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Evolutionary Imperatives in Human Seduction

Mating Strategy, Signaling, and the Limits of Adaptationist Inference

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Abstract

This paper evaluates what evolutionary theory can and cannot contribute to the scientific study of consensual courtship, which the IHE whitepaper series calls *seduction*. It examines a common popular account that presents seduction as a fixed adaptive system governed by unchanging evolved mechanisms and divided into distinct male and female strategies. The approach is a structured review of the primary literatures on sexual selection and parental investment, sexual strategies and strategic pluralism, cross-cultural mate preferences, stated versus revealed preferences, signaling theory, facial attractiveness, jealousy, pair-bonding, ovulatory-cycle effects, and same-sex attraction. Each thesis is presented with its best supporting evidence, its strongest objection, and a graded verdict. The main position is that evolutionary theory is a productive source of hypotheses about human courtship, and that some findings are robust, notably cross-cultural sex differences in stated preferences for partner age, attractiveness and resources. Many popular claims, however, are weaker than usually presented: stated preferences predict in-person attraction poorly, sex differences are mostly moderate and overlapping, several signature findings (ovulatory preference shifts, symmetry effects, forced-choice jealousy differences) have shrunk or failed under stronger methods, and human mating systems vary with ecology and culture. The paper sets out the methodological limits of adaptationist inference, including untestable ancestral scenarios, unrepresentative samples, and the naturalistic fallacy, and closes with ethical considerations and a pre-registrable research agenda. It describes tendencies, not laws, and offers no reproductive or relationship prescriptions.

Keywords: *sexual selection; parental investment; mate preferences; signaling theory; pair-bonding; adaptationism; evolutionary mismatch*

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1. Introduction

Evolutionary explanations of attraction are among the most widely cited and most widely criticized ideas in the behavioral sciences. They promise a unifying account of why some partners appeal, why courtship looks broadly similar across societies, and why loss is painful. They are criticized because that explanatory freedom makes them easy to construct after the fact, and because popular versions often present contested findings as settled facts about men, women and "human nature."

Popular accounts often go further than the evidence. It is commonly said that seduction is simply an adaptive behavior, that the evolved mechanisms governing desire have not changed since ancestral times, that men and women evolved distinct seduction strategies, and that heartbreak evolved as a penalty system. This paper asks what evolutionary theory actually contributes to understanding courtship and answers in the calibrated form the Institute's editorial standards require. Its scope is scientific and educational: IHE provides preventive education, not treatment, and refers people who need clinical care to licensed clinicians.

The paper is the third in a five-part series. IHE-WP-01 sets out the multilevel framework (biological, psychological, dyadic and sociocultural) on which the series rests. IHE-WP-02 examines the neurobiology of romantic loss, IHE-WP-04 the evidence on human chemosignals, and IHE-WP-05 the requirements for any probabilistic model of romantic outcomes. This paper supplies the evolutionary layer of the framework and its limits.

1.1 Scope and definitions

In this series, *seduction* is used as an umbrella term for consensual, communicative behavior by which one person seeks to elicit or increase another person's romantic or sexual interest. Coercion, deception about material facts, harassment, and manipulation of a person who has not consented fall outside the definition. They are not treated as skills to be improved, and nothing in this paper should be read as describing them as adaptive in any approving sense.

Several further terms are used throughout. *Sexual selection* is selection arising from differences in success at obtaining mates or fertilizations, as distinct from differences in survival. *Parental investment* is any investment by a parent in an offspring that increases that offspring's chance of surviving at a cost to the parent's ability to invest in other offspring. A *mate preference* is a disposition to evaluate potential partners more or less favorably on the basis of particular attributes; a *stated* preference is what a person reports, a *revealed* preference is what predicts their actual choices or attraction. A *signal* is a trait or behavior that has been shaped, at least partly, by its effect on the behavior of receivers; a *cue* is any informative feature that has not been so shaped. An *adaptation* is a trait whose form is explained by past selection for a particular function; a *by-product* is a trait that exists because it is linked to an adaptation, not because it was itself selected. *Pair-bonding* refers to a durable, selective social and emotional relationship between two adults, which need not imply sexual exclusivity.

1.2 Levels of explanation

Evolutionary accounts answer *ultimate* questions: why a disposition might have been favored by selection. Psychological, developmental and cultural accounts answer *proximate* questions: how the disposition is built and expressed in an individual life. The two levels are complementary, not rival. A frequent error in popular accounts is to treat an ultimate hypothesis as if it settled a proximate question, for example by moving from "a preference for healthy partners may have been favored" to "people choose partners in order to maximize reproductive success." Evolutionary hypotheses concern the design of motivational systems over deep time, not the conscious goals of individuals, many of whose romantic behaviors occur where reproduction is impossible or unwanted.

1.3 Evidence-strength vocabulary

Every major empirical claim in this paper is graded with the vocabulary in Table 1, which is used consistently across the IHE series.

Table 1. Evidence-strength vocabulary used in this paper.

Grade	Meaning
Established	Replicated, convergent methods, large or meta-analytic evidence
Supported	Consistent findings, but limited replication, samples, or methods
Preliminary	Few or small studies, or a single method
Contested	Credible evidence on more than one side, or failed replications
Speculative	Plausible hypothesis, no direct evidence

What this paper does not claim

It does not claim that any courtship behavior is fixed, universal, or immune to culture, learning and individual choice. It does not claim that men and women have two distinct, non-overlapping mating strategies, or that heterosexual, reproduction-oriented relationships are the natural or correct form of romance. It does not claim that what evolved is good, right, or a guide to how anyone should behave (the naturalistic fallacy). It does not offer matchmaking, genetic matching, reproductive advice, or any position on reproductive policy. It does not claim that the Institute has conducted studies, holds proprietary data, or provides treatment of any kind.

2. Sexual selection and parental investment

2.1 Darwin's two mechanisms

Darwin (1871) proposed sexual selection to explain traits, such as elaborate ornaments and weapons, that seemed to reduce survival. He identified two mechanisms: competition among members of one sex for access to the other, and choice exercised by members of the other sex. Both mechanisms are well documented across animals and form the theoretical starting point for evolutionary accounts of

human courtship. Whether a given human trait was shaped by mate choice, by competition, by natural selection for other functions, or by culture is, however, an empirical question that the general theory does not answer.

2.2 Parental investment and the Bateman tradition

Trivers (1972) argued that the sex that invests more in offspring becomes a limiting resource for the other, so that the lower-investing sex competes more intensely for mates and the higher-investing sex is choosier. Combined with Bateman's 1948 fruit-fly experiments, this produced an influential generalization: males benefit more from multiple mating and should be eager, females should be discriminating (Brown et al., 2009).

The best evidence for the generalization is comparative. A meta-analysis across the animal kingdom found that, on average, sexual selection is stronger on males than on females, consistent with the classic predictions (Janicke et al., 2016). The best objection is that the generalization was overextended. Tang-Martínez (2016) reviewed the history of Bateman's principles and the modern evidence that females of many species mate multiply and benefit from doing so, concluding that the model of sexually reluctant females and indiscriminate males has often been treated as axiomatic even where data do not fit it. Applied to humans, Brown et al. (2009) examined mating and reproductive-success data from contemporary and historical populations and argued that human mating strategies are unlikely to conform to a single universal pattern.

The decisive point for humans is that parental investment is not fixed by gamete size. In *Homo sapiens*, fathers and other kin frequently provide substantial investment, which reduces the asymmetry on which the classic model depends. Stewart-Williams and Thomas (2013) argued that humans are better described by a *mutual mate choice* model, in which both sexes are choosy about long-term partners and both compete for desirable ones, than by a model in which males compete and females choose. They suggested that the latter model has led parts of the field to exaggerate human sex differences and to neglect male choosiness and female competition.

Verdict. That sexual selection has shaped some human traits is *Supported*. That parental-investment asymmetries produce stronger average selection on males across animals is *Established* at the comparative level. That humans fit a simple eager-male, choosy-female model is *Contested*; the mutual mate choice description fits the human evidence better.

3. Mating strategies: from a binary narrative to strategic pluralism

3.1 Sexual strategies theory

Popular accounts often list traits that men supposedly evolved to signal (stability, protection, resources, status) and traits that women supposedly evolved to signal (fertility cues, youthfulness, emotional depth, selectivity). Such lists are a simplified version of *sexual strategies theory* (Buss & Schmitt, 1993), which in its original form is considerably more nuanced. The theory proposes that both sexes

pursue both short-term and long-term mating, that the adaptive problems differ by sex and by context, and that the sexes are predicted to differ most in short-term contexts and less in long-term ones. The theory is a framework for generating hypotheses, not a claim that each sex has one strategy.

3.2 Strategic pluralism and within-sex variation

Gangestad and Simpson (2000) proposed *strategic pluralism*: during human evolution there were trade-offs between effort invested in mating and effort invested in parenting, so both men and women evolved conditional strategies sensitive to circumstances such as one's own condition, local sex ratios, and environmental risk. This account predicts substantial variation within each sex, which is what is observed.

The largest cross-cultural study of *sociosexuality* (willingness to engage in sex without commitment) administered a self-report inventory to 14,059 people across 48 nations (Schmitt, 2005). It reported sex differences that were generally large and present in every nation, which supports an evolved component. It also reported that sex differences were larger in reproductively demanding environments and reduced to more moderate levels in cultures with greater political and economic gender equality, and that national sociosexuality tracked operational sex ratios. The same dataset therefore documents both a robust average difference and its sensitivity to ecology and social structure. The measure is self-reported, and the samples were mostly university students, which limits generalization.

3.3 How large are the differences?

A meta-analysis of gender differences in 30 sexual behaviors and attitudes across 834 samples and seven large national datasets found that men reported slightly more sexual experience and more permissive attitudes on most variables, but that most differences were small; medium differences appeared for masturbation, pornography use, casual sex, and attitudes toward casual sex (Petersen & Hyde, 2010). Differences were smaller in nations and groups with greater gender equity for some behaviors, and changed with publication year and sample age.

Average differences of this size describe heavily overlapping distributions, which a binary strategy narrative obscures. Two standard transformations make the point concrete. Under the simplifying assumption of two normal distributions with equal variance, the proportion of overlap and the probability that a randomly chosen member of one group scores higher than a randomly chosen member of the other are:

$$OVL = 2\Phi(-d/2) \quad (1)$$

$$CL = \Phi(d/\sqrt{2}) \quad (2)$$

Here d is the absolute value of the standardized mean difference (Cohen's d), Φ is the cumulative distribution function of the standard normal distribution, OVL is the overlapping coefficient (the shared area of the two distributions), and CL is the common-language effect size. As an illustration only, Lippa (2007) reported that across more than 200,000 internet respondents in 53 nations, men ranked good looks as more important than women did with $d = 0.55$. Applying equations (1) and (2) to that

value gives an overlap of about 78% and a probability of about 0.65 that a randomly chosen man ranks looks higher than a randomly chosen woman (computed in Python; the ranking data are not normally distributed, so these figures illustrate the meaning of d rather than describe that dataset). For a difference of $d = 0.2$ the corresponding figures are about 92% and 0.56. Differences of this order are real at the population level and nearly uninformative about any individual.

Verdict. Average sex differences in some sexual attitudes and behaviors are *Established*. That they are large in every domain, invariant across cultures, or sufficient to describe "male" and "female" strategies is *Contested* to unsupported: most differences are small to moderate, distributions overlap substantially, and within-sex variation is large and context-dependent.

4. Cross-cultural mate preferences and the social-structural alternative

4.1 The evolutionary account and its replication

Buss (1989) tested five predictions derived from parental investment and sexual selection theory in 37 samples from 33 countries (total $N = 10,047$). Women, more than men, valued cues to resource acquisition in potential mates, and men, more than women, valued characteristics signaling reproductive capacity, chiefly youth and physical attractiveness. The predicted sex difference in valuing chastity was much less consistent across samples.

Walter et al. (2020) replicated the study with a new 45-country sample ($N = 14,399$). Support for sex differences in preferences remained robust: men more than women preferred attractive, young partners, and women more than men preferred older partners with good financial prospects. This is among the best-replicated findings in the field, and the Institute treats it as such.

4.2 The social-structural (biosocial) alternative

The leading alternative holds that these differences arise less from sex-specific evolved preferences than from the division of labor and gender roles that societies construct around physical sex differences, especially pregnancy, lactation and average differences in size and strength (Wood & Eagly, 2002). On this view, women's greater emphasis on a partner's resources reflects their historically restricted access to resources of their own. Eagly and Wood (1999) reanalyzed the 37-culture data and reported that sex differences in preferences for a partner's earning capacity and age were smaller in nations where women had greater economic and political power. Zentner and Mitura (2012) reported a similar pattern, with sex differences in preferences declining as national gender parity increased, in both new data from 10 nations and the original 31-nation data.

The replication by Walter et al. (2020) tested both perspectives directly and did not settle the dispute in either direction. As gender equality increased, both sexes had partners closer to their own ages, which is consistent with the biosocial account; but beyond partner age, neither gender equality nor pathogen prevalence robustly predicted the size of sex differences across countries, which is less consistent with it. Two cautions apply to all such analyses. National indices of gender equality are

coarse, and nations are not independent units, so between-country correlations are weak tests of within-person causal processes.

4.3 What both sexes want

The emphasis on differences obscures a larger pattern of similarity. In the BBC internet survey analyzed by Lippa (2007), the traits ranked most important by participants overall were intelligence, humor, honesty, kindness, good looks, facial attractiveness, values, communication skills and dependability. Sex differences in rankings of physical attractiveness were highly consistent across 53 nations, whereas rankings of character traits varied more between nations and correlated with national gender equality. Sexual orientation differences were smaller than sex differences, and preference profiles clustered by participant sex rather than by orientation. The internet sample was self-selected and skewed toward Western, connected respondents.

Verdict. Cross-cultural sex differences in stated preferences for partner age, attractiveness and resources are *Established*. Whether they derive mainly from sex-specific evolved preferences or from gendered social structure is *Contested*; most researchers now accept that both evolved dispositions and social roles contribute, and the relative weights are unresolved. That both sexes prioritize kindness, intelligence, humor and honesty is *Supported*.

5. Stated versus revealed preferences

A preference that people report is not necessarily a preference that governs their attraction. Eastwick and Finkel (2008) used speed-dating with longitudinal follow-up. Participants reproduced the traditional sex differences when stating the importance of physical attractiveness and earning prospects in an ideal partner. Yet there were no sex differences in how strongly the actual attractiveness and earning prospects of people they met predicted their romantic interest, and ideal preferences stated before the event failed to predict what inspired desire at the event.

A subsequent meta-analysis ($k = 97$) spanning the attraction and relationships literatures found that a partner's physical attractiveness predicted romantic evaluations with a moderate-to-strong effect (r of roughly .40) for both sexes, and earning prospects predicted them weakly (r of roughly .10) for both sexes, with small and nonsignificant sex differences in these associations (Eastwick et al., 2014). An r of .40 corresponds to about 16% of variance and an r of .10 to about 1%.

The strongest objection comes from Li et al. (2013), who argued that speed-dating pools are often restricted in range, because most attendees are of similar status and attractiveness. When their experiments included potential partners at the low end of social status and attractiveness, choices became sex-differentiated in the predicted directions for long-term relationships, and stated preferences predicted actual choices. Their *mate preference priority model* holds that the sexes differ most in what they treat as necessities, that is, in what they most want to avoid.

A further limit concerns prediction itself. Joel et al. (2017) applied machine learning to more than 100 self-reported traits and preferences measured before speed-dating. The models predicted part of each person's general tendency to desire others and to be desired, but could not predict *relationship variance*, the unique desire of a particular person for a particular partner. Attraction to a specific person appears to emerge from the interaction itself, a point developed in IHE-WP-05.

Verdict. The dissociation between stated ideals and in-person attraction is *Supported* by several studies and a meta-analysis, and *Contested* in its interpretation: sex-differentiated preferences may operate mainly at the margins of a pool, when trade-offs are forced. The inability of pre-meeting traits to predict dyad-specific desire is *Supported* but rests on a small number of speed-dating samples.

6. Signaling theory

6.1 Honest signals and the handicap principle

A common popular taxonomy distinguishes honest signals (symmetry, clear skin, vocal quality, calm under stress) that supposedly cannot be faked, costly signals (courage, ambition, persistence) said to have evolved as indicators of long-term reliability, and deceptive signals (perfume, makeup, curated social media) said to produce only short-term attraction. Each part of this taxonomy is weaker than it appears.

The classic theoretical basis is Zahavi's *handicap principle*: a signal is reliable because it is costly, and only high-quality individuals can afford the cost (Zahavi, 1975). This principle has been very influential, but Penn and Számadó (2020) argued in a detailed critical review that Zahavi's claim that signals are honest because they are wasteful is erroneous, and that the formal models usually cited in its support do not establish it. In current signaling theory, reliability can be maintained in several ways, including physical constraints on the signal, differential costs and benefits across signallers, and the possibility of punishment for dishonesty. "Costly" therefore does not automatically mean "honest," and "cheap" does not automatically mean "deceptive."

6.2 Human evidence for signaling

Anthropological work offers the clearest human tests. Bliege Bird and Smith (2005) reviewed ethnographic cases of unconditional generosity, seemingly wasteful subsistence behavior such as prestigious but inefficient hunting, and craft and artistic traditions, and concluded that the conditions for reliable signaling of hidden qualities may be met in many social domains. Status itself is associated with reproductive success: a meta-analysis of 288 results from 33 nonindustrial populations found that men's social status was significantly associated with reproductive success regardless of subsistence type or how status was measured (von Rueden & Jaeggi, 2016). The analogous evidence for women is thinner, and the association in contemporary low-fertility societies is weaker and more complicated, partly because contraception decouples mating success from reproduction.

The evidence that traits such as courage, ambition, persistence and emotional regulation function as evolved mate-choice signals, as opposed to traits that people value for straightforward present-day reasons, is largely absent. A person may prefer an emotionally stable partner because emotional stability makes relationships work better, without any signaling history being involved.

6.3 "Deceptive" signals reconsidered

Cosmetics, fragrance, clothing and curated online profiles are better described as forms of self-presentation than as deceptive signals. Much of their function is socially understood by both parties, and their use is shaped by cultural norms rather than by a fixed evolved logic. The popular assertion that such signals create short-term attraction but not long-term bonding has no identified empirical basis. In online dating, Finkel et al. (2012) noted that profiles are partial and selectively presented, and that profile information is an imperfect guide to compatibility, but this is a point about the limits of available information, not evidence that self-presentation undermines bonding.

Verdict. That humans use some costly displays to communicate qualities, and that men's status relates to reproductive success in nonindustrial societies, is *Supported*. That the handicap principle explains signal honesty is *Contested*. That personality traits such as courage or ambition are evolved mate-choice signals is *Speculative*. The claim that self-presentation produces only short-term attraction is unsupported by the evidence reviewed here.

7. Facial and bodily attractiveness

7.1 Agreement and candidate cues

People agree substantially about who is attractive, both within and across cultures, and attractive people are judged and treated more favorably, according to a set of eleven meta-analyses (Langlois et al., 2000). Rhodes (2006) reviewed the evidence on three candidate biologically based standards, averageness, symmetry and sexual dimorphism, and concluded from meta-analyses that all three are attractive in male and female faces and across cultures. Little et al. (2011) described a flexible system in which face preferences vary with factors including the perceiver's own attractiveness, visual experience, familiarity, and social learning.

7.2 The health-signal hypothesis and its limits

The adaptationist interpretation is that attractive traits are preferred because they signaled health or genetic quality. Here the evidence is considerably weaker than the attractiveness findings themselves. Rhodes (2006) noted that face preferences might instead be by-products of how the visual system processes information, and argued that both kinds of explanation may contribute. In a comprehensive test, Foo et al. (2017) found that several traits predicted rated attractiveness, but links between appearance and actual measures of health (immune function, oxidative stress) were weak; male masculinity related to semen quality, while averageness related to it negatively. A meta-analysis of fluctuating asymmetry and attractiveness found substantial publication bias, with correction reducing

effect sizes by 30-50% and the few studies with more than 100 participants showing effects near zero (Van Dongen, 2011).

Cross-cultural sampling raises a further problem. Scott et al. (2014) studied perceptions of facial masculinity and femininity in populations ranging from urban to small-scale societies and found that typical Western perceptions were attenuated or even reversed in less developed environments, suggesting that some preferences treated as evolved universals may be relatively novel products of modern environments.

7.3 Genetic compatibility

It is often claimed that courtship helps people select genetically compatible partners. The most-studied candidate mechanism is preference based on the major histocompatibility complex (MHC), a set of immune genes. A phylogenetically controlled meta-analysis of 58 effect sizes from 30 studies across seven primate species found a trend toward MHC-diverse partners, significant for humans, but no general tendency toward MHC-dissimilar partners; apparent preferences for MHC similarity in observational human studies appeared to reflect ethnic heterogeneity of the populations sampled (Winternitz et al., 2017). IHE-WP-04 discusses this literature in detail. The Institute does not offer and does not endorse genetic matching of any kind.

Verdict. Consensus on facial attractiveness and the attractiveness of averageness, symmetry and dimorphism are *Established*. That these preferences evolved because the traits signal health is *Contested*. The claim that courtship selects genetically compatible partners is *Preliminary* at best and is not supported as a general claim.

8. Emotions as evolved regulators of mating

8.1 The functional view of emotion

The view that emotions are specialized states shaped by selection because they adjusted responses to recurring situations of adaptive significance is a mainstream position in evolutionary psychology (Nesse, 1990). It is a productive heuristic. It does not imply that every feature of an emotion is an adaptation, that each emotion has a single function, or that emotional experience in a given person is serving that function.

8.2 Desire, romantic love and pair-bonding

Popular accounts describe desire as motivating pursuit of genetically beneficial partners and infatuation as a temporary obsession that promotes pair-bond formation. A more defensible form of the hypothesis is set out by Fletcher et al. (2015), who argued that romantic love functions as a commitment device motivating pair-bonding, that it appears to be universal, that it suppresses attention to alternative partners, and that it has characteristic behavioral, hormonal and neural signatures. They also acknowledged challenges from arranged marriage, polygyny, divorce and infidelity. Diamond (2003) argued that the processes underlying sexual desire and affectional bonding are functionally

independent, and that the bonding system is not intrinsically oriented toward other-sex or same-sex partners. This account explains why people of any orientation can form intense romantic attachments, and why love and desire can come apart in either direction.

8.3 Jealousy and the measurement problem

The evolutionary account predicts that men should be relatively more distressed by a partner's sexual infidelity, because of paternity uncertainty, and women relatively more by emotional infidelity, because of the risk of losing investment. Buss et al. (1992) reported this pattern using a forced-choice question and supporting physiological measures. DeSteno et al. (2002) reported that the sex difference appeared only with the forced-choice format; on other measures both sexes reported more distress at sexual infidelity, and the forced-choice difference disappeared under cognitive load, suggesting an artifact of an effortful response strategy. Two later meta-analyses reached different conclusions. Sagarin et al. (2012) concluded that the sex difference is not merely an artifact of the forced-choice format. Carpenter (2012), analyzing 172 effect sizes from 54 articles, found the predicted pattern mainly in US student samples, found both sexes more upset by emotional infidelity under forced choice and by sexual infidelity on continuous measures, and found that lesbian and gay samples responded largely according to the sex of their partner, a pattern the author interpreted as favoring a social-cognitive account over the evolutionary one.

8.4 Heartbreak as a "penalty system"

It is sometimes said that heartbreak evolved as a penalty system that teaches the nervous system to refine future partner selection. No direct evidence for this specific function has been identified. The general idea that distress after loss motivates reconnection, reflection or behavior change is plausible within the functional view of emotion, but the evidence on the neurobiology of romantic loss, and on heterogeneity in recovery, is reviewed in IHE-WP-02 and does not support a single designed function.

Verdict. That romantic love is a widespread human experience associated with pair-bonding is *Supported*. That it is an evolved commitment device is *Supported* as a hypothesis with convergent but largely indirect evidence. A sex difference in jealousy responses is *Contested* and strongly dependent on measurement and sample. Heartbreak as an evolved penalty system is *Speculative*.

9. Pair-bonding, monogamy and cooperative child-rearing

It is often said that pair-bonding evolved because it increased offspring survival, and that courtship acts as the activation system that begins the bond. The evolutionary origins of human pair-bonding are an active research area with several competing accounts.

The traditional account holds that pair-bonding evolved because biparental care improved the survival of costly, slowly developing offspring (Fletcher et al., 2015). Comparative analyses complicate it. Across more than 2,500 mammal species, social monogamy appears to have arisen where females were

solitary and male infanticide was unusual, primarily as a male mate-guarding strategy, with paternal care a later consequence rather than the cause (Lukas & Clutton-Brock, 2013). A comparative analysis of 230 primate species instead identified male infanticide as the most compelling driver of the shift to social monogamy (Opie et al., 2013). For humans specifically, Schacht and Bell (2016) modeled multiple mating, mate guarding and paternal care under assumed ancestral conditions and concluded that mate guarding in the face of partner scarcity, rather than paternal care, drove the evolution of monogamy, cautioning that present-day patterns of paternal investment should not be confused with the reason pairing first evolved.

Other accounts emphasize the wider social group. Hrdy (2009) argued that humans are *cooperative breeders*, in whom mothers rely on help from fathers, grandmothers, siblings and other *alloparents* (caregivers other than the mother), and that this shaped human social cognition. Chapais (2008) argued that stable breeding bonds within multi-male, multi-female groups were the foundation of distinctively human kinship structures, including recognition of fathers and in-laws and exchange between groups.

These accounts disagree about causes, but they converge on two points relevant to this paper. Human pair-bonding is embedded in wider cooperative and kin networks, and the relevant evolved capacities are best described as capacities for durable cooperative attachment, not as a single mechanism activated by courtship. Human mating arrangements also vary widely across societies and individuals, including serial monogamy, polygyny, consensual non-monogamy, and long-term relationships without children.

Verdict. That pair-bonding is a recurrent feature of human social life is *Supported*. Why it evolved is *Contested*, with mate guarding, infanticide avoidance, biparental care and cooperative breeding all receiving support from different methods. The characterization of courtship as the activation system of the bond is *Speculative*.

10. Ovulatory-cycle shifts: a case study in replication

The *ovulatory shift hypothesis* proposes that women, on high-fertility days of the cycle, show heightened short-term attraction to men with characteristics that ancestrally signaled genetic quality, such as masculinity and symmetry. It was among the most cited sources of support for evolved, sex-specific mating psychology, and it illustrates how such findings change under stronger methods.

Gildersleeve et al. (2014) meta-analyzed 134 effects from 50 studies and reported robust cycle shifts specific to short-term attractiveness judgments of hypothesized genetic-quality cues, and concluded that neither publication bias nor flexibility in defining fertile windows accounted for them. Analyzing a partly overlapping literature of 58 reports, Wood et al. (2014) reached the opposite conclusion: the few significant shifts appeared to be research artifacts, declined over time, were confined to studies using broad and imprecise definitions of the fertile phase, and were found only in published research.

Subsequent large and pre-registered studies largely failed to support the preference version of the hypothesis. The largest longitudinal study of facial masculinity preferences ($N = 584$) found no

compelling evidence that preferences tracked changes in women's salivary steroid hormones, and no effect of oral contraceptive use (Jones et al., 2018). A pre-registered within-participant study of 157 women, using hormone measures and luteinizing-hormone tests to confirm ovulation, found no cycle shifts in preferences for men's competitive or courtship behaviors (Stern et al., 2020). By contrast, a pre-registered diary study of more than 26,000 entries from 1,054 women reported ovulatory increases in self-reported sexual desire (Arslan et al., 2021). The current picture is therefore that a change in desire across the cycle has some support, while the more specific claim of shifting preferences for particular male traits has largely failed replication.

Verdict. Ovulatory shifts in preferences for putative genetic-quality cues: *Contested*, leaning toward not replicated in the strongest recent tests. Cycle-related changes in sexual desire: *Supported* by large pre-registered data, with mechanism and generality still open. The episode illustrates the importance of pre-registration, adequate samples and precise measurement for the whole field.

11. Same-sex attraction and non-reproductive functions

An account of attraction that treats reproduction as its only function cannot explain much of human romantic and sexual life. Same-sex attraction and behavior are documented across cultures and history, and same-sex sexual behavior is widespread across animal taxa, where it can have multiple evolutionary causes and consequences (Bailey & Zuk, 2009). Bailey et al. (2016) reviewed the scientific evidence on sexual orientation and observed that the relevance of causal questions to social and political decisions is often poorly justified; scientific questions about origins do not settle questions about rights, dignity or acceptance.

Several features of the evidence bear directly on this paper. First, the affectional bonding system appears not to be intrinsically oriented by partner sex (Diamond, 2003), so evolutionary accounts of pair-bonding apply in principle to same-sex couples. Second, sex differences in some preferences appear similar across orientations: in the data analyzed by Lippa (2007), preference profiles clustered by participant sex rather than orientation. Third, much of the research reviewed in this paper sampled only heterosexual participants, used binary sex categories, and framed questions around reproduction; where this is so, the findings should not be generalized to sexual-minority, transgender or non-binary people without direct evidence. Fourth, attraction and bonding serve many functions unrelated to conception, including companionship, mutual support, pleasure and social integration, and these functions are not secondary simply because they are harder to model in fitness terms.

Verdict. The existence of non-reproductive functions of attraction and bonding is *Established* as a descriptive matter. Evolutionary explanations of same-sex attraction remain *Speculative* to *Preliminary*. The heterosexual and binary skew of the core literature is a central limitation of the evidence reviewed in this paper.

12. The limits of adaptationist inference

This section addresses methodological problems common to all the claims assessed above.

12.1 Just-so stories and spandrels

Gould and Lewontin (1979) criticized what they called the adaptationist program: the habit of breaking organisms into traits, proposing an adaptive story for each, and replacing a failed story with another rather than considering alternatives. The alternatives include by-products of other adaptations (by analogy with the spandrels of a cathedral, which exist because arches meet, not because anyone designed them), developmental and physical constraints, genetic drift, and traits that once served one function and now serve another. An adaptive hypothesis that can accommodate any observation is not a scientific explanation. Lloyd (1999) argued that much evolutionary-psychological work has not met the evidential burdens that evolutionary biologists require before accepting a trait as an adaptation.

12.2 The Pleistocene problem

Many hypotheses refer to an *environment of evolutionary adaptedness*, usually identified with Pleistocene hunter-gatherer life. Behavior does not fossilize, and ancestral social arrangements must be inferred indirectly from archaeology, comparative primatology, genetics and contemporary small-scale societies, each with its own limitations. Bolhuis et al. (2011) argued that several standard assumptions of evolutionary psychology require revision in the light of evidence that many human genes have undergone recent selection, that humans actively shape their own developmental and selective environments, and that experimental evidence often favors general-purpose over modular accounts of cognition.

12.3 Mismatch versus gene-culture co-evolution

A common popular claim is that the modern world has changed but the evolutionary mechanisms that govern desire have not. This conflates two different claims and overstates both. The *evolutionary mismatch hypothesis* holds that mechanisms adapted to past environments can produce maladaptive outputs when inputs change in quantity, intensity or fitness consequences (Li et al., 2018). Mismatch is a legitimate and testable idea, but it requires showing both what the ancestral input was and that the current output is maladaptive, and it is easy to invoke loosely.

The stronger claim, that human evolved psychology has been frozen since the Pleistocene, is contradicted by evidence of recent and ongoing human evolution and of *gene-culture co-evolution*, in which cultural practices alter selection pressures on genes, as in the spread of lactase persistence alongside dairying (Laland et al., 2010). Moreover, an evolved disposition is not a fixed behavior: dispositions are expressed through development, learning and culture, so the expression of desire can change substantially without any genetic change.

12.4 Who is studied

Most of the psychological research reviewed in this paper sampled people from Western, educated, industrialized, rich and democratic (WEIRD) societies, often university students, who are unusual on many psychological measures relative to the rest of humanity (Henrich et al., 2010). The facial dimorphism findings described in Section 7.2 show how a preference assumed to be universal can weaken or reverse in other populations (Scott et al., 2014). Cross-national surveys such as those of Buss (1989) and Walter et al. (2020) broaden the sampling but still rely largely on literate, often urban respondents and on self-report.

12.5 The naturalistic fallacy and essentialism

The *naturalistic fallacy* is the inference from what is natural or evolved to what is good or right. Even a well-established evolved tendency carries no moral authority: evolution has produced dispositions toward cooperation and toward violence alike. Evolutionary claims about sex differences carry an additional risk. Dar-Nimrod and Heine (2011) reviewed evidence that genetic explanations lead people to see traits as immutable, determined, homogeneous within groups, and natural, a pattern they call *genetic essentialism*. Statements such as "men evolved to signal resources" invite exactly these inferences, and can be used to justify stereotyping, coercive behavior, or resignation to inequality. The Institute regards this as a scientific and an ethical reason to report effect sizes, overlap and variability, and to avoid categorical language.

12.6 The best reply

Evolutionary psychologists have responded to these criticisms in detail. Confer et al. (2010) argued that many evolutionary hypotheses generate novel, falsifiable predictions; that the field explicitly incorporates learning, culture and environmental novelty; and that much criticism rests on misunderstandings, while acknowledging real limitations of current work. The ovulatory-cycle case in Section 10 supports both sides: the hypothesis was testable and was tested, and the strongest tests largely failed to support it.

Verdict. The critiques identify genuine and pervasive problems: *Established* for WEIRD sampling and publication bias, *Supported* for the difficulty of testing ancestral scenarios. Evolutionary hypotheses remain useful when they generate specific, risky predictions that are tested with adequate samples and pre-registration. The claim that evolved desire has not changed is not supported.

13. Modern courtship: evaluating the mismatch claims

Popular accounts often attribute four problems to mismatch between evolved instincts and modern life. Each is assessed here against available evidence.

Oversupply of partner options. Online meeting has changed how couples form: in a nationally representative US survey, meeting online had become the most common way heterosexual couples met, overtaking meeting through friends around 2013 (Rosenfeld et al., 2019). Finkel et al. (2012)

argued that browsing many profiles may encourage an evaluative, shopping-like mindset and that the scientific basis of algorithmic matching claims was weak. Whether larger choice sets destabilize ancestral mechanisms is, however, a hypothesis rather than a finding; Finkel et al. (2012) treated choice overload as a possible cost of online dating, and direct evidence that larger option sets reduce satisfaction with romantic choices is *Preliminary*.

Amplified status signals and unrealistic standards. The proposal that social media intensifies social comparison is plausible, but this paper identified no direct evidence linking it specifically to evolved mate-choice mechanisms. It is *Speculative* as an evolutionary claim.

Asynchronous expectations between men and women. The evidence in Sections 3 to 5 indicates that men's and women's goals overlap substantially and that within-sex variation exceeds between-sex differences on most measures. The framing is not supported.

Emotional fragility. The claim that modern environments "weaken resilience" has no identified evidential basis in this literature. IHE-WP-02 reviews evidence that most people recover from romantic loss without professional intervention.

14. What evolutionary perspectives do and do not imply for relationship education

This section states what an evolutionary perspective can reasonably contribute to preventive relationship education, which is the Institute's remit.

An evolutionary perspective can help people understand that common experiences in courtship and loss, such as preoccupation with a new partner, jealousy, or the pain of rejection, are widely shared features of human social life rather than personal defects. It can explain why attraction is partly patterned and partly unpredictable, and why self-reported "types" are imperfect guides. It can also supply hypotheses for education research.

It does not imply that any person should pursue particular partners, display particular traits, or conform to sex-typed roles. It does not justify jealousy-driven control, persistence after refusal, or any behavior that overrides another person's consent; describing a tendency as evolved does not make it acceptable. It provides no basis for prescriptions about reproduction, partner genetics, or relationship structure. Where people experience distress after loss that is severe, prolonged, or accompanied by thoughts of self-harm, the appropriate step is to consult a qualified clinician; IHE provides preventive education, not treatment, and refers people who need clinical care to licensed clinicians.

15. Evidence at a glance

Table 2 summarizes the paper's central claims.

Table 2. Evidence at a glance.

Claim	Evidence strength	Representative sources	Principal limitation
Sexual selection shaped some human traits	Supported	(Darwin, 1871; Stewart-Williams & Thomas, 2013)	Hard to assign specific traits to mechanisms
Humans fit an eager-male, choosy-female model	Contested	(Tang-Martínez, 2016; Brown et al., 2009; Janicke et al., 2016)	Human paternal investment reduces asymmetry
Sex differences in stated preferences for age, looks, resources	Established	(Buss, 1989; Walter et al., 2020)	Self-report; mostly literate, urban samples
These differences are mainly evolved, not social-structural	Contested	(Eagly & Wood, 1999; Zentner & Mitura, 2012; Walter et al., 2020)	Coarse national indices; non-independent units
Sex differences in sexuality are mostly small to moderate	Established	(Petersen & Hyde, 2010; Schmitt, 2005)	Self-report; WEIRD skew
Stated ideals predict in-person attraction	Contested	(Eastwick & Finkel, 2008; Eastwick et al., 2014; Li et al., 2013)	Restricted range in speed-dating pools
Dyad-specific attraction is hard to predict before meeting	Supported	(Joel et al., 2017)	Few samples; limited measures
Handicap principle explains signal honesty	Contested	(Zahavi, 1975; Penn & Számadó, 2020)	Honesty has several mechanisms
Status relates to men's reproductive success	Supported	(von Rueden & Jaeggi, 2016)	Nonindustrial samples; less evidence for women
Averageness, symmetry, dimorphism are attractive	Established	(Rhodes, 2006; Langlois et al., 2000)	Effects vary across populations
Attractive traits signal health	Contested	(Foo et al., 2017; Van Dongen, 2011; Scott et al., 2014)	Weak health links; publication bias
MHC-dissimilar partner choice in humans	Preliminary	(Winternitz et al., 2017)	Population structure confounds
Sex difference in jealousy	Contested	(Buss et al., 1992; DeSteno et al., 2002; Sagarin et al., 2012; Carpenter, 2012)	Strong dependence on response format
Romantic love as a commitment device	Supported	(Fletcher et al., 2015; Diamond, 2003)	Largely indirect evidence
Origins of pair-bonding	Contested	(Lukas & Clutton-Brock, 2013; Opie et al., 2013; Schacht & Bell, 2016; Hrdy, 2009)	Ancestral conditions inferred
Ovulatory shifts in trait preferences	Contested	(Gildersleeve et al., 2014; Wood et al., 2014; Jones et al., 2018; Stern et al., 2020)	Pre-registered tests largely null

Claim	Evidence strength	Representative sources	Principal limitation
Ovulatory change in sexual desire	Supported	(Arslan et al., 2021)	Self-report; inferred fertile window
Heartbreak as an evolved penalty system	Speculative	(Nesse, 1990)	General theory only; no direct evidence
Human evolution and behavioral expression did not stop after the Pleistocene	Supported	(Laland et al., 2010; Bolhuis et al., 2011)	Recent selection for mating psychology largely untested

16. Limitations and open questions

This paper is a narrative, structured review, not a systematic review or meta-analysis. Sources were selected to represent the strongest evidence and the principal critiques on each question, but selection judgments were made by the Institute and could be contested. The evidence grades are qualitative judgments and should be read as such.

The underlying literatures share several limitations. Much evidence is self-reported preference data, which, as Section 5 shows, may diverge from behavior. Laboratory paradigms that use photographs, vignettes or brief speed-dates have limited ecological validity for long-term relationships. Publication bias has demonstrably inflated some effects, including symmetry and ovulatory findings. Cross-national studies treat nations as units, which risks ecological fallacies. Samples are disproportionately WEIRD, heterosexual and cisgender, and many studies use binary sex categories. Few studies are prospective, and fewer track people from initial attraction through relationship formation and dissolution.

Several questions remain open. How much of the cross-cultural sex difference in preferences reflects evolved dispositions, social roles, or their interaction? Under what conditions do stated preferences predict behavior? Which features of attraction are universal and which are products of particular environments? How do evolutionary accounts apply to same-sex, transgender and non-binary people's relationships? What evolutionary scenario best explains human pair-bonding, and can comparative and genetic methods discriminate between the candidates?

17. Ethical considerations

Consent and autonomy. Evolutionary accounts of courtship are sometimes used to rationalize persistence after refusal, sexual coercion or controlling jealousy as "natural." The Institute rejects that use. Consent is a precondition of the behavior this series studies, and an evolutionary explanation of a tendency has no bearing on whether acting on it is permissible.

Dignity and essentialism. Claims about what men and women "evolved to" do can reinforce stereotypes and discrimination. The Institute reports overlap, variability and effect sizes alongside average differences, and avoids categorical language about groups.

Risk of misuse for manipulation. Findings about signaling and attraction can be repackaged as techniques for influencing people without their informed participation. The Institute does not develop or teach such techniques, and treats deception about material facts and manipulation of non-consenting people as outside its definition of seduction.

Sexual and gender diversity. Research framed around heterosexual reproduction risks treating other relationships as deviations. The Institute's research and educational materials will state the populations to which findings apply and will not generalize beyond them.

Privacy. Research on attraction can involve sensitive data, including sexual history, relationship status, photographs, hormone measures and, potentially, genetic information. Any future Institute study involving such data will require IRB approval with partner universities, review by the Institute's Independent Ethics Committee, informed consent, data minimization and secure storage. The Institute does not collect genetic data for partner matching.

Cultural sensitivity. Courtship norms vary widely across cultures, and some societies arrange or regulate partnerships in ways that differ from Western dating. Evolutionary accounts should not be used to rank cultures' relationship practices as more or less natural.

18. Research agenda

The Institute is young and has not yet conducted studies. The following questions are presented as aspirations for future collaborative, pre-registered work under IRB supervision.

1. *Preference integration under trade-offs.* Building on Li et al. (2013) and Eastwick et al. (2014), test whether stated preferences predict choices more strongly when participants must trade off attributes in a full-range pool than in a restricted-range pool. Falsifiable prediction: the interaction between pool range and stated preference on choice will be positive; a null interaction with adequate power would count against the trade-off account.
2. *Preference stability across development.* Examine, in longitudinal designs, whether stated partner ideals change with relationship experience and whether changes precede or follow partner choice.
3. *Diversity of samples.* Replicate key preference and attraction paradigms in sexual-minority, transgender and non-binary samples and in non-WEIRD populations, with measures developed in collaboration with those communities, before drawing general conclusions.
4. *Education outcomes.* Test whether a brief educational module on the distinction between evolved tendencies and personal choice reduces endorsement of essentialist beliefs about

men and women, using a randomized design with pre-registered outcomes and a follow-up assessment. The prediction is falsified if endorsement does not differ from an active control.

5. *Modeling dyadic attraction.* In collaboration with the work described in IHE-WP-05, partition attraction into actor, partner and relationship variance in new samples, and test whether any pre-meeting measure predicts relationship variance out of sample.
6. *Choice-set size.* Test, with pre-registered field or experimental designs, whether larger partner-choice sets reduce satisfaction or commitment, as the mismatch claims in Section 13 assume.

19. Conclusion

Evolutionary theory is a valuable source of hypotheses about human courtship, and some predictions have held up well, notably cross-cultural sex differences in stated preferences for partner age, attractiveness and resources. Many claims attached to it in popular accounts do not survive scrutiny in their strong form: sex differences are mostly moderate and overlapping, humans are mutually choosy, stated ideals are imperfect guides to attraction, several signature findings have weakened under pre-registered testing, the origins of pair-bonding are disputed, and attraction and bonding serve functions well beyond reproduction for people of every sexual orientation.

The appropriate conclusion is not that seduction is a biological system shaped only by survival pressures, but that evolved dispositions, development, learning, culture and individual choice jointly shape how people attract and bond with one another. Evolutionary explanations describe tendencies, not laws, and they carry no moral authority about how anyone should live. The Institute will treat them as hypotheses to be tested, reported with their uncertainties, and used in education only in ways that respect the consent, autonomy and dignity of everyone involved.

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