Journal of Interdisciplinary Feminist Thought

Volume 2
Issue 1 *Women and Science*

Article 1

June 2007

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Cover Page Footnote

An earlier version of the discussion of the Institute of Medicine text at the beginning of the section 'Thinking Through Duality' appears in a previous publication: Grace, V.M. (2004) The sex/gender distinction: from feminist post-mortem to medical revival. In N. Gavey, A. Potts and A. Weatherall (eds), Sex and the Body, pp. 125-143, Dunmore Press: Palmerston North.

Beyond dualism in the life sciences: implications for a feminist critique of gender-specific medicine

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The question of a feminist critique of dualist thought, of examining its role in the life sciences, and attempting to engage a non-dual perspective is arguably central to the field of feminist thought with respect to gender and science. Critical feminist scholarship in the humanities, social sciences or life sciences requires that the scholar be something of a philosopher. As soon as the epistemological grounds of our knowledge (on what basis do we claim knowledge), and the ontological nature of the objects of our inquiries are queried and interrogated, scholarship enters the field of philosophy. All research embodies epistemological and ontological assumptions about the nature of knowledge, and the nature of the world we are researching.

Feminist scholars in the field of social studies of science, however, do not study these questions of dualism from the point of view of philosophy, but rather from the point of view of action, i.e. from the point of view of grappling with substantive questions and issues in the world and the attempt to understand them through research. In my own case, the first encounter with problems of dualism resulted from interviewing women about their use of the health services for chronic pelvic pain, and discovering how their experiential discourse was traversed, constrained and shaped by the medical duality of pain being due to either somatic or psychological causes (Grace, 1995, 1998); if it's not one, it must be the other, a choice that is a clear example of the body/mind dualism in medicine. I thus approach the problematic of dualism in the workings of the life sciences and the practice of medicine from the point of view of a concern with how this science constructs, shapes, interacts with, and co-produces socio-cultural forms of embodiment; this concern is particularly important in the field of gender studies.

In this paper I begin with outlining the problem of dualism and addressing the question, why is it problematic? I then consider the project of thinking through duality, i.e. how gender studies scholars have to engage analytic work through encountering the inevitability of dualist conceptualisations, and yet also through critique of dualism. I

explore this through the example of gender-specific medicine. In the final section of the paper, I ask what is 'thought' that might be described as 'non-dual', and why it is important for the life sciences? The paper concludes with some thoughts on the implications of this discussion for a feminist assessment of the example of gender-specific medicine.

What is dualism and why is it problematic?

Dualism is most immediately thought of as a construct of either/or. The problems generally seen in gender studies are two-fold. Firstly, there is an objection to binary opposites such as male and female, or nature and culture, when the rigidity of an 'either/or' construct appear too rigidly dichotomous, too black and white. Possibly there are instances where it has more apparent validity and makes more sense to think in terms of both male and female, both nature and culture. Secondly, the Aristotelian dichotomy of either/or represents the world structured according to the principle of A/Not-A. In other words anything that exists is either A or Not-A; it cannot be both A and Not-A at the same time (and therefore the other possibility of 'neither A nor Not-A' is also excluded). It either is or it is not X (a pen cannot be both a pen and not a pen at the same time). This reflects the linguistic structure established in Saussurean semiology of identity/difference (where identity is A, and difference is Not-A). This second problem feminist scholars have identified with this structure is that it always, by definition, articulates a dominant and subordinate term: identity subordinates difference, and difference (Not-A) takes its 'identity' from A. In other words, if male/female is a binary dualist structure; male is the marked term and as such is identified, and female is defined by its/her difference from male (not male).ii Feminist scholars such as Judith Butler (1990) have engaged with Derrida's deconstructive critique of logocentrism to explore how dualist thought constitutes gender categories.

There is, however, another more fundamental problem with dualism that is sometimes overlooked or obscured by this focus on these first two problems, and that is its implicit ontology. There is an implicit assumption that is integral to dualist thought, and that is the assumption of essentialist identity itself. It takes for granted that the world exists as an array of discrete items or 'things' each with its own independent and generally fixed essence; that in terms of each item, what 'is' can be identified and defined

in absolute terms; 'it' inevitably has an essence, a reality that is isolable, and has an origin. As soon as a world of discrete entities is postulated or assumed, a logic of cause and effect is imputed.

These principles of dualist thought, and the mechanistic notions of causality of the Newtonian world-view, structure and underpin the technologies of biological knowledge that have envisioned the living body as scientific object of modernity. But what if life is not like this? What if the dominance of this form of thought, this method of postulation and validation, is a constructed ontology, and one in which this species of homo sapiens has indulged for at least the last three thousand years (with a few notable exceptions)?iii What if the rationalism of Cartesian dualism and analytic method is inadequate, or worse, erroneous when it comes to developing an understanding of living organisms; when it comes to developing a theoretical biology?

Before attempting to point to alternative ways of thought that undermine and refigure the ontological imperatives of dualist thinking, I present a critique of one example of the way dualist thought is structuring a vision of the living body currently. I hope also to show how this is problematic from a gender studies perspective – that is, the new development of gender-specific medicine currently gaining considerable momentum on the horizon.

Thinking through duality

> *And what is sex anyway? Is it natural, anatomical, chromosomal, or hormonal, and how is a feminist critic to assess the scientific discourses which purport to establish such 'facts' for us?*
>
> *Judith Butler, 1990: 6-7.*

In 2001 the Institute of Medicine (IOM) in the United States published a book-length report on the work of a committee of expertsiv established to investigate the question of the biological contribution of sex to human health, and the implications for research in health and medicine. The title of the book is Exploring Biological Contributions to Human Health: Does Sex Matter? and the findingsv result in an overwhelming 'yes'. More specifically, the Committee on Understanding the Biology of Sex and Gender Differences had the task of answering the questions: when does sex matter, and how does sex matter?

The work of this Committee must be considered against a background of medical and biomedical research being subject to criticism for treating sex difference as relevant to research only in reproductive areas of biology, and ignoring the role of sex difference in all other non-reproductive research. For example, the problem most commonly identified by those concerned with the implications of this trend is the tendency (prior to 1997 in the US) for clinical trials to be conducted using only male subjects (the reason given being that women's hormonal cycle would confound the results) and extrapolating the results to a general population.vi

The implicit assumption here appears to be that, in terms of biology, the population 'men' and the population 'women' are the same, or more strictly similar, in all respects apart from their reproductive components; in other words, the point of difference is relatively confined. Feminists have argued (Fausto-Sterling, 2000: Tavris, 1992) that the binary of sex difference produces two possibilities: sameness, whereby the 'other' is appropriated to the norm and rendered invisible, or difference, where difference is established relative to the norm (although incommensurably different, invariably inferior, lesser, etc).vii

The Committee claim explicitly that they foregrounded their focus on sex differences in non-reproductive areas of biology, noting in the preface that where there are such differences they may have important consequences for health. Understanding these differences will, they claim, make it possible to design health care more effectively for individuals, both males and females… Furthermore, these differences can offer important insights into underlying biological mechanisms (2001, x). They come to the task equipped with a rather awesome "new arsenal of powerful tools" that have emerged from the laboratories of the biological sciences "over the last few years."

The results of this in-depth audit of existing research, and analysis of emerging trends and new findings, create a strong mandate and agenda for research on sex differences understood in strictly biological terms to proliferate and expand into every aspect of human biological, biomedical and pharmacological sciences:

"The study of sex differences is evolving into a mature science. There is now sufficient knowledge of the biological basis of sex differences to validate the scientific study of sex differences and to allow the generation of hypotheses with regard to health. The next step is to move from the descriptive to the experimental phase and establish the

conditions that must be in place to facilitate and encourage the scientific study of the mechanisms and origins of sex differences…sex should be considered when designing and analysing studies in all areas and at all levels of biomedical and health-related research." (IOM, 2001, xix)

The pendulum is swinging away from an era of erasure of difference within medicine and its emphasis on sameness (with the problems of male-as-norm), towards an era of valorising the significance of sex difference.viii

The Committee's findings and recommendations are comprehensive. To give some brief examples from the summary, the report includes the key point summarised by the subheading that "every cell has a sex", and it therefore recommends the promotion of research on sex at the cellular level (for example, it is important to "determine the functions and effects of X-chromosome- and Y-chromosome-linked genes in somatic cells as well as germ-line cells").ix Another recommendation is the "study of sex differences from womb to tomb" (for example, they advocate the "inclusion of sex as a variable in basic research designs", and the importance of "mining cross-species information", ensuring that the endocrine status is identified for all research subjects). This is reflected in the sub-heading "sex begins in the womb". The Committee notes the obvious implication from their recommendations — that women's health is "expanding into the larger concept of gender-specific medicine."

What do the authors mean by 'sex'? The Committee clarifies the differential use of the terms sex and gender, and recommends that these be used consistently in research:

Sex: *The classification of living things, generally as male or female, according to the reproductive organs and functions assigned by chromosomal complement.*

Gender: *A person's self-representation as male or female, or how that person is responded to by social institutions based on the individual's gender presentation. Gender is rooted in biology and shaped by environment and experience.*

(IOM, 2001, 17)

Thus the Committee refers to 'sex differences' when the differences "appear to have primarily biological origins" and to 'gender differences' when they "appear to be expressed in response to social influences" (p.7). After some cautionary qualification

about the use of this 'causal' notion, they are on more certain ground when they move on to assert that "with respect to sex, humans are generally dimorphic" – either XX or XY (acknowledging some atypical variance). They note similarities with the definitions used by the American Medical Association and the World Health Organisation.

This renewed emphasis on sex differences in (bio) medical research is becoming manifest in the newly defined field of gender-specific medicine. The First World Congress on Gender-Specific Medicine was held in Berlin in February 2006. The subtitle of the event was Men, Women and Medicine: A New View of the Biology of Sex/Gender Differences. The list of sixty Faculty of the Congress (invited speakers) included a wide range of medical and biomedical scientists representing a considerable number of specialties within medicine. A very small number of officials with portfolios in women's health or women's issues, and one or two scientists with a public health focus were there. I was fortunate to attend this conference, attended all the plenary sessions, one stream of the parallel sessions, and received all the conference material (including the book of abstracts)x. I took extensive notes, tape-recorded sections of some papers, took photographs of some Power Point slides, and collected printed papers where they were available.

The main overt consensus with respect to the significance of 'sex' and 'gender' evident at the Congress was that this field of gender-specific medicine is new, it is important for women's health, it is progressive, and it is making headway against internal conservatism and opposition. Gender-specific medicine was defined in the first plenary as "the science of how normal human function, and the experience of the same diseases, differ as a function of biological sex" (Legato, 2006). The new view is that the sex of the patient should be fundamental to medical care. This view also constitutes the overarching focus for the influential U.S.-based Society for Women's Health Research whose goal is "for sex-based biology to be integrated and recognized as an essential element of all research". The significance of sex differences to health and illness is integral to their mission: "Differences between the sexes exist, and whether a person is male or female matters in the prevalence and severity of a broad range of diseases, disorders, and conditions. It matters at every stage of life - from the very beginning to the very end. It matters at every level - from the single cell to the entire body. It matters to the health of everyone" (cited from Web site).

The predominant implicit discourse that emerged from the Congress as a whole was that women and men comprise two entirely different groups, and membership of one or other group is of hitherto unrealised significance for health, illness and disease. Whether we are talking about cardiovascular disease, renal disease, autoimmune diseases, asthma, pain conditions, biological time-keeping, brain function, the message was the same: men and women are different, this difference has been ignored, it is very important to women's health (and inevitably men's health), and it must be recognised and incorporated into health research, health care, and medical education (to ensure graduates obtain 'gender competence'). This 'difference' was articulated as a dichotomous construct; male and female are incommensurable in their oppositional difference. Sex hormones, featured as integral to the constitution of difference, are evidently influential in a multitude of sites of bodily function.

The plenary speakers emphasised that gender-specific medicine is "not women's health alone"; and that "women's health is not a feminist, or political, or commercial issue; it is an intellectual imperative…". The concern to be inclusive of 'women's health' (gender-specific medicine and women's health) was frequently made in the context of invoking an historical continuum from the women's health movement of the 1970s and 80s to this current development of gender-specific medicine.

'Gender-specific medicine' (which, according to their own definitions is really 'sex-specific medicine'), is a major new development within medicine, and at the conference the plenary speakers referred to the "coming revolution in health care". It endorses the dichotomising and thus essentialising of biological sex. This absolute bifurcation of 'male' and 'female', as well as the 'biological' and the 'social' inherent in the sex/gender distinction, disavows attempts to re-theorise biology in non-dualist terms. Other associated dualisms include body/mind, nature/nurture and gene/environment.

While this lack of critical epistemological concern endures, we will remain caught within the conundrum of same versus different; we will also remain bound to reductionism of the statistical basis of the normal and the pathological, and the hierarchy intrinsic to dualism will continue to sustain a dominant and subordinate term. Most importantly, in addition to witnessing a veritable industry of sex differences research, professional organisations and large conferences, we will see biomedical researchers and medical clinicians taking up positions in relation to these debates in ways that will have

very real consequences for the phenomenological experience of illness for women (and men), and the treatments they do or do not receive. For example, an extensive literature indicates that the experience of chronic pain, or other forms of what are often 'medically unexplained symptoms', may be mediated by encounter with medical views of gender differences with respect to these conditions and symptoms.

Without a critique of gender dualism, a medicine will inevitably develop that is predicated on the assumption that men and women form resolutely discrete groups which are genetically determined, and they therefore should receive qualitatively and quantitatively different treatments, drugs, behavioural therapies and so forth. At the Gender-Specific Medicine Congress there were many papers which indicated potential concrete pathways for differential care for men and women as a result of the research presented. I will just give two quite different examples. We learnt about how men and women differ in their biological time-keeping processes. Bendayan (2006) claimed that deciphering gender pharmacogenomic clocks by clinical functional genomics and proteomics would lead to the creation of a biotechnology that provides "gender time-mapped pharmacogenomic personalized medicine", which could be used for numerous purposes including the "understanding of mechanisms underlying time-disruption in the etiology of various diseases […] in men and women along their lifespan". Plenary speaker Marianne Legato (2006) explained in her paper that gender-specific medicine will mean we learn a lot more about men, in particular about the implications of their greater vulnerability compared to women at every stage of development. She suggested, for example, that possibly psychosocial demands placed on boys to encourage male behaviour are "too harsh" given their increased vulnerability. Such a view, she suggested, would arguably have implications for educational and parenting policies.

I suggest that the problem of dualism evident in this discussion takes us into the depths of the discipline of biology, into the relative (and astounding) absence of onto-epistemological critique making any significant inroads into the life sciences for the last three hundred years.

By way of transition to the question of an alternative to dualist thought, a critical method will begin with deepening the understanding of the workings of dualist thought in the life sciences. In other words, what kind of science is it that leads to the findings of the

Institute of Medicine on the overwhelming significance of sex difference to biomedical research, medical practice, and human health?

Thinking non-dual

In this section I propose a number of key unquestioned assumptions of the life sciences or biomedical sciences, and then argue how a rigorous critical assessment of these leads to an alternative approach that rejects dualism. I am drawing on the work of a number of authors here (see Atlan, 1999; Bohm, 1980; Canguilhem, 1989 [1966]; Fox Keller, 2000; Hubbard and Wald, 1999; Lewontin, 2000a, 2000b) but most importantly, Susan Oyama (2002, [1985]) and Walter Elsasser (1998, [1987]). Oyama and Elsasser wrote paradigm shifting book-length works in the mid-1980s, and yet twenty years later nothing, or very little, has changed. If anything, there has been an intensification of the approach they criticise. It is important to acknowledge that additional theoretical developments such as systems biology, complexity theory and string theory are endeavouring to elaborate the basis for re-framing biological sciences, but it remains the case that in mainstream biological and (bio)medical science today, research progresses 'business as usual' with basic assumptions remaining unquestioned.

The unquestioned assumptions proposed are:
1) reductionism
2) Cartesian analytics
3) mechanistic model of cause and effect
4) preformationist understandings of information
5) information storage

Critique:
1) Reductionism

According to Elsasser, it is uncontroversial to state that the current mainstream methods of the biological and biomedical sciences are based on those of inorganic chemistry and physics. However, he argues that this is inappropriate given the nature of organic data; the data cannot be described or explained in these terms. To do so is reductionist. Reductionism in this context assumes that a theory of organisms, of bodies,

can be developed by combining deterministic necessity with the action of chance (Elsasser, 1998). On the contrary, organic data is characterised by what Elsasser (1998) calls "unfathomable complexity", which implies that there is no series of experiments that could possibly be devised to "demonstrate the way in which the sum total of properties of an organism, or class of organisms, can be reduced to the consequences of molecular structures and dynamics" (Elsasser, 1998: 3). This, however, is what current laboratory work in the life sciences in fact assumes. Furthermore, there is a vicious circle functioning whereby the experimental method used favours stable experimental situations, which in turn reinforce reductionism.

2) Cartesian analytics

In the inorganic sciences, the Cartesian method involves taking complex systems, analysing them by breaking them down into smaller and simpler components, studying these components separately, and putting them back together again theoretically, to explain the function of the system. Arguably this is the method through which the advocates of gender-specific medicine are assembling their data and building their case. But biology is a non-Cartesian science fundamentally and qualitatively different from the inorganic physical sciences (Elsasser, 1998).

For example, we may consider the notion Elsasser provides of 'generalised complementarity' proposed by the physicist Niels Bohr. This means that the atomic system can be understood in terms of two models, as wave and as particle. Generalised complementarity means these two ways of viewing the behaviour of atoms cannot be understood as an either/or. Rather, both are valid, and complementary. But in terms of epistemology, there is no way around the fact that the more accurate the knowledge gained of wave action in a specific instance, the less one knows about the atomic system functioning as particles. As Elsasser (1998) notes, Bohr's generalised complementarity has no counterpart in sciences using binary logic. In biology, this implies that any description of highly complex bodies, or organisms, can be achieved only through a process of 'loss'; if we know more about one aspect, we are simultaneously knowing less about another aspect. Unfathomable complexity means we cannot have knowledge of the whole.

In biology, unlike inorganic science, the data forms heterogeneous classes. In other words, whether the focus is on cells, molecules or organisms, no two are the same; they are alike and form classes through this similarity, but they are not identical. According to Elsasser (1998), heterogeneous classes and relationships cannot be analysed using a Cartesian method.

3) Mechanistic cause and effect

A reductionist approach involves applying a mechanistic model of cause and effect to organic life; it is an approach to causality that is based entirely on inorganic chemistry and physics. But in the organic sciences, an organism, or biological body, is a source (or sink) of causal chains that cannot be traced through a linear, mechanistic logic before becoming lost in the unfathomable complexity of the organism (Elsasser, 1998).

The possible states of an organism are so immensely numerous, we have to assume that the structure of the organism is highly indeterminate. Elsasser (1998) argues that this observation introduces the notion of creative selection: all possible molecular patterns are not existent in actual cells in the world, so there is a process of selection. Elsasser claims that the very availability of such a 'choice' from which selection is made is the basic criterion for a non-mechanistic biology. In other words, there will be regularities of biology that are in part autonomous; there is no such counterpart in inorganic chemistry and physics.

Elsasser (1998) details how the data of biochemistry differ from that of inorganic chemistry in two fundamental ways: firstly there is chemical heterogeneity of organic tissue (compared to homogeneous inorganic matter), and secondly there is a mechanical instability of electrical charges in organic molecules (compared to stability in inorganic molecules). These differences counteract mechanical determinism. For example, "the instabilities of electrical charges interrupt the reproducible flow of causal, deterministic events, and hence allow the introduction of what we shall call autonomous biological processes" (p.103). 'Creativity', as Elsasser uses the term, is a condition of the organism whereby mechanistic determinism, or linear cause and effect, is not operable.

Elsasser observes that "the embryo grows into an adult human being in the course of time because its ancestors were human beings" (p.147). In other words, the outcome of

creativity is repetition. He notes that this new concept of causality is absolute anathema to those educated within a Newtonian world-view, but it is central to the paradigm shift needed in the life sciences. Recent research at the interface of neuroscience and psychoanalysis provides some possible insights into the role of language in the development of the human brain. Pommier (2004) argues that advances in neuroscience corroborate the psychoanalytic understanding of the importance of 'the Other', i.e. a significant person, in the growth of the human infant (and furthermore that psychoanalytic understanding is vital for understanding these findings of neuroscience). Unlike development in other species, the development of neural networks and the attrition of neurons occur in the human infant through engagement with his or her entourage whereby the sounds of voices have significance by virtue of their meaning for the Other. This significance plays a role in structuring the neural topography of the brain. Such an understanding breaks any suggestion of an organicist understanding of neurons and brain structure grounded in a dualism of mind/body.

4) Preformationist understanding of information

The best example of the problem Oyama (2002) characterises as a preformationist understanding of information is evident in the case of genetics. Oyama contributes the insight that accepted interpretations of the metaphor of the gene as a database containing the informational plan that is productive of the developmental form of the organism is in essence preformationist. As such, it involves the postulate of a pre-existing form or ontological instance being necessary to be able to explain developmental formation within biology. It is assumed that for some form to exist, there must be evidence of some prior code, or plan, or activating principle. Oyama argues and demonstrates that this is an empty postulate.

Oyama (2002) proposes an approach to developmental systems that abandons any notion of preformation, and the dualistic opposition between gene and environment, nature and nurture. She argues for the notion of ontogenesis whereby developmental processes occur in orderly yet contingent ways, where 'genetic information' does not take on a magical existence prior to its meaning being 'read' but is formed as information in the very process of cellular and extra-cellular developmental processes. Its meaning is not pre-ordained, but depends on its actual functioning; it does not pre-exist the processes

that give rise to it. Thus, rather than order or regularities in biology being the outcome of some process of translation or imposition, they are rather understood in terms of transformation and emergence (see also Oyama, Griffiths and Gray, 2001).

In Elsasser's terms (1998), the discrete genetic message can be understood as a symbol of the complete reproductive process, where a symbol is an incomplete message from which the organism can reconstruct a structure by the process of heterogeneous reproduction such that the final structure is similar to an ancestral structure. Identity is not replicated; rather similarity is reproduced through a degree of autonomous, creative selection. This is particularly evident in the case of the human brain. In the case of human beings, psychoanalytic understandings of the role of the Other through language are crucial to shaping this selection. As Pommier (2004) writes, "the reason for the existence of a specific neuron is to be found outside the body," (p.26) and similarly, neurons decay if they are not 'exercised' through the sounds and meanings of the words of the Other. Furthermore, Pommier stresses that the emergence of the Other was central to the hominisation process and distinguishes the human species.

Lewontin (2002) writes "there are no 'gene-actions' outside environments, and no'environmental actions' can occur in the absence of genes" (p. xiv). In accord with Bohr's generalised complementarity, there is no experimental method that will enable a complete, simultaneous knowledge of both; their complementarity means it is not possible to hold one invariant and vary the other. Genes are, according to Varela, Thompson and Rosch (1991), better conceptualised as "elements that specify what in the environment must be fixed for something to operate as a gene" with the corollary that "in every successful reproduction an organism passes on genes as well as an environment in which these genes are embedded"(p.199).xi

5) Information storage

The concept of memory is used in biology to parallel the processes of cause and effect in physics. An effect is assumed to result from the mechanical activation of information, the nature of which is stored in the organism (in the genetic code, or some other information storage device). Elsasser's most radical proposal is that no such storage mechanism exists that would explain all transmission. Some transmission can be explained through genetic inscription, but most transmission cannot. He notes that the

whole of cerebral memory cannot be explained through any form of storage. He calls this 'memory without storage', postulating the transmission of information over a time interval without an intervening storage mechanism (such as coding or inscription).

While the organism creates a pattern, and an order (biological regularity) emerges,"… there is no indication of any mechanism which stores the requisite information" (Elsasser, 1998: 42). In other words, heterogeneous reproduction (or 'holistic memory'), reliant on the notion of a partly autonomous biology involving creative selection, cannot be understood in terms of mechanistic models of information storage. For Elsasser, this is the nucleus of a theory of organisms, or a theoretical biology.

Therefore an alternative approach not grounded in a dualist science proposes:
1) unfathomable complexity
2) developmental systems/ holism
3) emergence and creativity
4) ontogenesis of information in heterogeneous reproduction
5) memory without storage

The emphasis on similarity rather than identity points to similarities at the level of large heterogeneous classes. Citing an early text by Williams written in 1956, Elsasser (1998) makes the point that variation at the level of individual organis is huge. This large range of variation appears only when one focuses on the details. Contemplating the idea that no two brain states are alike (either in one individual at different points in time, or between two individuals) means confronting the immensity of the numerical values involved, and the sheer magnitude of variation encountered in organic sciences. The statement made by Elsasser "each cell has individuality" (1998: 131) opens onto a world of difference in terms of medicine when compared to the IOM statement "every cell has a sex". These two simple statements pull in radically opposing directions.

Conclusion

We can develop critiques of instances of dualism, such as that embodied in gender-specific medicine, and point to its effects. We can think through duality, by

pragmatically working both within its terms and at the same time questioning those terms, while being mindful of the fact that the very structure of the language we use mitigates against anything but dualist, essentialist forms of thought. But what does it mean to think differently? If a critique of dualism is important to feminist critiques of the life sciences, then it is important to address the question of how to not think in dualist terms.xii

I have presented a few very brief hints on alternative means of conceptualising some of the central assumptions that support a dualist ontology in the life sciences, and argue that a reconceptualisation is crucial for an adequate understanding of the living body. I suggest that the implications of such an approach for a feminist assessment of medical science and practice, and gender-specific medicine in particular are considerable. Gender-specific medicine emerges directly from the unquestioned assumptions outlined above: that is, it emerges from a theoretically void, empiricist, mechanistic, reductionist biological science based on mimicking inorganic sciences, when this is clearly neither possible nor desirable. If the medical scientists involved worked within a non-dual, non-Cartesian, non-Newtonian world-view, I propose that they would never have arrived at the conclusions they have regarding gender-specific medicine.

It is unlikely that a paradigm shift will disrupt the field of the biological sciences in the foreseeable future. Elsasser (1998) made the point that institutional and scientific change is very slow. But at least a critical consciousness can influence how feminists interact with the ironically-named 'coming revolution' of gender-specific medicine, and what is made of its claims and interventions.

Endnotes

i I use the word 'gender' in this paper to encompass 1) distinctions made between male and female in the bio and medical sciences, and 2) the field of critique of the constructions of these differences.

ii In many contexts the identified term is referred to as the 'unmarked' term because of its assumption of normality. The 'marked' term then is that term in the position of

difference, which is marked by virtue of its difference from the norm. I prefer to refer to the identified term as the marked term, as it is more unambiguously essentialised.

iii Over the last 3,000 years a relatively small number of cultural and philosophical groups have bypassed dualist and essentialist thought, for example, some Buddhists, Taoists, and the linguistic and cultural features of some peoples.

iv The Committee comprised 16 members, the majority of whom were professors of various medical specialties in university medical departments and schools. There were also professors in biology, neuroscience, zoology, preventive medicine, genetics, two individuals from the private sector (one clearly from a pharmaceutical company), and notably for the purpose of this paper, Anne Fausto-Sterling, Professor of Biology and Women's Studies at Brown University.

v I use the word 'finding' in this section to refer to the answers the Committee provides in response to their key task which they state was to answer the questions 'Does sex matter? When does sex matter? And how does sex matter? (see IOM, 2001, ix).

vi It is now mandatory in a number of western countries for there to be a gender balance in clinical trials unless there is an acceptable reason for this not to be the case.

vii Feminists continue to question whether difference or sameness is the best route to equality for women. My point in this paper is that this binary itself is problematic, and therefore both resolutions to the problem of equality are hostage to this duality.

viii For a current discussion of the 'biology of sex differences' see Federman (2006).

ix Germ-line cells are transmitted from one generation to the next, whereas somatic cells are not. Strictly, germ-line cells are any of the embryonic cells that have the potential to develop into spermatozoa or ova (Oxford Medical Dictionary). The specification by the committee that all cells have a sex means they advocate a research focus on sex differences in all cells, not just germ-line cells.

x The reference for the book of abstracts: Gender Medicine, Volume 3, Supplement A, 2006.

xi For a discussion of the significance of the critique of preformationism in the case of its application in human genome epidemiology, see Grace (forthcoming).

xii James Austin (2000) argues that those educated within dualist language and ontology can only achieve non-dual, non-essentialist thought processes through a restructuring of neurological pathways. His review of empirical research demonstrates that forms of

meditative practice can literally 're-wire' the brain to promote non-dual thought, that cannot be achieved through other means.

References

Atlan, H. *La Fin du Tout Génétique, Vers de Nouveaux Paradigmes en Biologie [The End of All Genetics: Towards New Paradigms in Biology].* Paris: INRA, 1999.

Austin, J.H. *Zen and the Brain. Towards an Understanding of Meditation and Consciousness*. Cambridge MA: The MIT Press, 2000.

Bendayan, H.J. *Timesome: the human gender clock-genes interactome of biological time-keeping. Toward mapping and timing gender Chrono-pharmacogenomic individualized medicine and therapy.* Paper presented to the First World Congress on Gender-Specific Medicine, Berlin, Germany, Feb 24 – 26, 2006.

Bohm, D. *Wholeness and the Implicate Order*. London: Routledge and Kegan Paul, 1980.

Butler, J. Gender Trouble. *Feminism and the Subversion of Identity*. New York: Routledge, 1990.

Canguilhem, G. *The Normal and the Pathological*. New York: Zone Books, 1989 [1966].

Elsasser, W.M. *Reflection on a Theory of Organisms. Holism in Biology*. Baltimore: The Johns Hopkins University Press, 1998 [1987].

Fausto-Sterling, A. *Sexing the Body: Gender Politics and the Construction of Sexuality*. New York: Basic Books, 2000.

Federman, D.D. (2006). "The biology of human sex differences." (Review article). *New England Journal of Medicine*, 354 (14): 1507-1514.

Fox Keller, E. *The Century of the Gene*. Cambridge MA: Harvard University Press, 2006

Grace, V.M. (forthcoming) "Human genome epidemiology: reviewing the stakes." Inte*rnational Journal of Health Services*.

Grace, V.M. (1995). "Problems women patients experience in the medical encounter for chronic pelvic pain: a New Zealand study." *Health Care for Women International*, 16 (6): 509-519.

Grace, V.M. (1998). *"Mind/body dualism in medicine: the case of chronic pelvic pain without organic pathology: A critical review of the literature."* International Journal of Health Services, 28(1): 127-151.

Hubbard, R. and Wald, E. *Exploding the Gene Myth. How Genetic Information is Produced and Manipulated by Scientists, Physicians, Employers, Insurance Companies*. Educators and Law Enforcers. Ed 2. Boston: Beacon Press, 1999.

Institute of Medicine Exploring the Biological Contributions to Human Health. *Does Sex Matter?* National Academy Press: Washington, DC, 2001.

Legato, M.J. *The new discipline of gender-specific medicine and the coming revolution in patient care*. Paper presented to the First World Congress on Gender-Specific Medicine, Berlin, Germany, Feb 24 – 26, 2006.

Lewontin, R.C. Forward to Oyama, S. *The Ontogeny of Information – Developmental Systems and Evolution.* Durham NC: Duke University Press, 2002.

Lewontin, R. *The Triple Helix. Gene, Organism and Environment*. Cambridge MA: Harvard University Press, 2000a.

Lewontin, R. *It Ain't Necessarily So. The Dream of the Human Genome and Other Illusions.* Ed 2. New York: New York Review of Books, 2000b.

Oyama, S. The Ontogeny of Information: *Developmental Systems and Evolution*. Durham NC: Duke University Press, 2002 [1985].

Oyama, S., Griffiths, P.E. and Gray, R.D. eds. *Cycles of Contingency. Developmental Systems and Evolution.* Cambridge, MA: MIT Press, 2001.

Pommier, G. *Comment les Neurosciences Démontrent la Psychoanalyse (How the Neurosciences Corroborate Psychoanalysis*). Paris: Flammarion, 2004.

Society for Women's Health Research: http://www.womenshealthresearch.org/hs/home.htm, 6.03.06

Tavris, C. The Mismeasure of Woman. *Why Women are not the Better Sex, the Inferior Sex, or the Opposite Sex*. New York: Simon and Schuster, 1992.

Varela, F., Thompson, E. and Rosch, R. *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge, MA: The MIT Press, 1991.