

Suicide Bombers, Weddings, and Prison Tattoos
An Evolutionary Perspective on Subjective Commitment and
Objective Commitment

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1. Introduction

Consider three hypothetical suicide bombers. The first seeks to die in a suicide attack because he believes that doing so is an effective means of achieving his pragmatic objectives, including obtaining access to sexual opportunities and ensuring the material and spiritual welfare of his family. The second seeks to die in a suicide attack because he is outraged at the treatment that he and others like him have received at the hands of their oppressors, feels that his honor has been tarnished, and therefore longs to visit vengeance upon his enemy. The third seeks to die in a suicide attack because, having already recorded a videotape detailing his plan, the social costs of backing out would be enormous. In common parlance, all three are said to be “committed” to terrorist acts. However, this broad term masks important differences among these cases. For example, the presence of alternative avenues may readily dissuade the first bomber; the second bomber is less easily discouraged, yet may nonetheless falter at the critical moment; the third bomber is more reliable still. In reality, terrorist organizations recognize these differences, and seek to create redundant motivations by employing all three facets in conjunction (see Moghadam 2003). While practitioners thus appear to have hit upon successful recipes through trial and error or intuition, we believe that scholars studying such topics have not always been as successful, and hence that understanding commitment can be advanced by efforts to systematically define and contrast different types of commitment.

The central feature of our notion of commitment is that, at the time at which commitment is initiated, multiple courses of action present themselves to the actor; in committing, the actor is selecting one of these options to pursue, and, by definition that choice is intended to endure despite the continued or anticipated attractiveness of alternatives. Importantly, markedly

different mechanisms might generate the two features of ‘selecting among options’ and ‘the durability of the choice.’ This heterogeneity is reflected in the remarks of Schelling, a seminal contributor to the modern study of commitment: “The ways to commit [...] are many. Legally, one files suit. Reputationally, one takes a public position. Physically, one gathers speed before taking an intersection. Emotionally, one becomes obsessed” (Schelling 2001, 49). In this paper, we propose that, as inspection of these instances suggests, commitment is an analytically diverse category that is useful in as much as it draws attention to some of the many possible factors that influence whether an individual’s behavior will be consistent over time.

Reflecting the heterogeneity that we attribute to commitment, the literature on this topic is characterized by a profusion of terms and distinctions. This is not without problems. First, though often useful within a specific subfield of the commitment literature, many distinctions cannot be applied to commitment in the broader literature. For example, Frank (2001, 58) draws a fundamental distinction between commitment facilitated by emotions and that facilitated by contracts. While this is a legitimate distinction, some important commitments involve neither exclusively internal motivations nor other parties, thus fitting into neither category.

The goal of this essay is to first disambiguate two major types of commitment, then stress the importance of hitherto neglected forms of commitment, and finally consider how disambiguating the processes at issue sheds light on the evolution of a variety of psychological and social phenomena. We begin by distinguishing between subjective commitment and objective commitment (Section 2), then introduce the notion of a commitment device (Section 3). These concepts are all defined in relation to the committing individual - whether others play a role in committing, and what role they play, is irrelevant to these prior distinctions. In Section 4 we then introduce various kinds of social interactions that can play a role in commitment,

focusing on the costs and benefits that impact third parties incur in this regard. In Section 5 we turn to the communicative facets of commitment involving social interactions, arguing that signals stemming from objective commitments are more reliable than those that derive from subjective commitments. Many social commitments employ existing practices, hence in Section 6 we explore how culture shapes commitment, concluding with conjectures regarding the co-evolution of culture and the psychology of commitment.

2. Subjective and Objective Commitment

By “*subjective commitment*” we mean an internal, psychological phenomenon wherein, either consciously or subconsciously, individuals appraise one course of action as intrinsically superior to other courses of action, leading them to pursue it. In contrast to the first suicide bomber in our opening example (who, by our criteria, would not be described as committed to a suicide attack), in cases of subjective commitment, the selected option is chosen not because it is deemed instrumentally superior, i.e., more likely to achieve some objective separate from the course of action itself, but rather because this course of action is valued more highly in and of itself. As illustrated by the second suicide bomber in our opening example, plausible primary factors in subjective commitment are ongoing, recalled, and anticipated emotions, and internalized cultural norms and values relevant to the chosen act. Our notion bears resemblance to the concept of subjective commitment as frequently used in the literature, but draws a cleaner distinction than is sometimes made. For example, Nesse (2001, 16) uses the term “subjective commitment” to denote those commitments wherein “fulfillment depends on emotions and concerns about reputation.” Because reputation is external to the individual, by our definition,

commitments defined by reputational issues are not subjective. Granted, Nesse does stress *concerns about* reputation, but, in our terminology, this would only be relevant to the question of whether one is committed to upholding one's reputation. After all, individuals also have a subjective valuation of money, yet it would be nonsensical (or at least unproductive) to say that an actor who engages in an action because he is paid to do so is subjectively committed *to that course of action* – at most, he might be subjectively committed to earning money. By the same token, in our terminology, an actor who is himself indifferent between two options, but selects one over the other because he knows that others will praise him for doing so, is not subjectively committed to his choice. All this is not to say that reputation is not important for commitment. In Section 4, we will argue that reputation can play a significant role in all forms of commitment; this, however, depends on the role of third parties in a focal actor's commitments, a topic that can be treated independently from the subjective or objective nature of the commitment.

As will prove important later, by our definition, in pure subjective commitments, no externally generated costs befall the actor should the selected course of action subsequently be abandoned in favor of another option. We stress the source of costs here because subjective commitment does entail costs, but these arise internally, primarily in the form of aversive emotional states, should the commitment be broken. In contrast, as we define it, *objective commitment* encompasses interactions with the external world that create a situation wherein the actor has narrowed the range of options, in that costs that are external to the actor will be incurred in the event of a subsequent change of course. The case of the third suicide bomber in our opening example illustrates the external nature of such costs: once the videotape has been made, the bomber's own attitude toward the terrorist plan becomes far less relevant to the costs that he will suffer if he fails to carry it out – were he to back out, dissemination of the videotape

would ensure the ostracism of him and his family. Note that for objective commitment to obtain, it is crucial that the actor takes steps, even if only by selecting one course of action over others, that change the costs of alternative courses of action. If such changes are the product of events not involving the actor's own actions, then the term "commitment" does not apply, e.g., when robbed at gunpoint, the victim is coerced, not committed, to handing over his wallet.

While subjective and objective processes can both contribute to commitment to a given course of action, in their fullest manifestations, neither form of commitment requires the other form in order to ensure that commitment is successful, i.e., that the selected course of action is followed to its conclusion. Strong subjective commitment requires no objective commitment because the actor's current ranking of the relative desirability of the various courses of actions is wholly predictive of the actor's future rankings – because the valuation of one option over others does not change over time, the course of action selected is pursued to its completion without fail. For example, our second hypothetical suicide bomber may be so firm in his belief in the moral rectitude of his cause, and so unwavering in his hatred of his foe, that neither concern for himself, empathy for his victims, nor obstacles in his way will lead him to abandon his plans. Conversely, strong objective commitment requires no subjective commitment because the alternative courses of action have been made prohibitively expensive (or, in some cases, eliminated entirely). For example, in order to protect themselves from security forces, some terrorist organizations make it difficult, or even fatal, to leave the organization once one has joined, thereby substantially obviating the need for unwavering ideological or emotional motives (see Crenshaw 1987; Miller 2006).

In all objective commitments, the act of choosing alters the cost/benefit ratios, or availability, of the various courses of action. The same is not true of many forms of subjective

commitment, as, much of the time, there is no feedback from the course of action to the emotions and values that motivated the choice. However, a subclass of subjective commitments involves selecting a course of action that, by virtue of its inherent subsequent effects on the actor, generates secondary subjective motivations that reinforce the original hierarchy of preferences. For example, an individual who wishes to reduce his salt intake for health reasons will, if he adheres to a low-sodium diet, find that his appetite for salt eventually diminishes, making his new diet more palatable than his old diet. Likewise, a teenager who wishes to overcome the aversive aspects of cigarette smoking in order to appear fashionable will, if she smokes consistently, become chemically dependent on nicotine. While dramatic, changes in bodily reactions to the actions at hand are not the only source of secondary subjective reinforcers, as mere habit may offer mild forms thereof, if only because following practices that have become habitual requires less concentration than deviating from them. Nevertheless, as centuries of discussions in philosophy and theology attest, many of the most important manifestations of subjective commitment lack such secondary subjective reinforcers – when discussing sexual fidelity, courage in battle, and similar challenges, observers have long understood that it is precisely because the relative attractiveness of the options remains unaltered by the choice that strong forms of subjective commitment are often needed if subjective commitment alone is to determine whether the selected course of action is fulfilled. One partial solution to this challenge is to augment the initial choice with secondary choices, as discussed below.

3. Commitment Devices

In some circumstances, once a course of action has been selected from among the available options, provided that the option takes some time to be completed, it is possible to then

additionally select a second course of action, unrelated to the first, that serves to increase the probability that the primary course of action will be pursued to its conclusion, i.e., that the commitment will be successful. We define a *commitment device* as any action that is taken with the intention of increasing the probability that a commitment will be successful.¹ Although both subjective and objective commitment can exist, and can lead to successful commitment, without the use of commitment devices, both can also be bolstered by commitment devices.

Actors can seek to maintain subjective commitment by structuring their environment in a manner that reinforces or re-generates the initial motivation to commit. For example, after being demoted for drinking on the job, an alcoholic may be subjectively committed to giving up alcohol. However, anticipating that the shame and regret undergirding this commitment will fade over time, while the pain of alcohol withdrawal will increase, the alcoholic may seek to maintain his subjective commitment by posting a copy of his demotion letter on his liquor cabinet, thereby re-eliciting the subjective state that led to his decision. We suggest that, though often not described as such, commitment devices intended to bolster subjective commitment are quite common. Religious symbols and icons displayed in the home evoke feelings of piety and reinforce the choice to forgo temptation; photos of loved ones, lockets, and similar reminders are akin to minor emotional spark plugs, reinvigorating dedication to the goal of benefiting the depicted individuals (e.g. Gonzaga et al. 2008); and so on.

¹ Note that, paralleling Elster's (2003, 1754) definition of what he terms *precommitment*, our action-based definition of a commitment device excludes internal psychological features, such as emotions, that scholars such as Frank (1988) include as possible commitment devices. We find the latter usage confusing, as it entails splitting the actor into a strategic agent and a subjective agent. The subjective agent's experiences would involve subjective costs or benefits that influence the strategic agent. Rather than enter into a discussion of plausibility of such splitting, we adopt an approach that simply preserves the unity of the actor.

As is true with regard to subjective commitment, commitment devices are not an intrinsic part of objective commitment. Some choices are themselves costly or impossible to reverse, hence taking them objectively commits the actor to pursuing the chosen action. For example, as noted earlier, in some terrorist or criminal organizations, once one has joined the organization, subsequent options are limited to a choice between continued membership and death; in cases such as this, no additional actions need be taken to raise the cost of the alternatives in order to ensure that the selected course of action will be pursued to completion. Nevertheless, just as commitment devices can rekindle subjective commitment, so too can they bolster objective commitment. Moreover, unlike subjective commitment (in which commitment devices usually merely recreate or enhance the initial hierarchy of preferences by, for example, rekindling emotions that contributed to that hierarchy), objective commitment can be generated *de novo* when a commitment device creates costs or eliminates alternatives. For example, choosing to save money for retirement in itself involves no objective commitment, as the act of choosing does not generate tangible costs if the actor changes course at some later date. However, having chosen to save money for retirement, if one then places one's savings in a retirement account having substantial penalties for early withdrawal, one creates an objective commitment, as this commitment device alters the costs of premature spending.

4. Social Facets of Commitment: Investment

Neither subjective commitment, nor objective commitment intrinsically requires interaction with other parties. For example, suicide can be pursued in isolation by simply stopping the consumption of food and drink (a process involving subjective commitment, as both

the opportunity to change course and the costs of doing so continue to exist until the process is completed) or jumping off a precipice (a process involving objective commitment, as other options evaporate once the action is begun). However, although social interaction is not intrinsic to commitment, interesting ramifications develop when a social component occurs, as social interaction in the context of commitment raises two distinct classes of issues, namely investment and communication.

In political science, economics, and related fields, commitment is discussed primarily as a social phenomenon, principally in terms of its communicative facets. While we will have much to say about this, before turning to communication, we would like to address two arguably simpler facets of social aspects of commitment, namely, social interactions as commitment devices, and social interactions as investments in other's commitments.

Because social interactions are themselves powerful elicitors of emotions, social interactions can bolster the emotional underpinnings of subjective commitment. Similarly, because we are prone to both imitate prestigious individuals and conform to the ideas held by a majority of the members of our group, others can have a strong influence on an actor's values. As a consequence of these and similar phenomena, social interactions can reinforce the hierarchy of preferences at the heart of subjective commitment. Together, these effects allow certain forms of social interaction to serve as commitment devices for subjective commitment. For example, our aforementioned alcoholic may join a self-help support group in which he is encouraged to revisit his shameful past failures, is provided with extensive input regarding the value of abstention, and is placed in relationships with successful role models. In this case, the members of the support group cooperate with the focal individual in order to help him fulfill his

commitment. Resembling the manner in which objects can help sustain subjective commitment, the support group can operate as a subjective commitment device.

Social interactions can also be a powerful source of commitment devices in objective commitments, as interactions can be used to change the cost or availability of alternative courses of action. In some cases, others are directed to enact a commitment device on behalf of the actor, as when Odysseus instructed his crew to first tie him to the mast of their vessel, then ignore his subsequent orders until they had sailed beyond the point where he would be able to hear the Sirens' seductive songs. In other cases, others are themselves the source of some of the costs and benefits of various courses of action, such that they are part and parcel of the commitment device. For example, publicly swearing an oath or issuing a promise creates a context wherein failing to adhere to the selected course of action entails reputational costs that increase the incentive to adhere to the commitment.

Whenever others play a role in commitment devices, they pay some cost in doing so, even if, in the minimal case, it is only time and attention. This raises the question of why, absent nepotistic or cooperative motives that obtain beyond the given interaction, others are willing to pay such costs. In some cases, others are subject to larger contracts that encompass the given interaction – payroll officers are paid to manage payrolls, including deducting contributions to a retirement plan from the employees' wages; Odysseus' crew was obliged to follow his orders, including those concerning the Sirens; and so on. In other cases, despite the absence of a larger contract, other parties participate in a non-symmetrical and non-reciprocal manner. For example, in the oath-swearing case, reputational factors are at stake precisely because observers benefit from knowing whether the focal actor is the sort of person who adheres to oaths, cares about others' opinions, and so on, information that is useful to the observers because they can then

employ it in making decisions regarding possible relationships with the focal actor. In still other cases, participation is a non-symmetrical reciprocal act; for example, in Alcoholics Anonymous, it is believed that an experienced sponsor benefits by mentoring a new member, as mentoring purportedly assists the sponsor in his own pursuit of sobriety. Most interesting, perhaps, are those cases in which participation is a symmetrical reciprocal act, i.e., all parties are in pursuit of the same objective, and they each generate a commitment device for the other. For example, rotating savings and credit associations (ROSCAs) are a mechanism that, among other functions, provides reciprocal social commitment devices that generate objective commitment to save up lump sums. In a common variant of this institution, at scheduled intervals, each member contributes a fixed amount to a pool, and the pooled funds are given to a single member at each meeting; this cycle is repeated until all members have received the pool one time. Once an individual has joined a ROSCA group, she is objectively committed to adhering to the contribution schedule, as failing to do so will elicit the wrath of those pool recipients whose proceeds would thereby ultimately be less than their net contributions. Although the respective roles are sequential rather than simultaneous, these social commitment devices are relatively symmetrical, as, due to simple self-interest, each member is motivated to perform the role of enforcer for each of the other members (Fessler 2002). This symmetry means that the system can be self-sustaining, as it does not rely on any additional benefits to ensure that actors are willing to pay the costs of enacting commitment devices for one another.

In sum, the recognition that enacting commitment devices for others entails investment focuses the investigator's attention on the benefits that those who serve in such a capacity reap; the higher the costs, the greater the benefits must be if the commitment device is to be reliably enacted. Given this, reciprocal symmetrical arrangements such as ROSCAs in which each party

performs the same function for the other will often be among the most stable such systems. However, as attentive readers may have noticed, costs and benefits do not need to coincide in time. This creates the possibility of defection: a focal actor may claim to commit to a certain action but then change her behavior as soon as third parties have invested. In the next section, we turn to the question of when signals of commitment are reliable.

5. Social Facets of Commitment: Communication and Reliability

The communicative aspect of commitment has long played a central role in scholarly treatments of the topic (e.g., Schelling 1960). In both situations involving conflict (ibid.) and situations involving cooperation (Hirshleifer 1987), the optimal course of action by one party is often contingent on the course of action selected by the other party. In such contexts, commitment is frequently conceptualized as a pledge that is communicated by one party with the intention of influencing the behavior of the other party (Schelling 2001, 48; Hirshleifer 1987; Nesse 2001). A signaled commitment is a threat if the signaler pledges to do something at a cost to himself that inflicts a cost on the adversary. The intention is to change the adversary's behavior in a way that will be beneficial to the signaler. At the same time, the adversary's new behavior will also be more beneficial to the adversary in light of the possibility that the threat will be carried out. For example, during an armed robbery, the robber threatens to shoot the victim if he does not hand over his wallet. Shooting is bad for the victim but also bad for the robber, who faces harsher punishment if caught. Before the threat, handing over his wallet would

not be in the victim's interest. When threatened, it becomes in both the victim's and the thief's interest that the victim do so. Conversely, a signaled commitment is a promise if the signaler pledges to do something at a cost to himself that will provide a benefit to the other party. The intention is again to change the other party's behavior in a way that will be more beneficial to the signaler. At the same time, the partner's new behavior will also be more beneficial to the partner in the event that the promise is kept. Promises thus differ from threats in that, in cases where the signal is veridical, a threat is only followed through if the adversary does not change behavior. As the examples suggest, threats occur primarily in cases of conflict, while promises are common in cases of cooperation.

Threats and promises are members of a larger class of signals describing purported future actions by the signaler that inform the recipient's optimal choice among the available courses of action. In deciding whether to act on such signals, recipients must, however, consider the signal's reliability, where "reliability" is defined in terms of the accuracy of the forecast that the signal provides concerning the signaler's future behavior. As we have seen, changing behavior contingent on a signal of commitment is beneficial only if the commitment is (or would otherwise be) followed through to completion. But how can the recipient be certain that the signal of commitment is reliable? In the robbery example, shooting is very costly to the robber, so he would do well to avoid it, while the victim, knowing this, would do well to keep his wallet if the threat is, in fact, an empty one. Among the factors that influence the reliability of signals of commitment, and hence their impact on recipients' behavior, the distinction between subjective and objective commitment plays a central role.

Subjective commitments can certainly be powerful determinants of behavior. Consider, for example, that the evolved psychological systems that motivate eating and drinking markedly

increase the attractiveness of these behaviors as the period of deprivation progresses, yet subjectively committed hunger strikers nonetheless sometimes fulfill their threats by fasting to death in pursuit of political objectives. Nevertheless, despite such dramatic examples of the powerful and enduring nature of some subjective commitments, recipients of signals communicating courses of action that derive from subjective commitment face the problem that such signals can be unreliable for two reasons. First, if the focal actor's internal motivators change between the time of the signal and the time of the behavior of interest to the recipient, then the signal will inaccurately forecast the behavior. The fact that today someone is passionately in love, or fervently dedicated to a political cause, does not preclude the possibility that they will not be so tomorrow, or next year – people 'fall out of' love, become disillusioned with causes, substitute new beliefs and values for old ones, and so on. Second, the focal actor may seek to deceive the recipient in order to manipulate the recipient's subsequent actions.

As prior investigators (e.g., Frank 1988) have noted, signals associated with subjective commitment afford deceptive manipulation. By virtue of the fact that the determinants of the focal actor's commitment are internal, they cannot be directly observed by the recipient of the signal. As a consequence, it will often be relatively simple for the focal actor to send signals that falsely convey the nature or degree of the commitment -- declarations of love or political dedication are unreliable because it is relatively easy to lie about one's emotions and values. In the abstract, there is no intrinsic connection between sentiments and statements, hence recipients of statements of subjective commitment are often rightly skeptical of them. And yet, subjective commitment is an undeniably real phenomenon. Seeking to explain the ultimate functions of subjective commitment in part with regard to the question of signaling, a number of investigators have attempted to grapple with the question of how, despite the above considerations, subjective

commitment might nonetheless lead to signals of sufficient reliability as to provide a selective advantage to those with a capacity and propensity for subjective commitment.

Hirshleifer (1987) and Frank (1987, 1988) promulgated versions of what has become an influential theory of subjective commitment wherein many emotions are described as evolved mechanisms that not only generate subjective commitment, but, moreover, signal said to other parties by virtue of costly voluntary acts. Around the same time, Gauthier (1986) proposed a somewhat parallel account of internalized moral norms. Hirshleifer, Frank, and Gauthier all propose that witnessing acts that have some cost attached to them, particularly when numerous and distributed over a prolonged period, leads the observer to accurately infer the dispositional nature of the focal actor, i.e., to discern that actor's chronologically stable hierarchy of preferences. In other words, through repeated actions, the actor establishes a reputation that accurately captures his enduring propensities. Such accounts hold that the honesty of the signal is maintained through budgetary constraints, cognitive constraints, or both.

Turning first to budgetary constraints, it is claimed that the larger the number of separate signals emitted, the greater the costs of employing a deceptive strategy. Habitually acting in a manner consistent with a given disposition is therefore claimed to provide a reliable index of that disposition to long-term observers. However, as illustrated by the case of spies and sleeper cells, if the benefits are great enough, it will be worth paying substantial costs to repeatedly emit false signals. Moreover, even in cases that do not involve malice aforethought, at the time that an opportunity for substantial gain through defection occurs, past signaling costs are already sunk, hence, from a cost/benefit perspective, the only logical consideration is whether the costs of the reputational damage caused by defection, reduced by the probability of detection, outweigh the benefits of defection. If the benefits of defection are sufficiently large as to outweigh the

reputational costs, it is economically rational (calculating over *both* the short and the long term) to defect. Similarly, expenditures in support of a positive reputation are probably characterized by diminishing returns, especially for repeated low-cost actions of similar type, a feature that potentially lowers the threshold for rational defection. In short, cost/benefit considerations suggest that, while many past acts of accurate signaling may well predict future instances when costs are low, there is no inherent strategic impetus for continued consistency when opportunities for substantial gain through Machiavellian manipulation present themselves. This means that, while the mechanisms that underlie much of subjective commitment may well have evolved in part due to the benefits of being able to persuade recipients as to the validity of signals concerning future action, such mechanisms will often not suffice in this regard in high-stakes situations, i.e., precisely those contexts which, from an evolutionary perspective, will often matter most.

A second tenet of Frank's (1987, 1988) position is that the reliability of repeated observations of signals derives in part from the greater cognitive demands of deception relative to honesty. Because sustained pretence is more cognitively taxing than acting in a manner that accurately reflects one's motives, multiple observations over prolonged periods will reveal the reliability of a focal actor's signals, as a manipulative actor will make occasional mistakes that reveal the underlying misrepresentation. While evidence continues to accumulate that deception is indeed more cognitively demanding than honesty (e.g., Walczyk et al. 2009), this argument nonetheless suffers from limitations similar to those that weaken the budgetary reasoning discussed above. First, we can expect cognitive resources to be marshaled in proportion to the importance of the task at hand. In pursuit of substantial benefits through long-term deception, spies and sleeper cells succeed at manipulating others in part through rehearsal and

memorization, practices that, while costly, are worth the price given the benefits at issue. Second, all such considerations apply primarily to cases of malice aforethought, and are less relevant to decision making at the time that a new opportunity for substantial gains through defection presents itself. Overall, the observation that deception is sufficiently common as to have apparently selected for evolved mechanisms for detecting cheaters (Cosmides et al. 1992; Verplaetse et al. 2007) suggests that, over evolutionary time, cognitive constraints have often not been prohibitive when it really matters. In sum, while existing signaling accounts of emotions and morality may shed light on these contributors to subjective commitment, they do not resolve the problem of the fundamentally unreliable nature of signals of subjective commitment.²

In contrast to signals associated with subjective commitments, objective commitments are maintained by factors that are external to the individual. As a consequence, observers will often be able to more directly discern the determinants of the focal actor's actions, thus increasing their ability to forecast the focal actor's future behavior. Of course, although the underpinnings of objective commitment are more amenable to inspection by virtue of their status in the external world, signals associated with objective commitment are nevertheless not entirely immune to deceptive manipulation. Focal actors can falsely create the impression that such external factors exist when they do not, often in regard to the purported deployment of commitment devices. For example, Kahn's (1965, 11) famous proposed strategy of winning the drivers' game of chicken by removing the steering wheel and conspicuously throwing it out the window hinges on the truth value attached by the opponent to the actions witnessed. However, such truth value is undermined by the fact that these actions are potentially subject to deception, as the thrown wheel may not, in fact, be the steering wheel from the given car, the focal actor

² We leave for another day the question of the evolution of emotions and morality, as each topic merits lengthy treatment on its own.

may have a secondary means of steering (such as a smaller steering wheel not visible to the opponent), and so on (R. Kurzban, personal comm.). Nonetheless, while both subjective and objective commitment signals are amenable to deception, signals associated with objective commitment can more readily be subjected to systematic scrutiny, thus increasing their reliability. As a consequence, we may expect objective commitments to have a stronger effect on other's behavior.

A key factor influencing the ability of observers to forecast the behavior of focal actors in situations of objective commitment is the extent of the costs underlying the given commitment. If alternative courses of action have not been eliminated, then signals associated with objective commitments are only as reliable as the size of the costs attending alternative courses of action, as this predicts the likelihood that the focal actor will not subsequently change course -- when the costs are low, objective commitment is weak, i.e., the actor may subsequently decide that the costs are worth paying, and alter course accordingly. However, once again, by virtue of the fact that the determinants of the costs are external to the focal actor, observers will have greater access to this information than is true in subjective commitment, and hence signals referencing this information will be more reliable than is often the case with regard to subjective commitment.

This does not mean that, in cases in which no deception is involved and the costs of alternative courses of action are high, forecasts based on signals associated with objective commitment are perfect. With the exception of those objective commitments in which alternative courses of action have been irreversibly eliminated, it is possible that external costs and benefits will change before the fulfillment of the course of action, where after the focal actor's behavior may then change accordingly. However, particularly when compared with the vicissitudes of

emotions and values, many features of the world are quite stable. More importantly, even when they are not stable, their change can be observed in ways that internal states cannot.

Correspondingly, observers can be expected to have greater confidence in forecasts associated with objective commitment than in those associated with subjective commitment.

Taken together, the above considerations indicate that, while caveats apply, signals associated with subjective commitment will generally be less reliable than signals associated with objective commitment. The focal actor motivated by subjective commitment who stands to benefit from signaling her commitment to others therefore faces the dilemma that, being unreliable, such signals will often likely not have sufficient effect on others' actions. A partial solution is to create an observable commitment device that bolsters subjective commitment, as knowledge of this device can provide some reassurance to observers. For example, our aforementioned demoted alcoholic might document for his employer that he has joined Alcoholics Anonymous. However, because commitment devices of this type merely enhance subjective commitment, signals associated with them still suffer from the problems of reliability intrinsic to subjective commitment itself. Because of the fundamental asymmetry in reliability between subjective and objective commitments, a focal actor motivated by subjective commitment who wishes to substantially increase her ability to influence observers will therefore often be best served by initiating parallel objective commitments through the use of commitment devices.

Consider the problem of forming a stable socio-sexual union (i.e., 'marriage,' howsoever locally defined). A substantial corpus of literature supports the assertion that, consonant with the central role of reproduction in natural selection, much of contemporary human behavior in this domain reflects the workings of evolved psychological mechanisms (for example, see Sefcek et

al. 2006 for review). Viewed in evolutionary terms, heterosexual courtship in an open market (i.e., free of ancillary social obligations and constraints) presents a prototypical signaling dilemma of the type described above. For women, a committed male partner affords substantial fitness benefits through provisioning, co-parenting, and protection. However, women face a signaling problem: men who wish to pursue a high-investment strategy run the risk that their partners will be surreptitiously unfaithful, leading them to miss-allocate their investment by provisioning another man's progeny. A woman who seeks to secure a high-investing partner therefore profits by signaling that she will be faithful to her prospective husband. However, given the benefits to women of securing investment from one man and genes from another (reviewed in Pillsworth & Haselton 2006), men, in turn, should be skeptical of women's declarations of subjective commitment. Elizabeth Pillsworth and Robert Kurzban (personal comm.) have each proposed that limerence, the form of romantic love motivating sincere courtship (Tennov 1979), impels the actor to conspicuously and consistently spurn alternative suitors, thereby generating observable objective commitment by narrowing the options available to the woman.³ Once a woman has a child by a man, the costs to her of being abandoned by her mate should he suspect infidelity increase. These costs create an objective commitment that enhances the likelihood that the woman will be faithful. With this observable objective

³ Note that the postulated system is only functional if the total pool of possible partners from which the woman selects is fairly small. If the pool is large, then spurning various suitors will not substantially narrow the woman's options, and thus will not reduce the likelihood that she will subsequently select an alternative partner. However, if the pool is small, then each such act removes a nontrivial fraction of the possible alternatives. Recognizing that the human mind evolved in circumstances very different than the present day, although reconstructions of the size of typical ancestral human groups vary, it is unquestionably the case that the scale at issue was vastly smaller than is typical of modern urban societies. Hence, reflecting a situation of evolutionary disequilibrium, the postulated mechanisms have little real signal value in much of the contemporary world.

commitment in place, the need for limerence diminishes, and, correspondingly, this highly disruptive emotion fades.⁴

Now, consider the same situation from the perspective of a male suitor. Because the obligate biological costs of reproduction are low for men, men have the option of pursuing either a quality-over-quantity strategy (one or a few partners in whom much is invested) or a quantity-over-quality strategy (many partners in whom little is invested). As a consequence, women should be skeptical of men's declarations of subjective commitment in this regard, as some purported dads are likely to be deceptive cads. As in the female case, limerence can motivate men to spurn alternative partners as a commitment device. However, this behavior will generate less commitment, and thus be less informative as a signal, when emitted by a man. A single man can produce a far larger number of children than can a single woman, hence access to female partners is the limiting factor in male reproductive success; men's pursuit of women will therefore generally be more extensive than women's pursuit of men. As a result, in small groups such as those in which our ancestors lived (see footnote 3), a limerent woman has the

⁴ Although not yet subjected to direct testing, this hypothesis is consonant with available findings. In well-nourished urban populations in which the timing of copulation is optimized, time to first conception is approximately six months (Gnoth et al. 003). This period is likely at least twice as long in hunter-gatherers, who are subject to substantial variation in food availability, and who presumably do not optimize the timing of copulation. Accordingly, in ancestral populations, for fertile couples, first birth would generally have occurred between the end of the second year of marriage and the start of the third year. Correspondingly, Tennov (1979) reports that limerence generally lasts approximately two years. Across 58 societies, divorce rates steadily increase from the first to the fourth years of marriage (Fisher 1989); data for hunter-gatherer societies is scarcer, but similar patterns appear to apply (see Fisher 1989, nd Blurton Jones et al. 2000), suggesting that this is the critical period during which the relationship must be cemented -- indeed, Hadza hunters explicitly state that they will seek a new partner if a child is not born within several years (Marlowe 2004). Nevertheless, as K. Sterelny (personal comm.) has pointed out, one limitation of this hypothesis is that being rejected as a suitor is not isomorphic with being ruled out as a partner for future extra-pair copulations, and hence, even in small groups akin to those of our ancestors, such behavior on the woman's part does not provide absolute certainty of paternity to the target of her limerence.

opportunity to spurn a far larger proportion of alternative suitors than does a limerent man, creating a stronger objective commitment, and thus a more reliable signal. However, spurning alternatives is not the only commitment device available to male suitors. Because provisioning loomed large among the benefits that men provided to women in ancestral populations, and hence plays a central role in mating psychology today, one solution available to the male suitor is to provide initial gifts that are sufficiently substantial as to constitute an objective commitment. American folk culture specifies that the man should give the woman a diamond engagement ring and, importantly, it should cost 25% of his annual salary; this is to be followed later by a similarly-priced wedding ring. Because the gifts become the property of the recipient (i.e., the man cannot subsequently retrieve the rings),⁵ these practices constitute sequential additive objective commitment devices (Sozou & Seymour 2005; see also Brinig 1990) – due to the financial constraints involved, the farther down the path to the altar that the man proceeds, the less feasible it becomes for him to alter course and seek to woo another woman.⁶ Lastly, although engagement and wedding rings are a culturally and historically parochial invention, the institution of requiring male suitors (or their families, to whom they are beholden) to provide a substantial up-front payment is not unique to modern nations, occurring in two-thirds of societies

⁵ Men are protected from the possibility that unscrupulous women seeking wealth would procure an engagement ring and then break off the engagement by legal precedents allowing them to retrieve the ring in such cases (see Brinig, 1990).

⁶ We do not contest prevailing costly signaling explanations (see Bliege Bird & Smith 2005) of behavior such as this (e.g., that, by virtue of their cost, expensive engagement rings honestly signal a suitor's ability and willingness to invest – Cronk & Dunham 2007). Our aim here is simply to point out that the same actions can serve as both i) signals that intrinsically reveal underlying features (as in costly signaling accounts) and ii) objective commitment devices that increase the reliability of forecasts of future behavior. Much of the time, these two processes will operate in parallel: on the one hand, the greater the relative cost of a signal, the more it is likely to be honest due to handicap considerations; on the other hand, the greater that relative cost, the more that the signal's production limits alternative courses of action. Indeed, at least under certain simplified assumptions, these two processes are mathematically equivalent (Sozou & Seymour 2005).

(Anderson 2007).⁷ Given the insights that contemporary hunter-gatherers provide into the lifeways of ancestral human populations, it is particularly noteworthy that bridewealth or brideservice (providing labor, rather than wealth, to the bride's family) occur in almost half of extant foraging societies (Apostolou 2008). In light of substantial cultural variation in the details of such practices, we do not expect the evolved mechanisms underlying male limerence to include any specific practice as part of their innately specified output. Rather, we expect such mechanisms to incline limerent men to find attractive any behavior that involves sacrifices (often concerning resource transfer), particularly those that constrain their options in a conspicuous fashion.⁸

In the above account of limerence, the emotion underlying a subjective commitment leads to behavior that generates an observable objective commitment device, thus creating a signal that allows the targeted party to reliably forecast the focal actor's future actions. We think that this general approach holds considerable promise. For example, whereas existing perspectives on anger in the context of commitment and communication focus on the message that the focal actor is not obeying rational calculations regarding immediate costs and benefits (Hirshleifer 1987, 2001; Frank 1988), we suggest that this is only part of the story. Anger is

⁷ Skeptics are often quick to point out that bridewealth is but one version of resource transfer, as dowries also occur. However, dowries are found only in a small fraction of the world's societies (see Anderson 2007; Apostolou 2008), and are often associated with social stratification wherein parents are able to move up the social hierarchy by providing inducements for higher-status men to marry their daughters (Anderson 2007), a very different function than that discussed here. Revealingly, dowry occurs in only 2.44% of foraging societies (Apostolou 2008).

⁸ Skeptics critical of the notion that natural selection favored adaptations for own mate selection and courtship point to the importance of parents and other family members in marriage decisions in small-scale societies, including hunter-gatherers whose lifeways are thought to resemble those of ancestral humans (Apostolou 2007, 2008). However, such critiques greatly underestimate a woman's autonomy in such societies, including both strategies that countermand others' efforts in regard to her first marriage, and the diminution of others' influence in regard to subsequent marriages (Pillsworth and Barrett, in prep.).

indeed associated with changes in sensitivity to risk, particularly in men (Fessler et al. 2004). Nevertheless, because there are many forms of risk-taking, engaging in acts that demonstrate this state does not by itself provide a reliable indication that, unless appeased, the focal actor will spitefully inflict costs on the target individual. Displaying evidence of such ‘temporary irrationality’ may thus be a necessary condition for generating a signal that, by virtue of being reliable, can effectively shape the behavior of the target individual, but, by itself, it is not sufficient to do so. Rather, we suggest, as with limerent individuals, the goals of angry individuals are best served when their subjective commitment leads them to act in ways that create objective commitment devices. That anger acts in this fashion is evident in the natural history of violent altercations.

Anger plays a central role in much non-instrumental violence (Fessler 2010). Altercations of trivial origin often escalate when they take the form of *character contests* wherein individuals attempt to save face in light of perceived challenges or transgressions (Luckenbill 1977). Particularly for men (who are vastly more violent than women – Daly & Wilson 1988; Kellerman & Mercy 1992), a public setting increases the likelihood that such character contests will end in assault (Deibert & Mietheb 2003). In our view, threats and insults uttered in anger can operate as objective commitment devices, as making such statements in public during an altercation creates a situation wherein failing to follow through on the statement entails reputational damage for the speaker, and invites additional transgressions against him. Moreover, the reputational costs of both failing to respond to threats and insults and failing to follow through on one’s own statements are symmetrical across the two parties in an altercation, a feature that explains the ratcheting escalation (see Felson & Steadman 1983) of such interactions. Each party is bound by his objective commitment devices to continue pouring fuel on the fire,

thus igniting both further subjective commitment by the other party and the corresponding deployment of additional objective commitment devices. The result is often tragic.

6. The Role of Institutions in Commitment

The above discussion of anger underscores the role that reputation can play in objective commitment – some reputations can deter transgressors, while others can shape access to opportunities for profitable cooperation. Many classes of public behaviors can thus act as objective commitments or commitment devices, as, once the chosen course of action has been broadcast, deviation from that course can entail reputational costs. However, this is not the only avenue whereby public behaviors can play a role in commitment. When individuals take on a social role associated with culturally-defined obligations or responsibilities, failure to properly perform that role may lead not only to lack of inclusion in cooperative ventures but, moreover, to active punishment by other parties. For several reasons, the more public the assumption of responsibilities (and, by extension, the failure to perform them), the more likely such punishment is to occur, and the more severe it is likely to be. First, the more widely the information is disseminated, the greater the likelihood that it will reach prospective punishers. Second, because the costs of punishing for any give punisher are inversely related to the number of punishers, the above feature makes it more likely that any given prospective punisher will punish (see DeScioli and Kurzban 2009; Boyd et al. 2010).

Acts that generate objective commitments by virtue of being public and addressing culturally-defined roles are often themselves culturally defined – culture supplies both the roles and the formulaic behaviors whereby one objectively commits to them. For example, in regard to

the case mentioned in the introduction, the role of “living martyr,” the final stage of preparation for a suicide bombing mission, has been highly codified among Palestinian terrorist organizations, and the testimonial video shot during this phase is likewise culturally dictated, with standardized props and set phrases being employed (see Moghadam 2003). Performing the prescribed actions that will serve to publicize one’s status thus generates powerful objective commitment that bolsters the subjective commitment that originally motivated joining the terrorist organization (Sosis & Alcorta 2008). Importantly, such practices are neither limited to rare behaviors such as suicidal terrorism nor usually intended to publicize the assumption of the role only retrospectively. For example, in the cultures in which they occur, engagement and wedding rings are precursors to a formal marriage ceremony, the components of which are standardized. Ceremonies such as this serve the dual purpose of publicizing the commitments at issue and linking them to a widely-shared set of cultural pre- and proscriptions. This linkage increases the likelihood that failure to adhere to cultural strictures will elicit punishment, since locating behavior within a framework of standardized cultural expectations reduces ambiguity as to whether or not a given action is acceptable. In turn, because prospective punishers decide whether or not to punish in part based on the likelihood that others will punish, reducing ambiguity as to the acceptability of any given act increases the likelihood that a given prospective punisher will punish (see DeScioli & Kurzban 2009; Boyd et al. 2010). By formalizing the public acts whereby roles are assumed, culture thus provides actors with powerful objective commitment devices that allow them to reliably signal their future actions to other parties.

Not all societies have formal marriage ceremonies in which there is a public pronouncement of new roles and attendant responsibilities. However, while marriage ceremonies

are not universal, it appears that all societies employ institutionalized practices to formalize and publicize commitments in a manner that generates objective commitment. In particular, oaths and similar formal pledges or promises appear to be a human universal (Brown 1991). Oaths can serve as objective commitment devices via a variety of pathways. Although the degree varies across instances, all oaths and promises are attended by norms of sanctity, such that violating them constitutes a moral failing above and beyond mere dishonesty, inconsistency, or hypocrisy. As such, these acts attach substantial additional reputation- and punishment-derived costs to deviation from the selected course of action. Indeed, oaths often contain within them an invocation of external costs should the oath be violated. A common variant of this is to appeal to supernatural agents or forces as sanctioners, as in "...may God strike me dead," or "...cross my heart and hope to die." Supernaturalism is not mandatory, however, and some oaths even contain within them an explicit social contract empowering others to enforce the oath, as in the initiation vow of the Nuestra Familia prison gang in California: "If I go forward, follow me; if I hesitate, push me; if they kill me, avenge me; if I am a traitor, kill me" (quoted in Phelan & Hunt 1998).

As illustrated by the last example, an extremely common pattern cross-culturally is the use of culturally-constituted practices to generate objective commitment to a group. Consonant with the above argument regarding publicity, punishment, and objective commitment, these rites often serve notice of the assumption of a new role. However, their power as commitment mechanisms is often increased through techniques that broadcast the assumed role not only to members of the in-group who serve to enforce the relevant cultural standards, but also to members of out-groups who, by virtue of their own agendas, influence the courses of action available to the focal actor. For example, some of the most powerful rites binding a new member to a group involve permanent body modification. Such advertisements of affiliation can

constitute objective commitment devices as, in the event of intergroup hostility or discrimination, emblematic body modification that identifies group identity will elicit hostility from out-group members, thereby casting the initiate's lot with the in-group. Consonant with this thesis, practices such as ritual surgical modification and scarification are more common in groups that engage in intergroup warfare than in peaceful groups or those that engage in intragroup conflict, a pattern explicable in terms of the need for warlike groups to bind their members to the group in order to prevent freeriding, obtaining the benefits of the group's aggressivity without paying the (often substantial) costs (Sosis et al. 2007).⁹ Similarly, in the U.S., prison gangs such as Nuestra Familia are engaged in endemic violent conflict; these gangs employ a graded system of tattooing wherein the more visible the tattoo, the greater the perceived dedication to, and hence status within, the group (Phelan & Hunt 1998). This is clearly a product of the levels of objective commitment generated by different tattoos, as, for example, individuals tattooed on the face and neck cannot pass as non-members of the gang, hence neutrality is impossible during intergroup conflicts.

7. Commitment and Gene-Culture Co-Evolution

⁹ In our reading of the literature on public goods problems in groups vulnerable to freeriding, we find that authors often do not explicitly differentiate between i) costs that are employed as barriers to entry (the theory being that only individuals who are subjectively committed to the aims of the group would be willing to pay them), and ii) costs that constitute objective commitments, such that their enactment eliminates alternative courses of action or makes them prohibitively expensive. Some authors (e.g., Sosis et al., 2007) emphasize the former, while others (e.g., Berman & Laitin, 2008) attend more to the latter. While these have been important contributions, we feel that it is useful to distinguish clearly between signals that constitute sunk costs and signals that constitute objective commitments, as these are not isomorphic.

As previous commentators have noted at length (Hirshleifer 1987; Frank 1987, 1988), objective commitment can be used to increase cooperation in a wide variety of domains, as each party can be confident that, due to the increases in the cost of defection entailed by the given objective commitment, the other party will cooperate. Importantly, while people occasionally invent novel objective commitment devices to facilitate cooperation, consonant with their linkage with both culturally-defined roles and reputation and punishment, this objective is usually achieved through existing culturally-defined practices. That such institutions are frequently available precisely in those contexts in which they are most useful is explicable in terms of cultural group selection. Consider the case of body modification discussed above. Intergroup conflict is an important source of selective pressure in cultural evolution, as groups that can successfully solve the freerider problem can marshal larger and more cohesive combat forces than those that cannot, leading the former to decimate, or conquer and assimilate, the latter (Boyd & Richerson 2009). Moreover, while dramatic, the case of intergroup conflict is not unique. Because groups characterized by higher rates of cooperation will be more prosperous, more stable, and more competitive than groups characterized by lower rates, cultural group selection can be expected to favor the cultural evolution of a wide variety of institutionalized practices that support cooperation (Boyd & Richerson 2009). This principle is nicely illustrated in Kanter's (1968) study of utopian communities, in which community longevity is shown to be correlated with both the contribution of all private assets to the common pool and the public renunciation of outside social ties upon initiation. These two measures objectively narrow alternative courses of action for all parties. The magnitude of the cost, together with the group-wide nature of the measure, increase dedication to, and cooperation within, the collective, as all parties know that the others are subject to the same objective commitments.

Noting that longstanding patterns of cultural practice can generate selective pressure for the biological evolution of traits that enhance fitness in such cultural environments, Richerson and Boyd (2001; Boyd & Richerson 2009) argue that institutions supporting cooperation and collective action have co-evolved with psychological propensities that undergird subjective commitment to groups. We concur, noting that many institutions appear exquisitely well designed to bolster subjective commitment and, correspondingly, humans seem markedly susceptible to such practices. Indeed, Kanter's (1968) study also revealed that the longevity of utopian groups is positively related to the presence of ideologies and rituals that involve the diminution of autonomy and surrender to the collective, practices that, in even more extreme form, are found among terrorist organizations (reviewed in Atran 2003, and Moghadam 2003), and, in less extreme form, are readily observed in the ceremonies of all major religions, the folk rituals practiced at professional and collegiate sporting events, and so on. Nevertheless, much as we agree with Richerson and Boyd in this regard, as our earlier example of engagement rings implies, we wish to carry their position one step further. We suggest that the psychological features responsible for many kinds of commitment, and not merely commitment to groups, have co-evolved with diverse cultural practices that shape commitment. We thus hypothesize that actors are innately prepared to recognize (albeit not always explicitly) the affordances that cultural practices offer as commitment devices, including opportunities to employ institutionalized commitment devices that both add an objective component to subjective commitment and provide other parties with a reliable signal whereby they can forecast the focal actor's future behavior.¹⁰

¹⁰ The plausibility of this proposal rests in part on the extent to which precursor adaptations operate proximally using subjective states rather than relying on fixed action patterns. For example, many nonhuman appeasement displays constitute objective commitment devices in that

The above hypothesis has two entailments, one cognitive/behavioral, the other affective. First, people will seize upon culturally-provided means to solve both the personal and the social aspects of commitment problems. For example, Brinig (1990) has compellingly demonstrated that, although the institution of the engagement ring had existed in some form for centuries, the practice only became widespread (and, eventually, highly normative) in the U.S. following the repeal of breach of promise-to-marry laws in the first half of the Twentieth Century. These laws had allowed a woman to sue a man for substantial sums if he broke off their engagement, with additional compensation awarded in the event that she had lost her virginity with him during that period (as was fairly common at the time). This legal recourse for women created an objective commitment for men who proposed marriage. As a consequence, women enjoyed increased certainty that proposals would be followed by marriage. When legislatures repealed these laws, both skeptical women and their sincere suitors were left without an institutionalized objective commitment device to solve their cooperation problem. Engagement rings, already known but not widely employed, provided a solution, and a previously rare behavior rapidly became common. Moreover, rings provided affordances absent from breach of promise laws, as wearing the ring signals to a woman's other potential suitors that she is no longer available; accordingly, confidence that his partner will display the ring in public (e.g., because she has elected to size the ring such that it cannot readily be removed) provides additional reassurance to a man that his betrothed will be faithful, i.e., the ring can enhance a woman's own efforts at reliable signaling

they entail reducing one's immediate fighting capacity through postural changes and the exposure of vulnerable body parts. If, rather than being immutable fixed action patterns, such displays are undergirded by a subjective desire to maximize one's own vulnerability, then any novel circumstance which affords increasing said can be pursued. We are confident that human subjective commitments are flexible in this manner; it is an open question whether the same is true of non-human animals, particularly those species of primates from which we are best able to discern the probable attributes of earlier hominid species.

via an objective commitment device. Our point here is that individual commitment psychology and culture work together. On the one hand, cultural practices provide standardized mechanisms for solving cooperative commitment problems, and, on the other hand, such practices are refined and transmitted in part due to individuals' propensities to recognize the relative utility in this regard of different practices.

The second entailment of our gene-culture co-evolutionary account is our claim that humans are unique in that, living within a culturally-constituted reality, they experience an intimate feedback between subjective commitment and culturally-shaped objective commitment. In our view, participants in cultural practices that generate objective commitment are often deeply moved by those practices precisely because they recognize the objective commitment aspect, and thus understand that their participation provides a reliable signal to others. We expect, for example, that the intensity of the sentiments experienced by a bride and groom at their wedding will increase with the size of the audience and the degree to which the wedding conforms to cultural templates; the same will be true of the allegiance of a suicide bomber to his cause, the devotion of an initiate to his group at an initiation, or the dedication of an oath-taker to the principles espoused in her oath. This is because, as discussed previously, audience size and cultural standardization are determinants of the degree of objective commitment. We propose that the mental mechanisms that generate subjective commitment are sensitive to the extent to which recipients of signals concerning the focal actor's future behavior can accept those signals as reliable -- when subjective commitment leads to objective commitment, the focal actor experiences intense emotions in part because she knows that both she and others can be confident that her future path is laid.

In sum, we suggest that, while nonhuman animals likely experience subjective commitment of sorts (Dugatkin 2001), and certainly recognize the external factors that generate objective commitment, unlike humans, they are not psychologically equipped to recognize how socially transmitted practices can translate subjective commitments into objective commitments, nor are they able to experience an enhancement of subjective commitments through the enactment of cultural commitment devices. Consonant with the highly cooperative nature of our species, humans possess an evolved psychology and a corresponding cultural repertoire that allow us to engage in commitment to a degree unprecedented in evolutionary history.

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References

- Anderson, Siwan 2007. “The economics of dowry and brideprice.” *Journal of Economic Perspectives* 21(4): 151–174.
- Apostolou, Menelaos 2007. “Sexual selection under parental choice: the role of parents in the evolution of human mating.” *Evolution and Human Behavior* 28(6): 403–409.
- Apostolou, Menelaos 2008. “Bridewealth and brideservice as instruments of parental choice.” *Journal of Social, Evolutionary, and Cultural Psychology*, 2 (3): 89-102.
- Atran, S. 2003 “Genesis of suicide terrorism.” *Science* 299(5612): 1534-1539.
- Brown, D.E. 1991. *Human universals*. New York: McGraw-Hill.
- Bliege Bird, R. and Smith, E. 2005. “Signaling theory, strategic interaction, and symbolic capital.” *Current Anthropology*, 46: 221 – 248.
- Blurton Jones, N.G.; Marlowe, F. W.; Hawkes, K., and O’Connell, J.F. 2000 “Paternal investment and hunter-gatherer divorce rates.” In *Adaptation and Human Behavior: An Anthropological Perspective*, ed. L. Cronk; N.A. Chagnon and W. Irons, 69-90. Piscataway, NJ.: Transaction Publishers.
- Boyd, R., Gintis, H., and Bowles, S. 2010. “Coordinated punishment of defectors sustains

cooperation and can proliferate when rare.” *Science* 328: 617-620.

Boyd, R., and Richerson, P.J. 2009. “Culture and the evolution of human cooperation.” *Philosophical Transactions of the Royal Society (B)* 364: 3281-3288.

Brinig, Margaret F. 1990. “Rings and promises.” *Journal of Law, Economics, and Organization* 6(1): 203–215.

Cronk, Lee, and Dunham, Bria. 2007. “Amounts spent on engagement rings reflect aspects of male and female mate quality.” *Human Nature* 18(4): 329-333.

Daly, M., and Wilson, M. 1988. *Homicide*. New York: Aldine de Gruyter.

Deibert, Gini R. and Miethe, Terance D. 2003. “Character contests and dispute-related offenses” *Deviant Behavior* 24(3): 245-267.

Cosmides, L., and Tooby, J. 2005 “Neurocognitive adaptations designed for social exchange.” In *Evolutionary Psychology Handbook*, ed. D. M. Buss, 584-627. New York: Wiley.

Crenshaw, M. 1987 “Theories of terrorism: Instrumental and organizational approaches.” *Journal of Strategic Studies* 10(4): 13-31.

DeScioli, P., and Kurzban, R. 2009 “Mysteries of morality.” *Cognition* 112(2): 281-299.

Dugatkin, L.A. 2001 “Subjective commitment in nonhumans: what should we be looking for, and where should we be looking?” In *Evolution and the Capacity for Commitment*, ed. R. Nesse, 120-137. New York.: Sage Press.

Elster, J. 2003. “Don't burn your bridge before you come to it: Some ambiguities and complexities of precommitment.” *Texas Law Review* 81: 1751-1787.

Felson, R. B., and Steadman, H. J. 1983. “Situational factors in disputes leading to criminal violence.” *Criminology* 21(1): 59-74.

Fessler, D.M.T. 2002. “Windfall and socially distributed willpower: The psychocultural dynamics of Rotating Savings and Credit Associations in a Bengkulu Village.” *Ethos* 30, 25 – 48.

Fessler, D.M.T. 2010. “Madmen: An evolutionary perspective on anger and men’s violent responses to transgression.” In *Handbook of anger: Constituent and concomitant biological, psychological, and social processes*, ed. M. Potegal, G. Stemmler, and C.D. Spielberger, 361-381. Springer.

Fessler, D.M.T., Pillsworth, E.G., and Flamson, T.J. 2004. “Angry men and disgusted women: An evolutionary approach to the influence of emotions on risk taking.” *Organizational Behavior and Human Decision Processes* 95(1): 107-123.

Fisher, H.E. 1989 "Evolution of human serial pairbonding." *American Journal of Physical Anthropology* 78(3): 331-354.

Frank, R.H. 1987. "If homo economicus could choose his own utility function, would he want one with a conscience?" *The American Economic Review* 77(4): 593-604.

Frank, R.H. 1988. *Passions Within Reason: The Strategic Role Of The Emotions*. New York: Norton.

Frank, R. H. 2001 "Cooperation through emotional commitment." In *Evolution and the Capacity for Commitment*, ed. R. M. Nesse, 57-76. New York: Sage Press.

Gonzaga, G., Haselton, M. G., Smurda, J., Davies, M.S., and Poore, J.C. 2008 "Love, desire, and the suppression of thoughts of romantic alternatives." *Evolution and Human Behavior* 29(2): 119-126.

Gauthier, D. 1986. *Morals By Agreement*. Oxford: Oxford University Press.

Gnoth, C.D., Godehardt, D., Godehardt, E., Frank-Herrmann, P., and Freundl, G. 2003 "Time to pregnancy: results of the German prospective study and impact on the management of infertility." *Human Reproduction* 18(9):1959-1966.

Hirshleifer, J. 1987. "On the emotions as guarantors of threats and promises." In *The Latest on*

the Best, ed. J. Dupre,. 307-326. Cambridge, Mass.: MIT Press.

Hirshleifer, J. 2001 “Game-theoretic interpretations of commitment.” In *Evolution and the Capacity for Commitment*, ed. R. M. Nesse,. 77-93. New York: Sage Press.

Kahn, H. 1965. *On Escalation: Metaphors and Scenarios*. New York: Praeger Publ. Co.

Kanter, R.M. 1968. “Commitment and social organization: a study of commitment mechanisms in utopian communities.” *American Sociological Review* 33(4): 499-517.

Kellerman, Arthur A., and Mercy, James A. 1992. “Men, women, and murder: gender-specific differences in rates of fatal violence and victimization.” *The Journal of Trauma* 33(1): 1-5.

Luckenbill, David F. 1977. “Criminal homicide as a situated transaction.” *Social Problems* 25(2): 176–186.

Marlowe, F.W. 2004. “Mate preferences among Hadza hunter-gatherers.” *Human Nature* 15(4): 365-376.

Miller, L. 2006 “The Terrorist mind: I. A psychological and political analysis.” *International Journal of Offender Therapy and Comparative Criminology* 50(2): 121-138.

Moghadam, A. 2003. “Palestinian suicide terrorism in the Second Intifada: Motivations and

organizational aspects.” *Studies in Conflict & Terrorism* 26(2): 65–92.

Nesse, R. M. 2001. “Natural selection and the capacity for subjective commitment.” In *Evolution and the Capacity for Commitment*, ed. R. M. Nesse, 1-44. New York: Sage Press.

Phelan, M. P., and Hunt, S. A. 1998. “Prison gang members’ tattoos as identity work: The visual communication of moral careers.” *Symbolic Interaction* 21(3): 277-298.

Pillsworth, E.G., and Barrett, H.C. In prep. “Women’s subordination and resistance in Shuar marriage: A case for female choice in the evolution of human mating.”

Pillsworth, E.G., and Haselton, M.G. 2006. “Women’s sexual strategies: The evolution of long-term bonds and extrapair sex.” *Annual Review of Sex Research* 17: 59-100.

Richerson, P. J., and Boyd., R. 2001. “The evolution of subjective commitment to groups: A tribal instincts hypothesis.” In *Evolution and the Capacity for Commitment*, ed. R. M. Nesse, 186–220. New York: Sage Press.

Sefcek, J.A., Brumbach, B.H., Vasquez, G., and Miller, G.F. 2006. “The evolutionary psychology of human mate choice: How ecology, genes, fertility, and fashion influence mating behavior.” *Journal of Psychology & Human Sexuality* 18: 125-35.

Schelling, T.C. 1960. *The Strategy of Conflict*. Cambridge, Mass.: Harvard University Press.

Schelling, T. C. 2001 “Commitment: deliberate versus involuntary.” In *Evolution and the Capacity for Commitment*, ed. R.M. Nesse, 48-56. New York: Sage Press.

Sosis, R., and Alcorta, C. 2008. “Militants and martyrs: Evolutionary perspectives on religion and terrorism.” In *Natural Security: A Darwinian Approach to a Dangerous World*, ed. R. Sagarin and T. Taylor, 105-124. Berkeley/Los Angeles: University of California Press.

Sosis, R., Kress, H.C., and Boster, J.S. 2007. “Scars for war: Evaluating alternative signaling explanations for cross-cultural variance in ritual costs.” *Evolution and Human Behavior* 28(4): 234–247.

Sozou, Peter D., and Seymour, Robert M. 2005. “Costly but worthless gifts facilitate courtship.” *Proceedings of the Royal Society B* 272(1575): 1877–1884.

Tennov, D. 1979. *Love and Limerence: The Experience of Being in Love*. Chelsea, MI: Scarborough House.

Verplaetse, J., Vanneste, S., and Braeckman, J. 2007 “You can judge a book by its cover: the sequel: A kernel of truth in predictive cheating detection.” *Evolution and Human Behavior* 28(4): 260-271.

Walczyk, J.J., Mahoney, K.T., Doverspike, D., and Griffith-Ross, D.A. 2009. “Cognitive lie detection: Response time and consistency of answers as cues to deception.” *Journal of Business*

and Psychology 24(1): 33-49.