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Book Review

On Fertile Ground: A Natural History of Human Reproduction by
Peter T. Ellison. 2001 Harvard University Press, Cambridge MA.

Reviewed by

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Peter Ellison's *On Fertile Ground* originally graced bookstore shelves in hardcover in 2001, but it was released more recently, in June 2003, in paperback. For a mere \$19.95 (USD), the reader can possess a comprehensive yet concise review of the natural history of human reproduction. The book contains an extensive (but not overly so) review of reproductive physiology, integrated with their accompanying ecological and evolutionary circumstances.

Ellison should revel in the knowledge that he has authored an undeniably balanced, well-researched and well-written book. Beginning with the first chapter and throughout the entire book, I was struck by the balanced approach he uses to present complex concepts. He openly states that technical terms will be kept to a minimum and earns the reader's trust that reading this book is not to be a daunting task. For example, he writes, "hormones ... with their complex-sounding names...carry an aura of biochemical complexity and can seem beyond the grasp of the uninitiated. This needn't be the case. Those hormones that are important to the story of human reproduction will be introduced as needed and in ways that will make the molecules themselves as well as their functions understandable in simple terms" (p.13). I heartily wish that this text had been on the market when I was enrolled in my graduate course on psychoneuroendocrinology, for Ellison does fulfill his claim and the book is surprisingly comprehensible but not at the expense of accuracy.

The book opens with an engaging tale from Ellison's fieldwork with the Lese of the Ituri forest of the Congo. This reminiscence sets the stage for his theme (i.e., the natural history of human reproduction) quite well, and immediately signals that he will present cross-culturally relevant theories. The

remainder of Chapter 1 is devoted to the rationale for the book, encompassing topics such as the idea that evolution occurs within a particular ecological context, and ends with a brief summary of protein versus steroid hormones.

The pace picks up in Chapter 2, beginning with a review of conception. One highlight of this chapter pertains to how the embryo and maternal immune system interact, such that immune functioning is slightly suppressed following ovulation to allow for embryonic development. Ellison continues by reviewing all the major steps in development, tying in a review of the female reproductive axis, and concluding with implantation. He draws attention to the fact that “successful implantation, not the mere fertilization of the egg, is the true initiation of a potentially viable pregnancy” (p. 22). Although by no means surprising, this statement slightly contradicts the ever-growing literature on behavioral changes that are correlated with ovulation which is widely interpreted to represent maximal fertility leading to pregnancy.

As a brief aside, it must be noted that the last 15 pages of this chapter are especially important (and worthy for inclusion as reading material in many courses), as they contain a pleasing blend of physiology, ecological circumstance, and natural selection. Ellison begins with a review of embryonic death, which reveals approximately 20% of successfully implanted embryos are lost within a week to 10 days (p. 34). He continues with a discussion of the benefits of discarding nonviable embryos, including those that may be premature or result in low birthweight. He also addresses different theories pertaining to why women menstruate, including an analysis of Profet’s (1993, p. 43) now infamous theory that menstruation cleans the female reproductive tract.

The focus of Chapter 3 is parturition, and all the factors that are involved such as gestation, pelvic size, labor, and the timing of birth. Although this chapter is rather interesting in general, this latter point is especially captivating because it has been debated in the literature for decades. Ellison summarizes the pertinent literature and proposes that parturition occurs when the mother is no longer able to “meet the energetic demands of the fetus” (p. 77). Another part of this chapter that is particularly interesting is the review of maternal fat storage; specifically the fat accumulation during the first trimester that is desperately needed in the third trimester to meet the demands of fetal brain growth (p. 72).

In Chapter 4, Ellison’s expertise becomes transparent, and the topic, breast milk and lactation, is thoroughly discussed. The chapter commences with a brief synopsis of the immunological benefits of breast milk, followed by a review of glandular development, and milk production. The rest of the chapter contains a lengthy analysis of the contraceptive effects of lactation, and although some readers may find it rather arduous and overly-detailed, it reflects a deep understanding of the issues. For this discussion, Ellison brings together evolutionary theory, ecology, and reproductive physiology in a unified manner to

create an intriguing and convincing view of human reproductive history.

Child growth and female reproductive development are the main topics of Chapter 5. Ellison presents the mechanics of growth and differences in developing height versus weight. Amongst this review, he incorporates an informative few paragraphs (p. 138-139) on the hormonal influences on skeletal growth, which leads to a section on the timing of menarche. He also includes a satisfying review of Frisch's (with McArthur, 1974, p. 150-151) minimal body fat hypothesis (i.e., girls must accumulate a sufficient level of body fat in order to reach menarche), discussing not only how the theory changed over time, but also why it is incorrect and yet continues to be cited in the literature (e.g., Aiello & Wells, 2002).

Chapter 6 is where all the previous components fall into place to create a logical story of human reproduction as influenced by natural history. Ellison provides an overview of female reproductive success, focussing on the limitations of energy and time, and with a terse section on female mate preferences. One idea that he advances is that "males may help females meet the metabolic load of gestation and lactation by provisioning them with food" (p. 168). I wish that he had dwelled on this topic, providing evidence to support this seemingly novel contention. However, the majority of the chapter is centered on the idea of energy flux—the level of energy a female has available based on her diet, relative to her expenditure. He examines females' graded continuum of fecundity, outlining various influences that vary menstrual phase length and ovarian function. Ellison then turns to cross-cultural evidence to support his arguments, and ties his research into the discussion in a meaningful, informative manner.

In Chapter 7, Ellison presents the relationship between age and fecundity in women, ending with discussion of menopause. In essence, he shows that females become fecund quickly following the onset of menarche, but the descent into infertility is slow and gradual, closing with follicular depletion and menopause. The one obvious omission from this chapter is Hormone Replacement Therapies (HRTs) which are constantly embroiled in debate. Instead of commenting on HRT, Ellison states, "lifetime exposure to ovarian steroids has a very strong impact on the risk of reproductive cancers in women, including breast cancer. The dramatic reduction of estrogen at menopause is associated with accelerated bone loss and increased risk of heart disease" (p. 247) but he provides no references for these contentions. If there is an increased risk of heart disease, why does the National Institutes of Health (2004) recommend that HRT not be used for the prevention of heart disease? Although Ellison presumably decided to omit this material due to space limitations, I would have appreciated some discussion of general physiological effects stemming from HRT, followed by an overview of major advantages and disadvantages of using these therapies.

Based on the fact that all of the previous chapters are specifically devoted to female reproductive physiology, at this point in the book readers may

mistakenly assume that Ellison intends to neglect the male half of reproduction. In Chapter 8, Ellison addresses male reproductive development, testosterone and social dominance, and problems in accurately assessing male fecundity. Although informative, this chapter is the least well developed, and concepts are introduced quickly without much discussion. After reading 43 pages discussing lactation, the mere 29 pages set aside to deal with male reproduction seems overly terse.

In the concluding chapter, composed of a scant 14 pages, Ellison summarizes the evolutionary history of humans to place his text in the proper context. It is, at times, speculative, but he summarizes the main points of evolutionary history very well and easily places the book in the appropriate evolutionary and ecological setting.

My overall impression after reading this text is that Ellison has authored a marvelous book that is definitely worth the time to read. It is accessible and well-researched, and may be an appropriate text for a graduate (or high level undergraduate) course on human sexuality. Moreover, he has managed to weave his research into an interesting story that fits with older and contemporary research. Unlike many of the books authored by evolutionary psychologists within the past few years, this book is not solely about one individual's work, and instead is truly a review and analysis of the natural history of human reproduction.

Due to the publication process, the contents of books can become stale rather quickly, although this phenomenon seems most rapid for the medical or physical sciences. It is not controllable by the authors, and hence does not represent a fault in any way, but it does make me wonder about the advances in knowledge since the publication, and how Ellison would respond to these changes. For example, Johnson and colleagues (2004) recently report that female mice do not have a limited number of oocytes in their follicles from birth, but are able to replenish oocytes throughout adulthood by using germline stem cells. If these cells are also evident in women, then the notion that women are born with a finite number of oocytes (leading to the development of ovum or "eggs") needs to be reexamined. This finding would presumably alter Ellison's conclusions in numerous ways.

One of the minor quibbles I have with the book is the lack of illustrations. Although Ellison does include a handful of photographs and a small number of figures, there is simply not enough to satisfy a visually oriented reader. Frequently throughout the chapters figures could have been incorporated to the reader's benefit, but sadly were not. He need not have included dozens of illustrations, but perhaps something more along the lines of Tim Birkhead's *Promiscuity*.

The second minor downfall is with respect to the referencing system. Ellison employs an endnote system, with all the references listed according to page number in the last section of the book. This format allows the reader to read the chapters without the distraction of citations, but it makes it a tad difficult to

align exact points with the corresponding reference. This approach reinforces that the book is intended for general reading, and not directed towards individuals who seek a reference guide.

These minor negative comments aside, *On Fertile Ground* is well worth reading and I encourage anyone interested, even lightly, to do so. Ellison's main premise is that human reproduction is a product of evolution and occurs in response to ecological conditions. Although he is not the first to make this claim, he appears to be one of the first to endeavor to devote a book specifically to the topic. The end result proves that the endeavor was successful.

On a final, and perhaps trivial note, it must be stated that Ellison's writing style is simply refreshing due to his use of prose. Seldom does one encounter a book that is in itself a genuinely enjoyable read, especially in modern academia. His use of witty chapter headings and sub-headings, his turn of phrase, and his general tone make the book an entirely enjoyable experience.

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