

Messengers of Sex

Since the early twentieth century, hormones have commonly been understood as ‘messengers of sex’. They are seen as essential to the development and functioning of healthy reproductive male and female bodies; millions take them as medications in the treatment of fertility, infertility and aging. However, in contemporary society, hormones are both disturbed and disturbing; invading our environments and bodies through plastics, food and water, environmental oestrogens and other chemicals, threatening irreversible, inter-generational bodily change. Using a wide range of sources, from physiology textbooks to popular parenting books and pharmaceutical advertisements, Celia Roberts analyses the multiple ways in which sex hormones have come to matter to us today. Bringing feminist theories of the body into dialogue with science and technology studies, she develops tools to address one of the most important questions facing feminism today: how is biological sex conceivable?

CELIA ROBERTS is a Lecturer in the Department of Sociology at Lancaster University. She is the co-author of *Born and Made: An Ethnography of Preimplantation Genetic Diagnosis* (with Sarah Franklin, 2006).

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Messengers of Sex

Hormones, biomedicine and feminism

CELIA ROBERTS
Lancaster University



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A message to readers

Like mine, your worlds probably teem with messages: emails, text messages, answer-phone messages, targeted advertising. Arriving home, at work, off the plane, onto the train, we check our messages. Who has been in contact with us? What did they have to say? What do they want us to do?

These messages are both a boon and a burden. I can barely imagine academic or personal life without email, but often approach my inbox with trepidation, especially after avoiding it for several days. These forms of messaging carve novel channels of communication and make possible new ways of articulating love, hostility, demand and care. Messaging, we have all learnt in deeply embodied ways (the thud of your heart as you double-click to open an email; the delight on someone's face as they read a text message; the involuntary smile as you hear a recorded familiar voice), is neither bland nor purely technical. Messages do not just convey information; they implicate, stir up feeling, make new worlds and responsibilities, create personal and political dilemmas. In short, messages are actions and stimulate further actions.

In the midst of this early twenty-first-century proliferation of messages comes the demise of historically significant cultural forms of *messengers*. On 3 February 2006, for example, Western Union terminated its telegram services. Announced on the internet, this closure of a 150-year-old service made few waves. We no longer need human messengers and slips of paper to make contact; our machines perform these services, albeit with huge amounts of labour and vast investments of time and money to produce and maintain the related technologies. The messaging we are used to now appears to work without embodied messengers: messages move 'instantly' between the sender and the receiver. The technologies underlying contemporary messages are of course still material, but messengers today are

distributed, made up of hard-to-grasp entities like software and silicon chips. The entities and networks that carry our messages are massively complex sets of relations between machines, humans, objects and codes. In contemporary forms of communication, then, messages are not entities carried from one place to another by an independent messenger. Messages flow through a complex network of relations and are literally constituted by these relations.

In biological terms too, we inhabit worlds brimming with messages. Most significant culturally are genes and chromosomes, which are often described as containing ‘instructions’ or ‘codes’ that are executed by cells. In pervasive popular discourses of genetic determinism, genes are described as carrying information through generations, instructing bodies to developmentally unfold physical and psychological characteristics, propensities for specific diseases and particular skills and attributes. In the case of sex, this role has been described scientifically as relatively simple: each human has two sex chromosomes coding for maleness or femaleness, a coding that produces gonadal differences *in utero* and initiates a cascade of sexual differences throughout foetal development and postnatal life. This representation is undermined by the fact that genes and chromosomes cannot work on their own; genetic ‘instructions’ must be ‘carried out’ by other biological entities such as neurons, hormones and proteins within complex biological and ecological systems. Increasingly, as science-studies theorist Joan Fujimura describes, scientists find that genes interact with other genes, ‘with various proteins, developmental pathways, cell signalling pathways, and many other parts of cellular, organismal, and environmental parts and processes that are fast becoming the territory of a new field called “systems biology”’ (Fujimura 2006: 28). Even in the supposedly relatively simple example of sex determination, then, technoscientific understandings of the messaging work of genes is ‘steadily increasing in complexity’ (Fujimura 2006: 28).

Alongside genes, hormones constitute one of the three most significant biological messaging systems for plants, animals and humans (the neurological system is the third one). Whilst a significant body of social scientific and cultural analysis of the messaging actions of genes has developed, there has been very little on hormones (or indeed neurons). This book, then, makes a contribution to social scientific and cultural analysis of contemporary biological actors by focusing on these less popular biological actors. In particular, it reworks the early twentieth-century idea of hormones as ‘messengers of sex’ to theorise the role of biology in the production of sexed bodies.

Messengers of Sex describes the historical development and contemporary state of technoscientific and biomedical understandings of hormonal action. In mainstream understandings, developed from the late nineteenth century onwards, hormones are understood to carry messages within sealed, homeostatic systems: systems that maintain a natural health or ‘balance’ in the body. Working with telegram-era models of messaging, early to mid-twentieth-century endocrinology understood the messenger as a non-implicated entity that carries a stable message from one preexisting and active entity to a responsive other. This conventional model describes sex hormones (oestrogen, progesterone and testosterone) as taking the message of ‘sex’ from the genes (which programme a predetermined sex) to the body (which changes according to the content of the message, thus producing bodily sexual difference). This model is represented in twentieth-century endocrinology textbooks and other technoscientific and popular literature in flow diagrams and line drawings of human bodies. Arrows represent the messaging of hormones moving in circular loops between the gonads (which are genetically programmed to produce sex hormones), the brain (where other hormones are produced) and other relevant parts of the body (to stimulate breast and body-hair growth during puberty, for example). These depictions borrow from mid-twentieth-century models of cybernetic signalling: hormonal circuits are figured as negative feedback loops in which the messages (‘information’) conveyed by hormones as ‘inputs’ change the activities or ‘outputs’ of the cells and organs at their destination.

In the early twenty-first century, this technoscientific model of hormonal action – like its information and communication technology counterparts – is undergoing serious stress-related change, caused by a kind of ‘information overload’. This change provides an opportunity to reconsider conventional figurations of hormones as messengers of sex. In a review article, environmental toxicologist John McLachlan (2001) describes how early twentieth-century definitions of oestrogens are breaking down in the contemporary biosciences. In the first three decades of the twentieth century, ‘oestrogen’ came to refer to a chemical message that produces a period of heat (estrus) in a female animal or human. As the material practices of endocrinological research developed – from injecting chemicals into mice’s vaginas or testing the weight of the uteruses of castrated mice, to microbiobiochemical analyses of how hormones move through the body and bind with specific receptor sites on the cell walls of target organs – this definition changed. Oestrogens came to be defined as ‘chemicals capable of stimulating an increased number of cells from

oestrogen target organs grown in tissue culture; [or] chemicals that form ligands [bonds] for the ER [oestrogen receptor] and displace radiolabeled estradiol from its binding' (McLachlan 2001: 328). Even more recently, as this work joined up with genetic research, hormones came to be understood as 'chemicals that regulate the expression of oestrogen target genes; and, chemicals that transactivate ER-driven reporter genes in cells in culture' (McLachlan 2001: 328).

These functional definitions of oestrogens, derived from specific technoscientific practices, today cause problems for scientists because increasing numbers of chemicals can be said to do *some* of these things, but not others. McLachlan articulates these controversies: 'If a chemical binds the ER with a high affinity and specificity, is it an oestrogen? Or must it also activate ER-regulated genes? Must it lead to a functional response?' (McLachlan 2001: 328). Such questions make some scientists want to return to earlier certainties, to insist that 'oestrogens' must always stimulate the tissues of the female genital tract. Others are more open to the suggestion that it is no longer clear what an oestrogen is. Semour Lieberman (1996 cited in McLachlan 2001), for example, argues that one of the bestknown naturally occurring substances in this field – estriol – may *not* 'really' be an oestrogen, despite being called such for sixty years, because it does not produce estrus. McLachlan describes this dilemma with some glee. Lieberman, he writes, 'raises the deliciously provocative possibility that estriol, the oestrogen of pregnancy in humans, may actually have a different role than one might surmise from its classification as oestrogen' (McLachlan 2001: 328). Lieberman thus raises a significant, disturbing question: 'When is an oestrogen an oestrogen, and when is it not?' (Lieberman, in McLachlan 2001: 328).

McLachlan's interest in these definitional difficulties is fuelled by work on endocrine-disrupting chemicals (or environmental oestrogens) and their actions in plants, invertebrates, animals and humans. McLachlan's and others' research on these chemicals challenges traditional definitions of hormones and troubles modern understandings of the boundaries and characteristics of the hormonally sexed body. As in the case of email and text messaging, the volume of (hormonal) messages has recently massively increased, causing confusion both about what a message is and how to distinguish between a message and a messenger. McLachlan describes our contemporary world as one of 'environmental signalling', in which chemicals of many sorts send messages to plants, insects, animals and humans, encouraging genetic and cellular change of both profound (irreversible or organisational) and acute (reversible or activational) kinds. Sex hormones,

McLachlan (2001: 319) argues, should now be understood as part of ‘ecosystem-wide communication networks’ that link numerous species, contributing to diverse forms of health and illness. This view is a long way from the sealed, homeostatic messaging systems of twentieth-century endocrinological thought described earlier.

In this book I elaborate this twenty-first-century uncertainty, making an argument for *reconfiguring* technoscientific understandings of sex hormones as messengers. In contrast to conventional biological models that suggest that hormones message something definite and known (‘sex’) between two already existing entities, I argue that the act of messaging constitutes both the sender and the receiver of the message and that messaging can be understood as a relationship or communication between the active entities thus constituted. The content of the message – ‘sex’ – is also not predetermined in this model.

This argument is made through a detailed investigation of the inter-relationship between arenas commonly described as ‘the social’ and ‘the biological’. Critically considering key examples of hormones’ messaging (how messaging happens in physiology textbooks, in animal and human bodies, in biomedicine and in popular culture), this book demonstrates how hormones actively participate in the enactment of particular versions of the biological (or nature) and the social (or culture) and of sex. I am convinced that because such enactments are historically specific materialisations (to use Judith Butler’s term) or articulations (to use Donna Haraway’s term), they could potentially be done in other ways, leading to other forms of biology/nature and the social/culture and, indeed, sex itself. This is the political aspect of this project: to investigate what is limiting about existing hormonal messaging and consider how to open space for variation or change.

This consideration of sex hormones is intrinsically linked with feminist politics. In the Introduction, I situate this book’s argument about hormones in feminist debates about the biological or material body. Sex hormones have a complex history within feminism and have often been understood as negative constraints on women’s endeavours. Engaging seriously with biological thinking in an attempt to challenge this negativity, this book goes somewhat out on a limb in terms of feminism, which – a significant but small tradition of feminist science studies notwithstanding – has traditionally been wary of biological discourses of sex. Today, however, this limb is not a particularly lonely spot; in an era dubbed ‘The Century of Biology’, feminist theorists (and many others) are increasingly turning their attention to such issues. Along with theorists

such as Donna Haraway, Elizabeth Grosz and Rosi Braidotti – but in notably different ways – this book argues that feminism needs to theorise biological actors like hormones and to take seriously the multiple discourses that describe their actions in bodies. These actions articulate highly significant relationships between human and non-human actors – relationships that constitute contemporary forms of sexual difference and life itself. Like the messengers constituting our contemporary communication technologies, hormones establish complex and distributed embodied relations in ways barely perceptible to most of us that are both profoundly important and historically specific (and therefore contestable). This book tells critically engaged stories about hormones as messengers of sex in order to bring these actions to the surface and to articulate their relevance to feminist politics.

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