This collection of eighteen chapters, two on male reproductive physiology, nine on female reproductive physiology, five on nonhuman primate reproductive ecology and two on parental investment, is designed for students of human evolution but should be of interest to women, their doctors, their families, and everyone concerned with healthy reproductive outcomes. The editor and contributors to this volume are guided by the premise that human reproductive physiology is the result of adaptive design by natural selection over evolutionary time. We generally teach students that selection favors designs that promote reproductive success; here the investigators propose that failure may be an adaptive feature of primate female reproductive physiology. Amenorrhea in the context of postponing investment in a new baby while nursing the last has obvious adaptive value to mothers and infants, but failure under other circumstances can prevent reproduction when the probability of success is low.

The idea that female reproductive design is sensitive to opportunity costs develops from Robert Trivers’s definition of parental investment as expenditure in one offspring that debits allocation to others; time and energy allocated to current reproductive effort debit future possibilities or impact the welfare of children already born and weaned. Pike expects primate mothers to be especially sensitive to prospects of success since they rear relatively large-brained offspring that develop slowly, placing large demands on maternal energy stores. Under this paradigm present failure is adaptive if it improves future prospects, leading to the prediction that older mothers should be less sensitive to conservation of resources for future offspring. The higher incidence of chromosomal trisomies carried to term in older mothers seems consistent with this prediction.

Wasser and Place add social stress, resulting from the demands of family, work, and reproduction, to the list of environmental causes of failure. They ask, if reproductive failure is adaptive, why not pay attention to the environmental pressures responsible for failure before trying to “fix” every problem technologically. They believe that the demand for fertility assistance in a “competitive biomedical environment” may cause clinicians to recommend treatments that are expensive and that “simply don’t work very well,” while ignoring components of failure amenable to change.

Many women seeking assistance are those who postponed early-age reproduction with the thought that at a later age they would be less stressed and better prepared, economically, for childbearing. Unfortunately, evidence developed by Holman and Wood shows that the probability of successful reproduction declines long before menopause. Their measures demonstrate that fecundability rises rapidly after a period of adolescent sub-fecundity, remains high from age 20 to 40 and then declines steeply to near-zero probability of conception by age 45. This evidence seems to support the presumption that human females have a long window of opportunity for successful reproduction but fecundability and implantation and successful gestation are not the same. At all ages, female reproductive physiology supports some conceptions and not others. Holman and Wood found that the probability post-conception loss increased from 55 percent at age 20 to 84 percent at age 30 and 96 percent at age 40.

Leidy Sievert relates the rise in late-age loss to senescence of ova and follicles, which were produced before the women they belong to were born and then decline in number and quality throughout life. But even in young mothers, conceptions are lost to spontaneous abortion as a consequence of maternal infection, chronic disease, or abnormalities in the fetus. Jasienska, Wasser and Place, Vitzthum, Lipson, and Ball and Panter-Brick develop hypotheses to explain reproductive failure as a consequence of maternal “assessments” of the value of present investment against future possibilities. These “assessments” are not conscious decisions but proximate responses of maternal physiology to signals of fetal quality and external — “environmental” — cues of energy balance, resource sufficiency, and social support. The sensitivity of reproductive physiology to signals of energetic stress supposedly explains why pregnancies may be threatened by weight loss, though nutrition’s role in human pregnancy, labor, and delivery has a long history of defying interpretive intuition.

Surprisingly, Jasienska found that working Polish peasant women exhibit negative hormonal profiles.