer. The authors offer increased public inquiries, commissions to examine risk, workers compensation, institutionalized research, prevention campaigns, educational programs, and regulatory changes as ways of addressing current regulatory failures and considering sex and gendered concerns in relation to chemical exposure in the workplace.

Adrian A. Smith and Alexandra Stiver's "Power and Control at the Production-Consumption Nexus: Migrant Women Farmworkers and Pesticides" (Chapter 11) examines production and consumption in the Ontario agricultural sector, and evaluates the significant occupational exposures to pesticides experienced by women migrant farmworkers. Drawing inferences from research on environmental justice and occupational health and safety, the authors argue that the migrant agricultural population faces a greater burden of risk from pesticides than non-migrant workers. The chapter outlines a model of production and consumption in which migrant labourers are often exploited. The authors argue that constraints placed on these workers, such as a lack of power and control over working conditions, occur as a result of processes of racialization, gendering, and the regulation of citizenship status. They point to a critical need for a precautionary approach that restricts pesticide use and improves enforcement mechanisms through collective bargaining.

This volume concludes with a short reflection on the current state of chemical regulation by Dayna Nadine Scott. She argues that we may have crossed a critical threshold to reach a place in which developments in environmental health and science (including the collapse of the notion of a threshold for health effects of certain key chemical exposures); a coalition of interests in women's health, occupational health, and environmental justice; and the willingness of governments to contemplate law reform on the regulation of toxic substances are converging in a way that provides room for greater understanding and social, economic, ecological, and political transformation with regard to issues of toxic exposure. Overall, we strive to provide researchers, policy makers, and advocates with the tools to make use of this moment. We consider it a collaborative effort to expand our collective understanding of the links between social inequity, environmental risks, and the gendered division of health burdens in Canada. We bring together scientific developments, policy options, and legal analysis to develop a critical, engaged theoretical framework for thinking about gender and environmental health. We hope you make good use of it.

Note

- 1 Notice of Application, Ada Lockridge and Ron Plain, Applicants, Ontario Divisional Court, Court File 528.10 (2010).