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Speculative Endocrinology and the Mid-Century Trans Futurity of Gerald Heard

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Abstract

In 1953, queer polymath Gerald Heard recognized that breakthroughs in endocrinology were beginning to dissolve destructive and archaic binaries of sex and gender. Fearing society's response, he called on science fiction writers to create stories that would help us imagine—and welcome—new ways of being human that could be accessed through endocrine therapy. Following Heard's lead, in this article I read the science and sf of the early 20th century together, showing that the sf of the time was meaningfully engaged with both the science and the politics we now think of as trans.

The 20th century opened onto a ferment of endocrinological research and speculation. The word "hormone" was coined in 1905 and "endocrinology" in 1909, and by the 1920s, glands and hormones, mysterious and powerful, were a full-blown cultural phenomenon. Basic endocrine research fueled and fed on "speculative fantasies about the imminent discovery of techniques to reverse the aging process," fantasies that were surely all the more febrile as they connected anti-aging to sex and reproduction (Pettit 1052). In Paris in the 1920s and 30s, Serge Voronoff "rejuvenated" men by implanting slices of ape testicles next to their own: hundreds of wealthy men opted for this treatment, and a science fiction novel—*The Gland Stealers*—was inspired by his work (Piepenbring). The Viennese endocrine researcher Eugen Steinach offered a vasectomy-like therapy that its recipients, including W. B. Yeats, swore rejuvenated their sexual and creative energies; for people with ovaries, Steinach provided rejuvenation through a low dose of radiation to those glands (Sengoopta 122). These early therapies were based on immature science, but the range of potential applications quickly grew.

In the 21st century, the endocrinology of sex has yielded therapies as life-saving as they are controversial. In the US, the distribution and use of the progesterone-blocker mifepristone, which has a range of medical uses including the abortion of pregnancy, was legally challenged in 2022, with more challenges likely in the near future (Mulvihill). In 2023, twenty-three states banned or heavily restricted gender-affirming care for minors, including hormone therapies such as "puberty-blocking" endocrine drugs as well as estrogen- and testosterone-based therapies (2023 Anti-Trans Bills); several of these bans are under judicial review, but many more are on the way. Obviously, these legal and legislative actions are not targeting hormones; they are targeting the people who need these hormones and drugs. Practices of care for trans people and people with

uteruses have always existed, and will survive this crisis, but it is a fraught and dangerous time for people seeking access to these therapies.

Could speculative fiction have predicted—or even helped us avoid—these politics, this moment? In 1953, queer polymath Gerald Heard (1889–1971) asserted that it could. In an essay collection entitled *Modern Science Fiction: Its Meaning and Its Future*, Heard published “Science Fiction, Morals and Religion.” Under that dry title, Heard wrote relentlessly against heteronormativity and binary understandings of sex. Seeing that biomedical knowledge about sex and gender was being transformed by endocrinology, Heard prophetically called for science fiction to support this revolution by telling stories that would support Western culture as it outgrew its norms.

Endocrinology and hormones are not common subjects for 20th-century sf or its scholars. Yet, as historian Marta Vicente observes, endocrinology was “the field that revolutionized medicine in the early twentieth century” (400). For example, the new ability to synthesize hormones sharply improved the management of diseases like hypothyroidism and diabetes. “Sex hormones,” by contrast, have a mixed record. As soon as these hormones became medically available, they were deployed in various eugenic projects. The system of biotypology developed by Italian endocrinologist Nicola Pende in the 1920s was mobilized in efforts across Spain, Argentina, Italy, and Brazil to “normalize” people whose bodies or behavior did not conform to the heterosexual binary; hormones were used in various eugenically-oriented “treatments,” including nominally temporary sterilizations, of women in Argentina (Beccalossi; Eraso). Nazi endocrinologists administered hormones to women as they entered concentration camps, resulting in temporary sterilization and lifelong reproductive problems for survivors (Kaupen-Haas; Kleinplatz and Wendling). The endocrinology of sex has also yielded powerful therapies, of course, including allowing people to control their own fertility and transforming some cancers from terminal illnesses to chronic conditions. And the discovery of hormones helped bring us the modern concept of “gender” in the mid-1950s, when psychologist John Money, dissatisfied by the language available to describe endocrine-inflected studies of intersex people ongoing for more than a decade, borrowed the word to capture the (roughly speaking) psychological aspects of sex (Germon 30–32; Gill-Peterson 97–103). As Heard recognized, endocrinology was revolutionizing more than medicine alone.

I want to acknowledge that writing about midcentury texts at the intersection of sf and trans history requires care.¹ Focusing on this period in trans history risks “a historicism that conceals how many... people in the first half of the twentieth century demanded gender reassignment from doctors or experimented with hormone therapy” (Aizura 54) and also may obscure the ubiquity of trans people who lived without medical support (Oxford 79); in the context of sf, the historicism in play is one that reifies, in Jeannette Ng’s words, “a tone of science fiction that still haunts the genre to this day. Sterile. Male. White. Exalting in the ambitions of imperialists and colonisers, settlers and industrialists.” Endocrinology enmeshes these concerns: earlier in his career, Steinach the rejuvenator (working with fellow endocrinologist Paul Kammerer) drew on his studies of the endocrinology of puberty to engage eugenicist debates about the fixity or plasticity of race and the possibility of racial improvement (Logan 64–88; Gill-Peterson 50–52).

Those debates were part of a long history of colonial relations in which “‘sex’ and ‘sexuality’ were used to denote racial/species difference and in the process became racialized long before their emergence as biomedical ‘truths’” (Méndez 47). Indeed, as C. Riley Snorton shows, drawing on the foundational work of Hortense Spillers, the idea of gender as “mutable... and amendable” emerged from chattel slavery, particularly the “ungendering” of the captive body of the African female (Snorton 56–57; Spillers 67–68). This perspective on the racial history of sex and gender is key to recognizing and resisting the impacts of anti-trans legislation, which are intensified for “low-income trans people and trans people of color whose lives are more directly intertwined with administrative systems that rely on... sex sorting” (Draz 39; see also Spade xiii–xiv). Mindful of the stakes, I hope that revisiting Heard’s article from a 21st-century vantage illuminates some important intersections between sf and trans history in the early 20th century. In particular, Heard was thinking about medical practices—especially hormone therapies that had become available in the late 1920s—that would soon be associated with the neologism “transsexual.” He speculated that these practices would disrupt norms about sex and what would come to be known a few years later as “gender.” Heard’s focus on the science of endocrinology as a substrate for literary speculation guides us toward reading speculative fiction and the medical literature of endocrinology together. Following his lead—looking for the hormones in sf—shows that the sf literature of the early 20th century, from which arose canonical concepts like the Robot and Cyborg, was significantly engaging both the science and the politics we now think of as trans.²

Below, I’ll first situate Heard’s essay in the sf and science of the first part of the 20th century (especially endocrinology and cybernetics), arriving at a trans reading of Lester del Rey’s 1938 “Helen O’Loy,” a story that has reached near-chestnut status. Then, I’ll take up Heard’s intervention, analyzing his essay and its context. Finally, I’ll revisit cybernetics, through the Cyborg, as a way to connect Heard’s prophecies to the present day, closing with some observations on the limitations of Heard’s thinking and his larger project.

Endocrinology, cybernetics, and sf

In the 21st century, expansive visions of gender have become familiar elements of sf and its criticism. The *Transcendent* series of anthologies (2016–19) and the *Routledge Companion to Gender and Science Fiction* (2023), for example, demonstrate that sf writers “have always worked to upend conventional categories of gender and sexuality, envisioning storyworlds in which the binary, exploitative structures of heteropatriarchy can be exposed, challenged, even overcome” (Yoshinaga 11). But Cheryl Morgan (with John Clute and David Langford) suggests that early in the 20th century, “transgender” stories were typically about involuntary and often punitive “gender transformation” (Clute et al). In the mid-1970s, Jessica Amanda Salmonson documented her gender transition in the pages of the fanzine *The Literary Magazine of Fantasy and Terror* (Clute), which paralleled a growing corpus of sf “inspired by the revival of feminism and the creation of the first gender studies programs” (Yaszek 4). Heard’s essay both complicates this history and suggests we can read more inclusively for “transgender sf” in the first part of the 20th century.

Born into an Anglo-Irish family of landed gentry and educated at Cambridge, Henry

FitzGerald Heard lived an omnivorously intellectual and spiritual—and remarkably privileged—life. Alison Falby, his biographer, describes him as a “[w]riter, science broadcaster, pacifist, mystic, gay activist, and psychedelic pioneer” (Falby 11). He worked as a science commentator for the BBC in the early 1930s, emigrated to the US after being offered the chair of historical anthropology at Duke University in 1937, became a devoted student of Vedanta, introduced Alcoholics Anonymous co-founder Bill Wilson to the spiritual use of LSD, wrote nearly forty books of fiction and non-fiction, and theorized his own queerness across several articles in the magazine *ONE* under the pseudonym D. B. Vest (e.g. “The Isophyl as a Biological Variant”). He also published a singular essay arguing that sf has the unique potential to create capacious, courageous spaces for writers and readers to grapple with societal challenges and shifting norms. Recognizing the gender binary as a senescent construct in 1953, he foresaw the need for stories that would help society free itself from outworn beliefs and habits and reduce harms rooted in ignorance and fear. He understood the implications of endocrinology for the future of gender, and he showed remarkable foresight in calling for sf to resist and reduce the shock and harms which might otherwise (and surely have proven to) accompany these changes.

His futurity anticipates twenty-first century gender speculation, both within sf and beyond. For example, his essay offers a sharp “discursive challenge to the naturalized understanding of sexuality and its concomitant sociocultural surround” and questions “the ‘naturalist fiction’ that sex and gender and sexuality are matters of ‘human senses and common sense’” (Pearson 19, quoting Darko Suvin). Much of the essay, too, resonates with the “gender futurity” described by trans scholars Amber Johnson and Benny LeMaster as “an imaginative space of reinventing the gendered alternative toward freedom... moving gender beyond a social category to something that is felt, expressed, embodied, avowed, and mapped into/onto the body via pleasure” (257–59). Heard reaches toward—but yet could not have anticipated—this vision of liberation, articulating a strain of trans/gender futurity that is both expansive and joyful, though, as I’ll discuss in the conclusion, he may not have imagined this joy to be accessible to everyone.

Endocrinology has a small but significant presence in the sf of the early 20th century, which shows that Heard’s call for (more) stories about endocrinology was both warranted and timely. For example, in 1935, Karel Čapek (whose 1920 play *R.U.R.* introduced the word “robot” into the world’s lexicon) published a column in a Prague newspaper protesting the idea that robots are mechanical. Writing about himself in the third person, he recounted some literary history:

His robots were created quite differently—that is, by a chemical path.... He was thinking about biological chemistry, which is constantly discovering new chemical agents that have a direct regulatory influence on living matter... those various enzymes, hormones, and vitamins....” (143–44)

As Čapek confirms, while the Robots of *R.U.R.* were immediately mischaracterized as mechanical, they were born in part from the intense endocrinological research of the early twentieth century. Though the tropes of cybernetics were not yet available, Čapek was one of the first artists to understand endocrinology as a technology of control with the potential to manipulate the form and function of organic matter (in *R.U.R.*, mass-produced synthetic flesh).

A few years later, Lester del Rey published “Helen O’Loy” (1938), a “robot story” that has been widely and continuously anthologized while also criticized as (for example) “a cheerfully sexist fantasy” (Hollinger). The story, partly inspired by the near-quackery of Voronoff and his ape testicles, posits endocrinology as a technology with radical identity-shifting potential. Del Rey asks us to imagine Phil, a successful young endocrinologist with a robust practice and an eye toward settling down. He and his housemate, tired of the hassles of modern courtship, find themselves discussing the possibility of creating a robotic companion—Dave, after all, is in the robot-repair business, and endocrinology offers insights into robot design. Theories are discussed, techniques refined. But Phil is soon going to need some lucrative work that will pay for this project. What’s an endocrinologist to do?

As Phil relates, he had a crucial role in Helen’s design and construction, as he understood “the glands, secretions, hormones, and miscellanies that are the physical causes of emotions.” This knowledge undergirds both Helen’s design and the work that funds her construction. Together, the men augment Helen’s off-the-shelf circuitry with “heterones” (a portmanteau of hormones and heterodyne: these were “complex little bundles of transistors and wires that heterodyned on the electrical thought impulses and distorted them as adrenalin distorts the reaction of human minds,” 51–53).³ As Alfred Berger explains, the idea is that “[R]eceptivity to emotion will enable Helen to become self-programming, to learn from her mistakes. Human emotions and even human learning are traceable to nothing more than chemical secretions” (286). Just as Helen’s construction is completed, and her makers’ funds exhausted, one of Phil’s wealthy clients calls: “her son has an infatuation for a servant girl, and she wants you to come out and give counter-hormones.” Phil protests that he’s “no society doctor, messing with glands to keep fools happy” (surely an allusion to Voronoff), but after “racking my brain to trick [him] into getting the counter-hormones, and giving the servant girl the same,” he finally reports them as “cured” (53–54). Dominick Grace suggests this is about controlling emotion, as “[t]he problem is one of an inappropriate emotional relationship between members of different classes, and Phil must solve the problem by correcting their emotions” (46). But an “infatuation” between a couple of “kids” is not likely to be a purely emotional relationship. Phil’s non-consensual hormone manipulation reads both as an echo of the coercive experimental “treatments” imposed on intersex children in the early 20th century (Gill-Peterson 111–13) and as a dark precursor of the “chemical castration” tested on institutionalized men with psychiatric diagnoses in 1944 (Foote).

Phil returns home to find Helen fully activated. Consuming broadcast media and books, she developed her emotional capacities and quickly fell in love with Dave. As she explains to Phil, she wants to “make [Dave] a good wife.” Phil’s response is cruel mockery: “And give him strapping sons to boot, I suppose. A man wants flesh and blood, not rubber and metal.” Helen fully understands the harmful intent, defending her newly claimed identity: “Don’t, please! I can’t think of myself that way; to me, I’m a woman” (61). Indeed, she and Dave would live as husband and wife, keeping her origin secret, until his death; and Phil would remain closely bound to them, though “I should have married and raised a family, I suppose” (65).

It is tempting to read del Rey’s Helen merely as a materialization, possibly a satire, of male

sexual and domestic fantasies.⁴ But what if, instead, we view Helen's female voice and experience as authentic, against the banal cluelessness of Dave and Phil? Through this lens, she becomes the locus of a chosen family that is neither heteronormative nor nuclear. Helen's journey is not one from robot to human—this is not a Pygmalion story. Helen never “comes to life.” Instead, she transitions into a fully female consciousness and identity. Through Phil's endocrine-inspired intervention, Helen transcends the limitations of earlier, crudely feminized servant/utility robots, becoming something insistently and specifically gendered. While the story's depiction of being female is limited by 1930s stereotypes, and del Rey probably didn't intend the story as trans speculation, I can't help but wonder how this story might have been received by contemporary readers holding trans identities. Might this story be read as *both* a cheerful sexist fantasy *and* an accidental trans allegory? A multiplicity of readings renders visible a multiplicity of possible readers.

Isaac Asimov also explored the use of endocrinology in the creation of robots.⁵ In “Evidence” (1946), rather than producing human-like behavior and experience, hormones produce human-like bodies in an industrial setting akin to *R.U.R.*'s flesh factory. Partway through the story, the Director-Emeritus of Research at U.S. Robots admits that experimental studies show the viability of using “human ova and hormone control [to] grow human flesh and skin” (107). The phrase “human ova and hormone control” smacks of both provocation and pseudoscience, but “hormone control” surely meant something to Asimov, who was a biochemistry PhD student when he wrote the story.⁶ For that matter, del Rey sketched a fully medicalized vision of “hormone control” in the late 1930s. The scientific developments underpinning these speculations would also transform sex endocrinology from a zone of quackery into a biomedical field of profound impact, allowing Heard to envision a different role for endocrinology in creating new kinds of humans.

In his essay, Heard's most specific call is for stories of people who intentionally undergo endocrine therapy in order to be “transmuted” (253) into new kinds of humans who can meet new challenges for the greater good. With this call, Heard anticipates, by just months, a new global awareness of medically supported gender transition, prompted by intense international news coverage of Christine Jorgensen's hormone therapy and surgery.⁷ His use of the word “transmuted” evokes ideas of the plasticity of sex which marked both early 20th century trans life and the mid-century clinical studies of intersex children that gave rise to Money's concept of gender (Gill-Peterson 13–17)—ideas I will take up again below. But Heard's notion, of using endocrinology to create humans able to survive environments and solve problems beyond the capacity of unmanipulated humans, doesn't seem so speculative in the 21st century. In particular, this concept bears a familial resemblance to the Cyborg, introduced just a few years later in 1960.

Both Heard's transmuted human and the Cyborg were speculations based on recent developments in endocrinology as well as new cybernetic understandings of endocrinology. Cybernetics emerged in the 1940s as a “new science” of communication and control, aspiring to produce new insights into the nature of systems, whether biological, artificial, or social. Much of cybernetics elaborates the ancient idea that the effective pursuit of a goal, or the maintenance of

an equilibrium, requires “negative feedback” to calibrate future action based on the results of present action. This process is the basis, for example, of mechanical systems that maintain a stable temperature: when a thermostat detects a temperature below a certain threshold, it calls for heat to reverse (negate) the cooling trend, and similarly turns off the heat when the temperature has risen far enough. By focusing initially on electricity as a means of communication and control, cybernetics blurred the distinction between machines controlled by engineered circuits and organisms controlled by nervous systems. But electricity was only one channel through which cybernetic ideas could be realized: endocrinologists had recognized negative feedback in the body well before the founding of modern cybernetics.

In the early decades of the 20th century, endocrine research, especially on “sex hormones,” was focused on control: how were these hormones produced in the body? how did they act upon the body? how did they interact with each other and other kinds of glands and hormones? For example, Steinach’s earliest animal experiments involved transplanting testes into female rodents and ovaries into male ones, removing the gonads that had been present from birth. Steinach concluded that male and female sex hormones were directly “antagonistic” to each other: not only did (say) ovaries cause males to develop feminine characteristics, but they also “inhibited” masculine characteristics (Fausto-Sterling 158–62). The counter-hormones of “Helen O’Loy” are a mutated form of this antagonism. Later, in 1936, Magnus Hirschfeld, the German sexologist who oversaw early “sex-change surgeries” for humans (Meyerowitz 15), used Steinach’s work to suggest that biological sex could be manipulated with these techniques: “male, female and intersexual constitutional types can be created at will by implanting certain sex glands in diverse species of animals” (334; qtd. in Roberts 167). While this turned out to be an oversimplification, it captures an emergent understanding that biological aspects of sex are not fixed but may be influenced, perhaps controlled, through medical intervention. But, as Steinach and other endocrinologists were discovering, sex glands “are not self-regulating, automatic structures, but... they require a stimulus to compel normal function” (Moore and Price 52). Gonads themselves seemed subject to control by some other bodily process.

In 1932, Dorothy Price, a graduate student working in the laboratory of Carl Moore at the University of Chicago, uncovered the specific nature of the interaction.⁸ The full title of the paper announcing the discovery proclaims the essence of her theory, as well as its relationship to Steinach’s early work on antagonism: “Gonad Hormone Functions, and the Reciprocal Influence Between Gonads and Hypophysis [Pituitary] with its Bearing on the Problem of Sex Hormone Antagonism.” After twenty years of intensive research across Europe and the US, the “reciprocal influence” between sex organs and the pituitary was cautiously identified. Price and Moore realized that ovaries and testes (or their hormones) don’t *directly* affect each other in an “antagonistic” way. Rather, the pituitary produces a hormone that stimulates the sex glands, and, in a feedback loop, the hormones thus produced by the sex glands dampen the pituitary’s production.

Later, Price would adopt this language: “A reciprocal relationship, a negative feedback between the hormones of the gonads and the anterior pituitary gland” (“Carl Richard Moore” 405). Thus, Price and Moore, by identifying and characterizing a non-electrical system of

feedback control, anticipated cybernetic language and thought by at least a decade. As Price recounts, by the late 1960s, the “Moore-Price system” was widely understood as a feedback system, and as a crucial insight (“Feedback Control”). Not only did this theory of negative feedback supersede earlier theories of antagonism, it would also become the essential concept of many sex- and reproduction-related therapies, and it continues to explain complex loops of hormone control beyond the reproductive system. By 1973, a cyberneticist was able to write, “[M]ost of physiology, including endocrinology, appears to be concerned with elaborating the structures and mechanisms through which feedback control is exercised in living systems” (Stear 497). Price discovered and articulated not only the particular means by which the gonads and pituitary mutually regulate, but also a fundamental metaphor for understanding biological systems.

The same hormone preparations that Moore and Price used in their research—estrogen isolated from human placentas and the urine of pregnant women—were already being used by trans women before Price came to understand the feedback loop. Otto Spengler wrote of seeking treatment from Dr. Harry Benjamin around 1928, who at the time was “trying to establish himself as an expert in rejuvenation therapies... inspired by the research of... Eugen Steinach” (Timm 89). As Spengler wrote, “In trying to become feminine, I went through rejuvenation, the American Steinach operation.... I also took a great deal of [P]rogynon to develop my breasts and it succeeded quite well” (Henry 495).⁹ In 1950, the Danish endocrinologist Christian Hamburger described a similar therapeutic protocol in more medical terms: “to provoke hormonal castration by means of estrogenic substances” (394).¹⁰ This protocol continues, in the 21st century, to be foundational therapy for trans female patients: “Through a negative feedback loop, [estrogen] therapy suppresses gonadotropin secretion from the pituitary gland, leading to a reduction in androgen production” (Unger 879).¹¹ And it is this kind of therapy that motivated Heard’s speculative essay on the impact of endocrinology.

Heard’s Futurity

The essay was commissioned by Reginald Bretnor, an occasional sf author who produced three collections of sf criticism. For his first, *Modern Science Fiction*, Bretnor’s essayists were, in the main, closely associated with the burgeoning science fiction enterprise.¹² Isaac Asimov and Arthur C. Clarke each contributed an essay, as did magazine editors John W. Campbell, Jr. and Anthony Boucher. The essay most frequently cited by later critics is Asimov’s “Social Science Fiction,” in which Asimov distinguishes “social” science fiction from “gadget” and “adventure” science fiction, arguing sf that addresses “the impact of scientific advance upon human beings” is the only “sociologically significant” kind (158–59). Heard opens with a similar argument: In science fiction, the “dawn phase of gadgetry is long over,” and both science and sf demonstrate a new “interest in the sciences of life,” which in turn have “upset our rigid notions of the normal right” (245–47). Science fiction writers, “with the endocrine choices now set human nature,” also must choose: “They can play on old prejudices, making Martians monsters and any human variety which is new, a ghastly misbirth. Or they can show us of the next thirty years, surmounting each new wave of knowledge and pushing out with a new tolerance and fresh curiosity on wider seas of comprehension” (257–59). Heard’s ability to perceive this junction

and what might lie ahead marks him as a thinker of unique experience and idiosyncratic curiosity.

In his accompanying biographical sketch, Bretnor notes Heard's *sf bona fides*, but makes particular mention of the nonfiction works *Is Another World Watching?* and *Morals Since 1900*. Both of these works contain themes illuminating Heard's approach to "Science Fiction, Morals, and Religion." Biographer Falby notes that Heard wrote *Is Another World Watching?* (published in the UK as *The Riddle of the Flying Saucers*) as serious nonfiction, an effort to collect and analyze the state of knowledge about the "unidentified aerial objects" that had repeatedly been sighted since 1947 (126–27). For our purposes, the most significant speculation in the book regards the occupants of flying saucers: they are two-inch-long super-bees from Mars. This remarkable confection has some solid foundations. Karl von Frisch had just (in the late 1940s) discovered the nature of bees' ability to communicate and navigate, which, for Heard, sets them above other social insects. And Heard leans heavily on an uncited assertion from astronomer Gerard Kuiper that on Mars, "No form of life as we know it could exist but insect life." Heard went so far as to write a short story on this theme, "B+M—Planet 4," published in the 1951 anthology *New Tales of Space and Time*. In the story, a human visitor to Mars discovers it to be populated by eight-inch bee-like insects and two-foot-tall humanoids, who, with the native vegetation, form a kind of symbiosis, a "single threefold life" (198). The symbionts fly *en masse* to Earth (yes, in flying saucers) and are welcomed as saviors ushering in a new era of solar-system-wide health and collaboration.

The other book Bretnor cites, *Morals Since 1900*, is more sweeping of scope if lesser of scale: an analysis of "British morals" into the postwar period. A few points from the book clarify the connection between flying saucers and endocrinology. Early in the book, Heard optimistically asserts that British society has become, as of mid-century, radically more open and accepting about sex and sexuality. Moral judgment has weakened to mere "crabbed prejudice;" conversational taboos around prostitution, sexually transmitted disease, and homosexuality have broken; and tolerance of difference significantly strengthened. Heard writes,

To call all but the 100 per cent male and female 'unnatural' was no longer permissible once entomology had studied the social life of... the bees, the ants and the termites... [which] have converged on similar social patterns... by drastic modification of sex and reproduction, so that between the male and the female there has arisen the intergrade class of workers... Nor are such intergrades confined to insects. They are to be found freely among most mammalian species. (106)

Here, Heard is jumping a wide species gap, comparing insect sex/gender systems to mammalian ones, and aligning "worker" insects, through the term "intergrade," with mammals we would now describe as "intersex." His enthusiasm for insect society, and his comfort making analogies between human and non-human animals, will figure significantly in his vision of endocrine transmutation.

In the book's conclusion, Heard offers an assessment of Anglo society as a whole. He cites the century-opening (1897) release from prison of Oscar Wilde, "who had been condemned with

complete execration on a sexual charge” as well as Winston Churchill’s (then Home Secretary) 1910 announcement of relaxed rules for the treatment of prisoners “not guilty of any acts involving moral turpitude.” By mid-century, Heard argues, science had cleared anyone who transgressed sex and gender norms:

After the work of psychologists such as Moll [Albert, a rival of Magnus Hirschfeld], sociologists such as Havelock Ellis, and... the studies of the endocrinologists (showing that the ductless glands can and do over-rule the specific sex expression of either gender) it is clear that inversion and intergrades are as natural as any other genetic variation and more common than most. (196)

Heard’s account doesn’t completely align with science and history as we understand and experience them. Few entomologists would agree with his characterization of worker bees as an “intergrade” gender, and the British government didn’t begin to relax legal punishments for homosexuality (“inversion”) until 1967.¹³ But Heard, in his optimistic resistance to heteronormativity, found the seeds for his liberatory futurity in many places—including very real scientific findings about the endocrinology of sex and gender.

Which brings us back to “Science Fiction, Morals, and Religion.” Heard asserts that the turn-of-the-century endocrine research of Bayliss and Starling contains “the real dynamite that would test our prejudices,” pointing out that someone who suffered from congenital hypothyroidism or acromegaly would in earlier times be treated as “a freak of nature” but is now understood as having a treatable hormone imbalance. But as the endocrinology of sex became better understood, “we came inevitably closer to head-on trouble with the conventional. What was human nature? What was natural?” In particular, the endocrine system “can play the most carnival tricks with what seems most basic and polar, an individual human being’s sex.... What is morality going to do about such finds?” Indeed, “[q]uite a number of physicians and surgeons are performing what the ordinary person still regards as science fiction... transforming a man into a woman or vice versa” (248–49). Heard seems to be asking: If science is threatening to exceed science fiction, and the idea of sex as a fixed binary is already crumbling, what is the role of science fiction?

Heard positions science fiction at an inflection point. Its writers can continue producing fairy tales “with a space-suited Prince Charming as the arrested idea” (249). Or they can be “courageously contemporary” and illustrate the “new conditions (which without preparation would prove highly shocking).” Most importantly, they “can show ourselves behaving in an attractive, civilized, constructive, tolerant way toward the new knowledge and event.... with a new tolerance and fresh curiosity” (258–59). For example, we might imagine a story of someone

who, undergoing endocrine change (because he [*sic*] thinks this is best for some cause he wishes to serve) watches his metamorphosis with increasing humor. He sees himself not merely altering in physique.... He sees his psyche changing too. He sees his romantic attachment to home and family, and to the values which he considered to be eternal, fading away. (257–58)

In other words, we must prepare ourselves, says Heard, for scientific and cultural developments that will transform sex, gender, and conventional society. Science fiction must move beyond its grounding in heteronormative family structures, replacing the usual “boy-meets-girl” characters with protagonists who are, for example, “streamlined... alienated and finally transmuted” (253) for a righteous cause. With its “essential extravagance,” science fiction can create stories in which “the central character, able to laugh at himself, ... leaves us unable to escape from the issue by mockery” (256–57). Science fiction, says Heard, can let us apprehend this “immensely enlarged picture of what nature and human nature are, and what their interplay is, with a new interest, a new humor, a new fun” (256).

Transmuted Humans and Cyborgs

Heard’s challenge to sf seems to have had little immediate impact, but the idea of using endocrinology to endow humans with extraordinary capabilities arose again within the same milieux and with some similar motivations. As the study of endocrinology became increasingly cybernetic after Moore and Price’s discovery, it also got caught up in some adventurous, if not exactly fictional, speculation. A few years after Heard’s essay, the military-scientific complex conceived of the “cybernetic organism,” or Cyborg, a deeply speculative notion of a living organism augmented with mechanisms allowing it to survive in hostile environments.

The concept of the Cyborg was introduced by Manfred Clynes and Nathan Kline (a biocyberneticist and a psychopharmacologist) in 1960, first at a May symposium then, somewhat abridged, in the September *Astronautics* article “Cyborgs and Space.” By then, many endocrine functions had been discovered and analyzed, and cybernetics and its metaphors were well established. Clynes and Kline observed that many biological systems, such as those regulating internal temperature or blood pressure, exist solely to maintain an equilibrium, relying on negative feedback. Such systems, with their built-in feedback loops, are open to artificial/external manipulation: “The autonomic nervous system and endocrine glands cooperate in man [*sic*] to maintain the multiple balances required for his existence.... Necessary readjustments of these automatic responses under extraterrestrial conditions require the aid of control theory, as well as extensive physiological knowledge” (27). Living organisms are *already* cybernetic, but when a body is transplanted to a new (say, extraterrestrial) environment, it may need intervention and support to maintain its systems at a different equilibrium. The first specific example Clynes and Kline discuss is endocrine: “[S]ystolic blood pressure may be sensed, compared to a reference value... and regulated by letting the difference between sensed and reference pressures control administration of an adrenergic or vasodilator drug” (74). Adrenergic: emulating the action of adrenaline, the first identified hormone. In this cybernetic hypothetical, the synthetic hormone is administered slowly and continuously by a pump. If the blood pressure gets too high or too low, the system will, via negative feedback, adjust the rate of the pump. The totality of the blood-pressure-sensing mechanism, the pump-control mechanism, the pump itself, and the body with its pre-existing cybernetic condition constitutes the capital-C Cyborg.

Although the theoretical foundations of cybernetics were broadly accepted by 1960, it is hard to overstate the wildly speculative nature of the cyborg. The symposium where Kline and Clynes

first presented, hosted by the US Air Force, was on the topic of the “Psychophysiological Aspects of Space Flight.” The title of their talk is more specific, and more speculative, than the journal article’s: “Drugs, space, and cybernetics: evolution to cyborgs” (Kline and Clynes). As Ronald Kline (no relation) argues, the symposium paper out-speculated the science fiction of the time. *Life* magazine included an illustration of their vision in a July 1960 photo essay:

The illustration seems to come straight out of a science-fiction novel. Indeed it was more futuristic than most contemporary science fiction in the USA from the 1930s to the 1950s.... Although clearly futuristic, the *Life* illustration accurately depicts the technical proposals made by Clynes and Kline in their [symposium] paper. The cyborg concept was too drastic, however, for one reader of *Life*. A self-identified ‘technologist’ wrote the editor that he ‘was profoundly shocked by the inhuman proposal ... for the manufacture of “Cyborgs”, artificially de-humanized, mechanized monsters’ (Kline 341–42, quoting Shelly and Editor 9).

Indeed, Kline and Clynes explicitly characterize much of their conference paper as “projections in the future which, by their very nature, must resemble science fiction,” demonstrating the close kinship between their work and Heard’s endocrine speculations. Their paper is an effort, first, to enumerate the biological problems that might attend space travel, considering not only flights of days or weeks, “but also journeys of several thousand years’ duration” (347), and, second, to propose solutions based on (a few) existing or (mainly) imaginable scientific and medical techniques.¹⁴ Space travel may not have been Heard’s primary concern as he called for endocrine-modified humans to serve a greater cause, but Kline and Clynes’s “Cyborg technique” relies on the same cybernetic/endocrine processes that would create Heard’s “transmuted” humans.

Cyborgs were speculative in the 1960s, and, as Kline argues, they never became significant to mainstream cybernetic inquiry (333). But from the 1980s to our present moment, they have become indispensable elements of speculative popular media, both liberatory and reactionary. Donna Haraway’s 1985 “Cyborg Manifesto” breathed new life into the cyborg as a locus of study and speculation about gender.¹⁵ Jacob Barry observes that cyborg/gender anxieties spilled into the conservative mainstream in 2019, when Laura Ingraham released a 90-minute podcast in which she pondered, in Barry’s words, “whether trans people are secretly cyborgs trying to destroy humanity” (124). Titled “Transhumanism and the Assault on Traditional Gender and Masculinity,” the episode features a guest who characterizes trans people as “abandoning gender altogether” in order to “create a new species,” then equates this with the “transhumanist” practice of “[u]sing medical and other technologies to develop a new species” (124, quoting Ingraham). Heard might recognize these “transhumanist” strategies, but he would surely also recognize an alarming absence of “tolerance and fresh curiosity” that echoes his 1953 concerns. But, as Barry further notes, Ingraham’s paranoid fantasy of “an alternative future where trans people take over the world” is in fact “a future which, in my view, and arguably in the view of a majority of the gender benders out there, is one ‘badass utopia’” (124). Fulfilling Heard’s hopes, “In the 21st century... it is the genre of science fiction that continues to push the boundaries of the relationship between technology, gender, and the category of human” (125). It’s several decades

later than we needed, but sf has started doing the work Heard wanted us to do.

The Biopolitics of Transmutation

Heard was a science journalist as a young man; this may explain why his essay seems to be based on an understanding of endocrinology derived from medical and journalistic sources.¹⁶ But, as Gill-Peterson points out, this approach is limiting and inaccurate in the context of trans history: it falsely suggests a midcentury “revolutionary technological or medical shift,” and it erases the agency of trans people, including both those who lived public trans lives before/without hormones and those who sought doctors to help them realize their transitions (11–13). Indeed, many of the speculative storylines Heard proposes involve sharp restrictions on the autonomy of those receiving endocrine therapy—we might ask, “transmuted *by whom?*” While he does imagine stories of voluntary endocrine therapy in service of a greater good, he also suggests stories of militaristic, compulsory, and punitive “service.” Some of his transmuted heroes might be “streamlined by the forced draft.” Or, drawing on his understanding of the insect world, Heard suggests endocrine therapy might change the nature of work, imagining a time when supervisors “give glandular treatments and/or operations to the members of each profession...[so] they may become perfectly adjusted to their job” (253). He even recommends a “reconstructive” approach to “those cross-grained types who make trouble” through “psycho-physical modification by endocrine secretions”—such a modification could “transform the rugged rebel into a gay consenter... regraded and rejuvenated... apotheosized out of this dreary world by being made the latest ‘nova’ in the heaven of the screen” (250). The apparent contradictions between the fascistic fantasies and the liberatory futurity Heard articulates, nearly in the same breath, echo the troubling politics and practices surrounding endocrinology in the “real world.”

Most remarkable about these problematic storylines is the degree of bodily plasticity Heard believes endocrinology makes available, which seem to go well beyond changes to biological markers of sex. This tight connection between endocrinology and plasticity emerges from 20th century experiments on intersex children (Gill-Peterson 103–23). Heard was certainly aware of this research, writing, “For (the present argument runs) if nature is going to change a citizen’s sex then... we must insist that the change is complete.... We cannot let nature, as she very well might, stop halfway” (249).¹⁷ But the plasticity conferred by hormones was as tightly bound to eugenic theories of racial improvement as it was to basic research on biological sex. The coercive and carceral character of these propositions invites us to read them as a manifestation of what Gill-Peterson names as the “racial plasticity of sex and gender” (27). Against these storylines, Heard’s enthusiasm for endocrinology’s apparently limitless potential for liberatory transformation racializes as white, while his penal impulse toward the defective “cross-grained types,” in combination with his embrace of human-animal analogy, seems to be directed toward the kind of non-white “deviance” that eugenicists would mark as subhuman.

Some of his punitive speculations were already being realized. Just as Heard was finishing his essay, endocrine negative feedback was being wielded against queer British men—including one of the world’s most significant cyberneticians, Alan Turing.¹⁸ When Turing was convicted for “gross indecency” in 1952, the court offered him a choice between incarceration and a

“probation” that involved receiving diethylstilbestrol, a synthetic form of estrogen. It’s not clear whether Heard, living in the United States, was aware of this practice, which was new and little-used in 1952 (Battersby).¹⁹ The drug Turing was court-mandated to receive was not intended to “treat” homosexuality. Rather, it had been used since at least 1944 in male psychiatric patients to manage “excessive sexual drives” through a temporary “partial suppression” of testosterone production—or, in medical terms, “its depressant effect upon the gonadotropic substance emanating from the anterior pituitary which, in turn, inhibits androgen production” (Foote 928). In essence, the same negative feedback that is life-giving and gender-affirming for many trans women was used to impose “chemical castration” on Turing, and may have been connected to his early death.²⁰ Turing’s experience surely mirrored that of thousands of men. While it is difficult to find estimates of how many were subjected to this treatment, 65,000 British men who had been convicted for consensual sex with other men were pardoned, 50,000 of them posthumously, by a 2016 amendment (“Alan Turing Law”).

Heard’s curiosity, directed toward the study and advancement of the evolution of human consciousness (see Barrie and accompanying biographical essays), led him to forms of speculation that were at once deeply humane and bioethically fraught. Writing on the cusp of radical changes to both “trans” and “gender,” Heard saw endocrinology as a discourse within which destructive and archaic binaries of sex and gender could—would—be broken down, and he recognized sf as a medium capable of amplifying this radical message and making society more receptive to it. Though Heard’s vision is flawed and incomplete, through it he affirms the cultural potency of sf, calling its readers and writers to continue imagining liberation for all.

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Notes

¹ In developing this article, I've been mindful both of my positionality (white, heterosexual, and cisgender male, born and living in the US) and my intellectual identity (I'm an interdisciplinary scholar with formal training in computer science).

² I am deeply grateful for the extraordinarily constructive criticism of the anonymous reviewers, especially the one who helped me refine my main claim; for the direct and indirect aid of unruly and heroic librarians; and for the Ethyle R. Wolfe Institute for the Humanities at Brooklyn College, which supported the early stages of this project with a fellowship leave.

³ Heterodyning is a signal processing technique developed in the early 1900s in support of radio-based telegraphy and widely used in telecommunications today.

⁴ Grace asserts the story "condemns, rather than consecrates male stereotypes of women" (49).

⁵ Robots were not the only context for endocrine sf. In *Liminal Lives*, Susan Squier identifies several stories exploring the potential of endocrinological control for manipulation of human bodies, though these stories are based on endocrine findings of the 1910s rather than later discoveries about sex and reproduction.

⁶ Asimov co-authored a 1952 textbook entitled *Biochemistry and Human Metabolism*, in which Part II, titled "Control," contained Chapter 6 on "Hormones." The feedback loop discussed below does not appear in the 1952 edition, though it is mentioned in the 3rd (1957) edition.

⁷ Her transition was reported on by the *New York Daily News* on December 1, 1952, months after the text of *Modern Science Fiction* was finalized (the editor's preface is dated September 1, 1952). See Stryker 1999, 2009 and Aizura (esp. Chapter 1) for discussions of the transnational and global significance of Jorgensen.

⁸ In Price's later account of this research, she notes that Moore "was a male chauvinist, and women... were not really to be considered scientifically equal to men." She describes how she developed the negative feedback theory on her own, interpreting findings that had been confusingly uninterpretable (Price, "Feedback Control" 221, 228–29).

⁹ Progyonon, brought to market in 1928 by the German company Schering AG, was a form of estrogen, taken by mouth, extracted from human placentas and the urine of pregnant women. It was not available to Moore and Price, who relied on hormone extracts produced by their

colleagues (“Gonad Hormone Functions” 19).

¹⁰ Hamburger is describing his treatment of Christine Jorgensen.

¹¹ Testosterone is involved in a similar negative feedback loop, but its therapeutic effect on estrogen levels in trans men appears to be less well understood by the medical community (Defreyne et al).

¹² The book was nominated for a Retro Hugo in 2004.

¹³ But it is true that the sex systems of insects are more amazingly diverse than Heard imagined. For example, “intersex” was coined by the geneticist Richard Goldschmidt studying sex determination in gypsy moths (Dietrich).

¹⁴ Only six of the seventeen problems they identify are addressed cybernetically (hormones/drugs administered by an automated pump); four others are addressed by traditionally-administered drugs or the creation of artificial external organs. The remaining seven are addressed with research program sketches. The cyborg, then, is not a purely cybernetic organism—which aligns with its origin story: as Kline told the *New York Times*, “‘We were asked to present a paper on drugs for space flight’, he said, ‘and this naturally led to a question of how they would be administered.... [T]his led us to applications of cybernetics’” (“Spaceman”).

¹⁵ Haraway’s 1985 re-writing/wiring of the cyborg has had enormous cultural impact, including on sf/criticism, but this article is rooted in the science and culture of the first part of the twentieth century, so I won’t take up her work here.

¹⁶ According to a biographical essay written by Heard’s personal secretary, “He was, by 1925, ‘...just then making his name as a scientific journalist. He... had an extraordinary flow of information about hygiene, sex, paranormal phenomena and the probable destiny of mankind’” (Barrie, quoting Furbank p. 136).

¹⁷ This sentiment is very much alive in 21st century approaches to intersex: in *Contesting Intersex*, Georgiann Davis quotes a doctor describing how he talks to parents: “I always talk about it as, nature . . . just about got it right, but just this is the last few steps or last step, and we can complete that for you” (79).

¹⁸ Husbands et al. situates Turing in the transatlantic cybernetic community. Of course, his role in cybernetics is not significant here beyond a certain irony; his relatively recent fame, though, has made him a posthumous representative of a large population of men who were similarly treated.

¹⁹ The Criminal Justice Act of 1948 specified that courts could require a 1–3 year probation instead of sentencing (Criminal Justice Act 1948, sec. I.4[1]). Of particular relevance for Turing, if the offender had a treatable mental condition, the court could impose “a requirement that the offender shall submit, for such period not extending beyond twelve months..., to treatment by or under the direction of a duly qualified medical practitioner with a view to the improvement of the offender’s mental condition” (sec.I.3[1]).

²⁰ Turing died two years after his arrest. It is widely believed that Turing committed suicide—perhaps partly because of hormone-induced changes to his mental state—but some evidence supports the theory that his death was accidental (“Alan Turing”).