

THE STRATEGY OF CHALLENGES: TWO BEHEADING GAMES IN MEDIEVAL LITERATURE

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Abstract. I use game models to analyse two mediaeval tales about re:markable challenges. The goal is to understand their plots and to clarify in general why challenges are made and accepted. Children's contests of daring provide a simple context to study challenging, and I argue that children seek a certain reputation; they want to be known for placing a high payoff weight on others' estimate of that very weight. This definition might seem circular, but it leads to well-specified, solvable games. The model for the children's dares is modified in steps to fit the mediaeval stories. Game theory has treated language as a way to transmit information, but here verbal challenges are speech acts, or "performatives" in Austin's sense, that trigger the concern for reputation. The analysis of challenging is relevant to international conflicts where large powers' make commitments and struggle in the Third World over "credibility."

The Middle English poem *Sir Gawain and the Green Knight* and its Old Irish ancestor *The Feast of Bricriu* recount a remarkable stranger's challenge to the hero, in effect, "You can chop off my head if you'll let me return the blow." Old romances and sagas teem with challenges, but this one puts the hero in a genuine dilemma. This paper analyses the situation using the theory of games, to clarify some obscure plot elements and to show that the best action is strategically interesting, that it exacts real risks, costs and tradeoffs. A game approach reveals some of the reasons why their storylines are so successful.

SIR GAWAIN AND THE GREEN KNIGHT

Sir Gawain and the Green Knight survives in one small manuscript (British Library, Cotton Nero A.x). Its script and language indicate that it was written in the late 1300s. Authorship then conferred less personal celebrity and the poem bears no signature. It would likely have been read aloud to a gathering, and its length of 2500 lines would have taken up several nights, like a television mini-series. The poem was unknown to the literary world for four and a half centuries, until the palaeographer Sir Frederic Madden published it in 1839. Since then it has prompted a great scholarly outpouring: the number of books and papers is nearing one thousand, and only the writings on *Beowulf* and Chaucer's poetry surpass this amount for an English work of such antiquity. It has been popular with general audiences, and can be read in Breton, Turkish, Japanese and several other languages, or viewed as a motion picture starring Sean Connery as the fierce green man.

Laura Hibbard Loomis (1959, p.528) borrows the Green Knight's epithet for Gawain to praise the poem itself, "The hero of *Gawain and the Green Knight* is likened to a pearl beside a pea (vs. 2354), and so might the poem be reckoned among its contemporaries. It moves over an almost flawless structure as smoothly as supple skin moves over the bones of the hand. With the exception of Chaucer's *Troilus and Criseyde*, no other Middle English romance approaches its artistic and spiritual maturity, its brilliant realism, its dramatic vigour, its poetic sensitivity to nuances of word and mood, its humour, its nobility of spirit." While most mediaeval works allow us a glimpse into a vanished past, this one engages modern readers by addressing modern problems. Gawain tries to maintain his ideals when the world brings them into opposition with each other, forcing him to sacrifice one or another. The poem recounts the green stranger's intrusion at Camelot's Christmas feast, his offer to allow any one to behead him in exchange for a return blow, Gawain's acceptance of the dare, and the latter's eventful search for the Green Knight to give him his turn. The challenger is of immense size and entirely green. As Gawain deliberates whether to accept, he and the reader will ask the same questions: Why would the Green Knight propose this bizarre game? Is he supernatural or deranged, or neither? What are the stakes for me, and what are my prospects? Both the reader and Gawain strive to construct the game.

This paper offers two game analyses of the poem. The first game, of which I describe three versions, portrays Gawain as taking up the dare for the sake of his reputation. This thesis seems reasonable, almost obvious, but it is elliptical: his reputation for what? A reputation is a general belief about a person and must have content. At first thought, the reputation is simply for bravery, but this hypothesis gives no role to the Green Knight. If Gawain had needed to boost his name for risktaking he could have performed a display without waiting for someone to challenge him. And he could have devised better proofs of bravery than this beheading match where he runs the risk for no higher end. The Green Knight questioned the Round Table's bravery but offered no evidence to put it in doubt, beyond the fact that the Court was not taking up his bizarre challenge. The Green Knight himself identifies the issue addressed in this paper. When his first offer produces silence, he furrows his green brow, draws himself up to his full height, and speaks to the Round Table:

What, is this Arthurs hous, quoth the hathel thenne
That al the rouse rennes thurgh ryalmes so mony?
Where is now your sourquydrye and your conquestes
Your gryndellayk and your greme and your grete wordes?
Now is the reuel and the renoun of the Rounde Table
Ouerwalt wyth a worde of on wyghes speche
For al dares for drede withoute dynt schewed. (309-315)

(Excerpts are from the edition of Tolkien and Gordon, 1925.)

This is surely not Arthur's house renowned through many kingdoms, he is declaring. The Round Table's pride and fierceness and bragging talk have vanished, its fame has been upset by one man's speech, *his words alone*, for all are cowering without a blow being dealt. How could the Green Knight's mere words make them play his game or suffer disgrace? The paper will try to answer this question.

Gawain's goal, I will argue, is a reputation for placing a high value on his reputation. This objective seems circular, but as the first model shows, it is well-specified in the sense that it allows Gawain to decide on an action. Defining payoffs recursively in this way leads to the consequence that sensible actors sometimes choose to fight over an issue of no direct value to them whatsoever. Because of this recursive ness, the goal is confusing when stated in English, but it is easy to formulate in mathematics, and it is also within the intuitive reach of ordinary people, even though they may be unable to articulate it. It seems to underly children's contests of daring. The power of the Green Knight's verbal challenge in triggering Gawain's display of bravery is explained here through a theory of daring contests, combined with John Austin's theory of performative utterances, which describes how certain sentences function to change the social relationships of the speaker and listener. A dare is one such performative utterance, and the Green Knight's words infuse Gawain with a new motive to establish a particular type of reputation. The Green Knight's attempt to set up a compelling dare explains many text elements. The paper then examines a much earlier beheading story, the final episode of *The Feast of Bricriu*. Events are superficially parallel to the Gawain story, but the underlying game is different, and the difference explains changes in the dialogue and the procedure of the beheading. An informal strategic analysis clarifies some obscure events in the plot. The next section of the paper presents a second game, one played wholly within Gawain, a conflict between his dutiful nature and his self-preserving nature. Finally I add some comments on how game theory can supplement conventional literary analysis, and how the model of daring clarifies the motives behind superpower proxy wars in the Third World.

SUMMARY OF THE BEHEADING SCENE

Arthur was the noblest king of England, and here is an extraordinary episode, a marvel that befell him, that the storyteller heard told "in town": On New Year's the Round Table is celebrating the fifteen-day Christmas festival. True to his holiday custom and his youthful spirit, the king will not eat until he has heard of some wonder or seen some feat of arms. As his courtiers sit down to their feast, an awesome figure rides into the hall, a large man, perhaps a giant, handsome, sturdy, finely dressed, and all over bright green. He wears no armour, but carries a cruel battle-axe in one hand and a holly bough in the other. The metal of his axe, even his horse, are as green as he is. Offering no one greeting, he brusquely asks who is the head of the group. Arthur welcomes him and invites him to dismount. The stranger says he will not spend time with them, but has come to propose a Christmas "gomen," a game or sport. The fame of the Round Table is universal and he hopes his request will be granted here. Arthur promises that he will have single combat if

he wants it. The Green Knight replies that his is a different quest, that in any case none here could match him; next to him they are like beardless boys. He challenges any person to deal him one blow in exchange for another. Anyone who is rash-headed, hot-blooded, enough to accept will use his green axe to strike the first blow, and keep the axe as a gift. The Green Knight will not resist, and he will not demand his turn before a year and a day.

When no one steps forward, the Green Knight taunts the company, declaring that he has now exposed its reputation as counterfeit. Pricked by shame and anger, Arthur leaps forward to seize the axe. The Green Knight dismounts and bares his neck, but before the king can strike his blow, Gawain interrupts from the banquet table. In an elaborate and courteous speech he asks that he stand in for Arthur, and the counsellors consent. The Green Knight says he is happy to be facing Gawain, and has him recite the terms of the bargain. Gawain asks the Green Knight who he is and where he lives? The Knight promises to answer if he survives the blow, and Gawain must then seek him out. Of course, if afterwards he can reveal nothing, Gawain will be free of obligation.

The Green Knight again lifts his long hair to expose his neck. The axe shears through flesh and through bone. The head rolls across the floor and into the crowd, blood streams down the green chest, but the body neither staggers nor falls. It springs after the head and grabs it. The body mounts the horse, holds the head up by the hair, the eyelids open, and the head commands Gawain to appear one year hence at the Green Chapel or be branded a coward. The body rides out of the hall. When the hoof-beats have receded into the distance, Arthur and Gawain laugh nervously, stifling their awe at what they have witnessed.

This is the poem's opening episode. The narrative moves on to Gawain's search for the Green Knight, his encounter with the lady of the castle and her tests of his chivalry. He passes them creditably but not perfectly. In the final scene, the Green Knight feigns preparations to behead Gawain, but only wounds him with a nick on the neck, which will thereafter signify his imperfection.

If Loomis is right that the poem fits its structure like skin over the hand, there ought to be some logically consistent account of what has happened here. How are we to understand Gawain's view of the Green Knight's challenge? The poet's narrative style is unusual in that he reports all of the dialogue but nothing about Gawain's thoughts. The reader can speculate: Does Gawain think the Green Knight is trying to disgrace the Round Table, or perhaps to kill him by shaming him into a bargain tantamount to suicide? Why does Gawain accept?

CHILDREN'S DARING CONTESTS

Gawain is competing for reputation, I argue, in an adult version of children's contests of daring. (The fullest accounts of children's dares are given by Opie and Opie, 1969, and Fowke, 1988.) Under the simplest rules, one child challenges another to perform some bold or risky feat: knock on a door and run away, hail a cab and walk through it, make a prank phone call, enter an empty old house, lie down on a railroad track and let a train

pass over you, tell a schoolmate of the opposite sex that you like them or otherwise. In Bielefeld, children dare each other to swallow one of the large slugs that crawl out during damp times.

Clearly children accept dares, sometimes dangerous ones, to promote their reputation, but it makes little sense to speak of reputation attached to no specific character trait. We have to ask, as we did for Gawain, what personal attribute do they want their friends to reassess? Toughness, perhaps? But "reputation for toughness" has no clear meaning. Taking the case of a dare to eat a slug, the reputation could not be one of indifference to eating slugs. Having that name would make you a celebrity, but it would not raise your degree of respect or dominance in the group. If it became known that you savoured slugs, the dare would not be regarded as a real test, and the group would simply choose another task. For the daree's purposes, the audience must know that he or she finds the task aversive but is strong-willed enough to do it anyway for the sake of the reputational goal. Eating the slug functions like a measuring marker, to show how highly the daree values reputation.

REPUTATION FOR VALUING REPUTATION

My thesis is that the content of the reputation at stake in dares can be defined recursively. The reputation is for valuing reputation. The child is in effect saying, "I don't like to eat this, but I'll do it. I attach great importance to your estimate of this very importance. When you see me eat this slug, you raise your estimate of that importance." In its simplest form I am comparing the payoffs (my reputational weight) \times (Other's estimate of my reputational weight given I accept) $\dots c$ versus (my reputational weight) \times (Other's estimate of my reputational weight given I decline), where c is the cost of performing the challenge. (Other papers where game payoffs depend directly on others' beliefs independent of their actions, are those of Gilboa and Schmeidler, 1988, Geanakoplos, Pearce and Stacchetti, 1989, and Nalebuff, 1990.) It is surprising that, while the goal of "valuing reputation" is incomplete, that of "valuing reputation for valuing reputation" leads to a well-defined game.

A reputation for valuing reputation might be desirable exactly because it is free of links to specific traits. Onlookers can generalize it to other contexts more readily, in that they infer that the daree would face other risks and discomforts for the sake of reputation. Compare a *dare* with a *bribe* like eating a slug in exchange for a dollar bill. If you take the bribe, should I conclude you are particularly tough, or particularly greedy for money? One interpretation is as valid as the other. The same argument can be made against an institution of performing unpleasant chores in hopes of a specific reputation: "Eat this slug, and I'll tell everyone you can speak French." But when you accept a dare, the audience can assess you as willing to suffer for your reputation in many contexts, someone to be reckoned with in general. Children play many types of the daring contests. The simplest involves a dare leading to a simple performance or a refusal. Another version is Truth, Promise, or Dare, where the target chooses either to give an honest answer to an

embarrassing question, which the group will select, for to forfeit some object, or to perform a dare. A risque version of this game was popular with adults in centuries past (Opie and Opie, 1969). Follow the Leader requires the darer to act first, after which the daree may accept or decline. In Darers Go First the daree can either do the task, or simply refuse, or answer back, "Darers go first!" Then the darer must perform the deed or the contest is off. Another custom is Double-daring. This concept seems to have different meanings, but from my memory someone who declines can be double-dared, and the second challenge carries greater coercive power. "I double-dog-dare you!" is stronger still. Not all dares fit the pattern I have described, that of building a reputation for valuing reputation; some are more to prove one's ease in doing the task. A child who can smoke a cigar without throwing up is proving that he or she is almost an adult, but this type of dare falls outside the present model.

DARING AS A FORMAL GAME: VERSION I

The following game models one type of daring contest. Following it are Versions II and III, each meant to be successively closer to the poem. That the three games have non-trivial solutions shows that my interpretation of daring, whether right or wrong, is at least strategically coherent. To simplify the analysis I will take the person who dares as a given, so there is no issue of me trying to jump in and dare you before you can dare me. In reality, social rules often limit who can make the dare: groups are more able to do the challenging, and a younger child or newcomer is more often the target. The task will also be taken as a given. It would be interesting to examine the darer's strategic choice of a task, but the paper does not address this question. The contest requires both the darer and the daree to perform the task if the challenge is accepted. This assumption is closer to the Green Knight's rules.

The sequence of play is shown in Figure 1. Player K (the Green Knight) chooses to dare or not to dare, and Player G (Gawain) either accepts or declines. If K does not dare, reputation remains non-salient and the two players receive 0. (I could have assumed that K suffers a reputational loss for failing to dare, but the present approach fits the poem better since the Green Knight could have simply stayed home and never issued a challenge.)

If G accepts, both do the deed, and each receives a difference-of-reputations payoff minus the cost of the deed: $Fw_K(E[w_K|dare]-E[w_G|accept]) - 1$ and $Fw_G(E[w_G|accept]-E[w_K|dare]) - 1$, respectively. Each component of these payoffs will now be explained. (The corresponding two payoffs in the case that G declines are shown in Figure 1, and have corresponding meanings.) A cost of 1 is subtracted from their payoffs as the burden of performing the task. Without loss of generality this cost can be taken as 1 for both, and it then defines each player's unit of utility. The coefficients w_K and w_G , both assumed to be greater than zero, are the weights that the two players attach to their relative reputations. The expression $E[w_K|dare]$ is the onlookers' and Player G's estimate of K's weight w_K after they observe that K has made the dare. Likewise, other expectations in the

two payoffs involve estimates of Player G's weight, given an acceptance or a refusal of the dare. To derive their values the game must be solved. The expression $E[w_K|\text{dare}] - E[w_G|\text{accept}]$ in K's payoff is the difference in reputations. These payoffs portray the challenge in the poem as competitive, a contest of relative reputations. Also, in the case of the poem, the reputation must be understood as not just Gawain's own but that of Arthur's court, and likewise the "on lookers" are really the Round Table's whole world, everyone who matters. For simplicity I will talk about personal reputation in the eyes of those present.

FIGURE 1: Sequence of play for Versions I, II and III.

The remaining element in the players' payoffs is the strictly positive constant F , which stands for the "felicity," a term introduced by Austin to analyse performative utterances like daring. It refers to how effectively the darer sets up a compelling dare. A dare is felicitous if it has real force. Thus, as F approaches zero, a dare loses its power to change the daree's motivation. Felicity is determined by both the content and context of the dare, as will be discussed later after the game's solution has been derived.

SOLUTION OF VERSION I

This game involves incomplete information, since each player is uncertain about the other's value for reputation. They know all the other factors. A (subgame perfect) equilibrium solution will comprise a pair of sets: the values of w_K for which Player K will dare, and the values of w_G for which Player G will accept. In the Appendix it is shown that at any equilibrium a player who dares or accepts a dare for a value of w_K or w_G , will dare or accept for all higher values. An equilibrium therefore is specified by a pair of thresholds, k and g : Player K makes a dare for $w_K > k$, and Player G accepts for $w_G > g$, and they do not act for lower values. When the weight is just at the threshold either behaviour is part of an equilibrium.

It is assumed that before the moves, Player K holds a distribution on Player G's reputational weight w_G that is uniform between 0 and 1. The same is true for G's distribution on w_K . The onlookers hold the uniform distribution for both weights w_K and w_G , but the players know their own values. The Appendix shows that the threshold values are then $k = F(F/2-1)^{1/2}$ and $g = 2^{1/2}/F$. These functions are graphed in Figure 2, which shows that if F is high enough the dare will be made and performed, a result that stands to reason.

I specified the cost of the dare to be one unit, but if it were assigned the general value c , F would become F/c in these formulae, so F should be understood as relative felicity, taken in comparison to the cost of the action.

THE DARING GAME II: THE GREEN KNIGHT'S SECRET KNOWLEDGE

Contrary to the assumptions of Version I, the dare in the poem will apparently be costly either to Gawain or to the Green Knight, but not to both. The Green Knight knows who will suffer. Either he is invulnerable, a shapeshifter, or he is vulnerable, a bluffer, who will die by his own axe, and is challenging in hopes that the Round Table will decline and lose face. In Version II, the costs of performing the dare are 0 to Gawain and 1 to the Green Knight if the Green Knight is vulnerable, or 1 and 0 if the Green Knight is invulnerable. The sequence of play and payoffs are the same as Version I, shown in Figure 1 - - only the information conditions are different.

Let p be Gawain's and the onlookers' prior probability that the Green Knight is vulnerable. This probability is "prior" in the sense that it is based on everything they know about the Green Knight short of his strategic choice. Within the present model, Version II, his strategic choice is whether to challenge the Round Table, so p will reflect information about his appearance, his equipment, his words, etc. Gawain will update this p to a new value in the light of the fact that the Green Knight is challenging him. This new probability will be lower, its exact value determined by the solution of the game.

Let w_G , w_V and w_S be the reputational weights held respectively by Gawain, the Green Knight if he is vulnerable, and the Green Knight if he is invulnerable ("strong"). An equilibrium for this game involves three sets: values of w_V for which a vulnerable Knight challenges, values of w_S for which a strong Knight challenges, and values of w_G for which Gawain accepts. Again the equilibrium is essentially unique and involves thresholds. It is calculated in the Appendix, and shown in Figure 3 for various values of F and p . For $p = .5$, for example, a strong Knight always challenges, and a vulnerable one challenges only if his value of w_V is above a threshold, which is much higher than that of Version I. This rise makes sense since if Gawain refused, a vulnerable Knight would be indistinguishable from strong Knights of low reputational weight, so his prize would be less than in Version I. Gawain's threshold remains roughly the same. Comparing the thresholds for $p = .1$ and $p = .5$, different prior probabilities of vulnerability, Gawain is more likely to accept, the more he believes the Green Knight is vulnerable.

THE DARING GAME III: PLAYING BY PRETENDING TO PLAY

This final version of the game most accurately describes the events in the poem. It posits that the Green Knight and Gawain know the truth about each other. (This is supported by textual evidence which I will summarize later.) Gawain knows that the Green Knight is invulnerable, and knows that for some unexplained motive he wants a contest, that he has no motive to disgrace him by intimidating him into a refusal. Gawain regards the Green Knight as having chosen his words, appearance, and the terms of his offer, in order to recruit someone into playing. On his part, the Green Knight knows that Gawain's value for his reputation is high. The audience, however, is as uninformed as it was in Version II, and in fact thinks that Version II is the game being played; it is uncertain about the value for reputation held by the Green Knight and by Gawain, and also about the Green Knight's vulnerability. The view of the onlookers is important since they will give

Gawain his reputational payoff. Like a poker player who has spied on the other's hand but must hedge the use of this information or be accused of cheating, Gawain must consider the onlookers' view of the game.

Gawain's optimal choice in Version III is found by comparing his reputational payoff from accepting minus his performance cost of 1, with his payoff from declining, both reputational payoffs being calculated for Version II played with a Green Knight who would be revealed as invulnerable. These payoffs, and therefore Gawain's action, will be functions of F and w_G for a given p , as Figure 4 shows. For the purpose of later discussion, Figure 5 graphs his strategy on different axes than Figure 4, using p and F , the variables the Green Knight is manipulating.

Several sections of the text support the postulates of Version III that the Green Knight wants his challenge accepted, unlike a normal daring contest, and that Gawain knows that the Knight is invulnerable. That the Green Knight wants a contest is consistent with his goading of Arthur. When the gathering was silent to his first challenge, he could have ridden out to spread the news. Instead he chides the Round Table and especially Arthur, working on the king's pride in his name. The Green Knight seems determined to have an exchange of blows, and his tactic succeeds on the volatile king. Further, the Green Knight's demeanour while Arthur is preparing to swing the axe reveals that he wants an exchange. He is as calm as if "any burne vpon bench hade broght hym to drynk of wyne" (337-338), as if someone at the table had approached him with a drink of wine. Previously, when his challenge was unanswered, he had been restlessly shifting in the saddle (304-306), but now events are proceeding as he intended. Finally, note the Green Knight's remark, made and repeated, that he is happy it is Gawain who will be striking the blow (387-391). He leaves us ignorant about why he prefers Gawain in particular, but he does want a contest.

Gawain seems sure that the Green Knight will live through the blow. In his request to substitute for Arthur he speaks of his life as being the least valuable to lose (355). Arthur declares that a deft blow will end the match (372-374), but Gawain gives no word of agreement. When he promises to seek the challenger out (402), his words are unconditional; he does not qualify them with "if you survive my blow." Also revealing is the poet's focus when the decapitated body stays standing. We learn about the onlookers' shock as the head rolls into their midst, their fear as the body remounts the horse and the head gives orders to Gawain, but not until the visitor has galloped off are we told of Gawain's reaction. Although his fate is uniquely tied to the news that the Green Knight has survived, the poet does not report Gawain's response, and the suggestion is that he expected the Green Knight to live. Version III incorporates these ideas, that the Green Knight and Gawain know the truth about each other.

The game analyses of Versions I and II clarify not the actual contest being played, but the social conventions through which the Green Knight traps the hero into the bargain. The real planning and strategizing is close to Version III. The Green Knight's problem is to select Gawain from the company for his adventure. He presents himself to the Round

Table in a way that invokes the social convention of a challenge, that is not so effective that everyone volunteers, but strong enough to recruit the opponent he wants. In making his offers, the Green Knight manipulates the prior probability p of his vulnerability and the felicity F of his challenge. To describe how he does this, I first look at the determinants of the felicity of a dare in general.

AUSTIN'S THEORY OF PERFORMATIVES

A dare is both a statement and an act; felicity is its effectiveness, regarding it as an act. When John Austin delivered the 1955 William James Lectures, the philosophical majority held that sentences assert possible events. He expounded a theory, to become widely influential in the years following his death, that some sentences do not say things, but rather do things (Austin, 1962). *Performatives* do not primarily make claims about the facts, but are more like actions, and they typically cannot be labelled true or false. One example is a promise. If I promise to loan you my car and never do, perhaps never intended to, you cannot say my promise was "incorrect," that I claimed to be promising but I was not. I may have promised insincerely and broken my word, but I did indeed make a promise.

A promise is one type of performative and there are many others. Austin estimated one or several thousands. Sentences that thank, blame, apologize, welcome, find a defendant guilty, pronounce a couple married, all do things beyond their assertive function. Just what do they do? Many change the social relationship between actors by inducing new utilities, duties or rights in that relationship. A jury finding a defendant guilty gives the legal system the right to punish. Forgiving constitutes a promise to accord the other respect in your future relationship, in spite of a transgression.

A performative is judged not by its truth, but by its effectiveness, and Austin labelled this concept *felicity*. Felicity depends on both the immediate context around the speaker and listener, and on the societal customs supporting the performative. For example, if I make a promise but at the same time show you my crossed fingers, I am not really promising. My own action undermines my words. If I declare, "I apologize for X," but I am reciting a line as an actor in a play, then I am not really apologizing. Taking an example of Austin's, I come upon a ship ready to be launched, and seizing the occasion, declare, "I name you the *S.S. Joseph Stalin*." For good measure I break a bottle of champagne over the bow and kick out the chocks. However if I am not the person appointed to christen the ship, my action is void. Felicity is not all or none: it can be a matter of degree (promising versus solemnly promising), or it can be debatable (promising my cat a treat). A performative thus is not a magical incantation whose mere enunciation does the job. Performatives "come off" to a greater or lesser extent, depending on their appropriateness.

THE GREEN KNIGHT'S MANIPULATION OF FELICITY

The requirements of felicity depend on the particular performative. I will suggest

some requirements for a successful dare. (Neither Austin nor later philosophers seem to have investigated daring. Greenberg, 1990, gives an interesting account of the language of challenges to duel in the antebellum American South, but he does not use the framework of performatives.) First, the two actors must be part of a *shared culture* that supports the practice of daring. What goes over with children may not with adults: if one grownup challenges another to eat a slug, the dare will fail. It also seems unlikely that an adult could dare a child; daring is not a practice parents can use to manage their children. The folklorist Roger Abrams (1963) described black youths in Philadelphia playing the "dozens," a back-and-forth game of sexual insults, "Somewhere between the ages of sixteen and twenty-six, playing begins to lose its effect . . . When someone indicates that he wants to start, the one who is supposed to be insulted may reply, 'Oh man, don't play with me.' If he needs a more clever retort, he may rely on the proverb, 'I laugh, joke and smoke, but I don't play.'" (p.51). A particular mode of daring must have cultural support.

Second, the dare must have apparent purity of motive. If one child were to dare another to hand over \$5, the trick would surely fail. Dares deal in the commodity of reputation, and a blatant scheme to make money lacks felicity. Third, for those dares where both parties are to perform the deed, there must be *apparent symmetry* of the action. "Let's run through the boys' locker room, I dare you!" This might work between little girls, but not from a boy to a girl. Fairness of this type is necessary to compare the players' weights on reputation. Much of the Green Knight's self-presentation is aimed at satisfying the three requirements of felicity of his dare. Regarding the need for a shared culture that supports daring, the rules of courtly behaviour do provide such support for challenging, and the Green Knight himself says he is challenging "bi ryght" (274). His problem is to establish himself as member of the culture, a bone fide knight whose challenges compel a response. His fine clothing, his articulate speech, his horse obedient to the rider's command ("To the gome he wath ful gayn," 179) serve this end. When he is offered a fight, he replies that he did not come for that, although at home he has a hauberk, a helmet, a shield and sharp shining spear (268-269). Cataloging his equipment can be taken partly for its face meaning, as an elaboration of how he has not come to do battle, but he is also letting it be known that he is a fellow knight as he possesses the accoutrements of one (Burrow, 1965). In line with the need for purity of motive, the Green Knight stresses the reason for his challenge: it is a game, for sport (263, 274). He mentions no other goal. His manner is almost jocular. Only after Gawain accepts does he become businesslike (Davenport, 1973). His size ensures that physical prowess is not the issue, since no one could stand before him. The Round Table has drawn him here by its reputation, he says (258), and it will lose face if it does not take up his challenge (313). The third requirement is apparent symmetry of the action. Here the Green Knight has a difficult problem. Getting his bizarre terms accepted will not be easy. He is either mortal and vulnerable, or magical and invulnerable, and in either case his beheading proposal is unfair. He must obscure this truth, so he loads the details of the agreement with symmetries that give a facade of fairness. You strike at me, I strike at you. I offer no resistance, neither will you. I sought

you out at your abode, you seek me out at mine, and come at this same time next year.

THE GREEN KNIGHT'S MANIPULATION OF THE APPEARANCE OF MAGIC

Having described the ways through which the Knight ensures felicity F , I turn to how he sets the perceived likelihood p that he is vulnerable. Several authors have noted the "richness and variety of suggestion" in the Green Knight's description (Benson, 1965; Burrow, 1973). He is "bristling with ambiguity." Within the framework of Version III, this dual nature stems from the Green Knight's manipulation of p , the audience's probability that he is invulnerable. The poet is careful not to place him squarely in this world or the other. He promises to tell us of a "selly in sight summe men hit holden . . . an outrage awenture . . ." (28-29), a marvel, *so some men say*, an extraordinary adventure, but he refrains from unequivocally promising a tale of magic. The Green Knight hovers between the human and the supernatural by the way he enters, his physical form and his words. He does not appear in a puff of smoke, but rides in as a mortal could. He is large, the poet says, perhaps a half-giant, surely the biggest of men, but in any case handsome. The poet describes his shape and size, anchoring us in the first impression that he may be human, and after a dozen lines of detail tells us that punchline, that he is bright green. In the Green Knight's own words, deliberately chosen, he is a "wyghe" (315), a term that usually denotes a person but could mean a living being of any kind (Borroff, 1962, p.112). In battle, he claims, he would defeat his adversary through armour and weapons, not by dint of magic. He addresses Arthur with the familiar second person pronoun. Is this the manner of a hostile but human challenger or that of a being who has no obligation to human kings? Within Version III's approach, uncertainty over the Green Knight's nature, measured by p , functions to recruit Gawain but to make his decision hard.

The effect of the Green Knight's manipulation of F and p can be understood through Figure 5. Depending on the joint values of F and p , a challenge will select a knight of the Round Table whose weight on reputation is above a certain value. (A further refinement would portray the situation as an n -player game including all the members of the court.) By setting his parameters correctly the visitor in duces Gawain, the pearl among peas, to step forward for the adventure that awaits him.

THE FEAST OF BRICRIU

The earliest surviving version of *The Feast of Bricriu* is found with other important Irish sagas in *The Book of the Dun Cow*, transcribed about 1100 A.D. The book's title derives from the tradition that the ancient champion Fergus, dead for centuries, returned to life to narrate the deeds of the heroes of Ireland to St. Ciaran who copied them onto the hide of his cow. The Feast of Bricriu was first written down in the Eighth Century, as indicated by its language, so it was almost as old when the Gawain poet lived as his work is now. The tale describes a more warlike, less refined society than Arthur's court, and probably originated far earlier than the Eighth Century. Although it is highly regarded, the literature on it is sparse (e.g., Thurneysen, 1924), and spends little attention on the plot

structure. This summary of the final episode in the story follows the translations of Henderson (1899) and Meyer (1893).

SUMMARY OF THE FINAL BEHEADING SCENE IN THE FEAST OF BRICRIU

Bricriu of the Poisonous Tongue is a gossip and a troublemaker. (His motto: "Clearer to me is a whisper, than to anyone else a cry.") To foment strife, he invites three of Ulster's eminent warriors, Loigaire the Triumphant, Conall the Victorious, and Cuchulainn ("Kuh-hoo-lin"), to a feast, maliciously advertising that only one shall have the champion's portion of the meal, and his wife preeminence over the women of Ireland. The three warriors refuse to come for fear of the trouble Bricriu might stir up, but when he threatens to use his poetic skill to incite slaughter across all Ireland, they relent. Knowing that the heroes will not permit him to attend his own banquet, he builds a sun-room of coloured glass from which he can look down on the great hall. The three heroes and their wives perform various feats, some grotesque and bawdy, to gain the champion's share. Cuchulainn wins consistently, but the other two find excuses for denying his victory. In the final section of the tale Cuchulainn is publicly proven to be the deserving one, through the following beheading contest.

The Ulstermen return to the Royal Court after a day of athletics; the three champions are absent. A *bachlach* (a rough herdsman) of great size and ugliness, dressed in an old hide, enters the hall. From his head protrude ravenous yellow eyes, each the size of a cauldron to hold an ox. (His description is so fear some that the Eleventh Century monk recopying the manuscript here inserts into the margin the Sign of the Cross.) In the *bachlach*'s left hand is a block, in his right hand an axe; "its handle would require a ploughteam to move it; its sharpness would lop off hairs, the wind blowing them against its edge." He strides to the high arched forkbeam by the fire, and Duach of the Chaffer Tongue immediately speaks up to ridicule his height: "Is the hall lacking in room for you, that you find no other place than by the fork beam, unless you wish to be a domestic lightholder? Only sooner will a blaze be to the house than bright ness to the household." The giant stays calm: "Whatever property may be mine, you will agree, no matter how big I am, that the whole household will be brightened, while the hall will not be burnt." Bearing a light is not his only skill, he says. He has searched the world, yet found no one to give him fair play. As the Ulstermen excel all, he expects someone among them will grant his request. The company agrees to grant him fair play. He exempts the king and his relation from his challenge, but to the others, "Come whoever of you that wishes to do it, and I may cut off his head tonight, and he will cut off mine tomorrow night." (This, of course, is the reverse of the Green Knight's game.) Duach doubts that anyone will volunteer, and Munremar mac Gerreind springs to the floor to propose that the order of the blows be switched. "Were that my quest, I could have got that anywhere," the *bachlach* objects, but Duach goads him and he accepts, adding the comment, "strange as that may seem to you." Pledging Munremar to come back for a return blow, the giant lays his head on the block. Munremar swings the axe, and the head flies across the hall. Blood streams

from the giant's neck and fills the house. He gathers the head, axe and block to his chest and strides out.

The giant returns the following night, but Munremar is not to be found. Loigaire, one of the three contending heroes, is there, and the giant summons him by name. He beheads the giant, but, like Munremar, shirks his part of the bargain. Conall is challenged and behaves identically. Finally the bachlach calls Cuchulainn to play, and despite the latter's innovation of smashing the head after severing it, bending the rules as Gawain would later do, the bachlach returns intact next night to demand his turn. Cuchulainn has fallen into deep gloom, but, unlike the other two, keeps his word and lays his head on the block. The giant mocks the reputation of the court and teases Cuchulainn, saying that he cannot kill him yet because his neck does not reach across the block. Cuchulainn complains that he is being tormented and asks to be dispatched forthwith. He extends his neck so that a man might put his foot between each of the verte brae, and it stretches across the whole block. As the giant raises the axe, the hides that cover him creak like a forest in a winter storm. He brings it down on Cuchulainn's neck, but blunt side downwards. He bids him rise and accept the champion's portion. The giant disappears. He was the magician Curoi mac Daire who came to prove to all that Cuchulainn was the deserving one.

THE BACHLACH'S STRATEGY

The narrative seems less polished than *Sir Gawain and the Green Knight's*, more like a disconnected dream, but an informal game viewpoint reveals the functions of some obscure plot elements. Some of the puzzles are these:

--Arthur's court falls silent when the Green Knight enters the hall, out of fear and courtesy according to the poet, but Duach speaks up to insult the bachlach. What is the function of Duach's remark?

-- Why does the bachlach propose the unfair rule that he strike the first blow, but quickly agree to reverse the order?

-- Why does the giant include Munremar in list of beheaders when he is not one of the three contending champions, and in fact he has no other role in the poem?

-- Why does the bachlach summon each champion by name?

The key to these riddles is the different strategic structure of the contest compared to Gawain's dilemma, and the different trick the challenger uses to induce the heroes to accept. The Green Knight strove to make the contest look fair between himself and Gawain, but the bachlach has a different problem. His aim is to establish fairness among the three champions who he is comparing publicly, so he must first ensnare them into the game and then design their tests to be equal.

In inducing the heroes to take up his challenge, the giant is clever. He first extracts a pledge of fair play, without revealing the game. He then proposes that he strike the first blow. When Munremar objects that the order should be switched, the giant readily accepts. Munremar is trapped; he cannot refuse the bargain since he himself proposed it. The situation is something like Darers-Go-First, except that we suspect that Munremar made

his retort without realizing that he was falling in with the bachlach's plan. To his chagrin, Munremar learns that the giant did not issue his initial proposal naively; the giant's remark that he is ready to go first "strange as that may seem to you," reveals that he knew his earlier plan had no chance of being accepted. Regarding the giant's goal of making the contest fair among the three, the difficulty is that they will play the game sequentially, and this ordering introduces unfairness in two ways. One is that the person offered the first turn will be more ready to accept, since he is not sure that the giant can replace his head. Later players will know about the magic and will be less likely to play. Consequently, the audience cannot gauge their courage by noting who accepts and who declines. This first difficulty is solved by introducing Munremar, whose trial displays the bachlach's wizardry to the later players, the actual rivals for the champion's portion.

The bachlach's second problem involves the order in which the champions play. He wishes to show the world who will accept the game and keep his pledge to return. The giant knows that Cuchulainn alone is worthy among the three, and must ensure that he is the final player. If Cuchulainn plays too early, the others will learn that the giant will not behead them. The giant accomplishes his goal by asking each of them by name to step forward and play. There is a strategic equivalence between Munremar in *The Feast of Bricriu* and Arthur in *Sir Gawain and the Green Knight*. The Green Knight incites a first-taker by angering Arthur. Once his king has accepted the challenge, Gawain can scarcely maintain that the terms are unfair and confer no obligation on anyone to accept. The bachlach accomplishes the same end with a more subtle trick, by maneuvering Munremar into proposing and accepting the terms of the bargain.

Another strategic correspondence between the poems is the Green Knight's bough of holly and Duach's initial insult to the bachlach. Both establish immediately that, despite his threatening appearance, the stranger has not come to fight. The bachlach and the Green Knight must shift the issue to one of sport and fair play. The latter cites the holly as a symbol of his peaceful intentions -- he carries it in his hand where one would expect a weapon or shield. The bachlach proves his peacefulness when he stays unruffled by Duach's suggestion that he could not hold a light for the household. Each device fits its setting: Arthur's assembly could not have insulted the Green Knight without violating its code of courtly behaviour, and the bachlach would have looked ludicrous holding a holly twig or a flower.

A ONE-PERSON TWO-PLAYER GAME

Another portrayal of Gawain's dilemma has the hero playing against himself. Here the focus is on the Green Knight's enigmatic character and on Gawain's choice of what he should believe about it. The knight offers plenty of evidence that he is malicious, but plenty that he is chivalrous and will give Gawain fair play. Gawain has two natures, a dutiful one and a self-preserving one. Each can regard the Green Knight as malicious or chivalrous. If the Green Knight were a clearly malicious being, his challenge need not be accepted; submitting to him would be suicide. However if he is a chivalrous fellow knight,

Gawain owes him fair play and the Green Knight will somehow reciprocate it. Neither case is entirely convincing from the evidence available before decision. Either choice presents a risk, one of abandoning duty, the other of dying, but the two natures weight these risks differently. His dutiful half worries more about shirking an obligation, and his self-preserving half more about being killed.

If Gawain's two natures disagree on the Green Knight's character, Gawain will experience tension, an aversive mental state. They want to agree, but one nature will have to compromise by overlooking the evidence supporting the other half's worries. The question of what to believe is here a strategic choice; each nature can focus on part of the evidence and try to rationalize away the rest. However each nature can ignore its worries with only partial success, and each would prefer that the other did the compromising.

This approach is somewhat Freudian, with its duality of the individual's psyche and its idea of minimizing mental tension. Freud would call the two natures the superego and the id, and expect that the superego would be logical and verbal while the id would be intuitive and inarticulate. This dichotomy fits the poem well. In his speech, the Green Knight talks like a chivalrous knight in the role of a challenger (Burrow, 1973), but the unearthly aspect of him, his green hue, stays entirely off the spoken record. Neither he nor the court make any reference to it. Freud's framework suggests that the dutiful nature of Gawain will listen to the speech, while his basic nature will focus on the huge green figure. The notion of choosing beliefs to minimize tension is prominent also in cognitive psychology, as in the theory of dissonance reduction. Seeking out evidence to confirm what you have already chosen to believe appears in decision-making psychology -- Janis and Mann (1977) call it "bolstering."

FIGURE 6: A game between Gawain's two natures

These assumptions describe a Battle-of-the-Sexes game, with payoffs shown in Figure 6. It has two strong equilibria and at each one or the other nature compromises. Since there are two equilibria the game has no obvious solution. If one were to substitute cardinal payoffs in the diagonal cells, one selection solution proposal, justified by axioms (Harsanyi and Selten, 1988; O'Neill, 1988), would multiply the payoffs in the equilibrium cells to calculate the Nash products, and choose the higher of the two. However this rule is rather esoteric, and the essential situation has an outcome that is equivocal. This indeterminacy makes for a more suspenseful plot.

GAME THEORY AND LITERARY ANALYSIS

Given the memorable impact of the beheading scene in *Sir Gawain and the Green Knight*, it is surprising how few papers analyse the characters' motives and choices. The conventional literary repertoire seems to lack a good method to analyse plot per se. The field of narratology, for example, investigates how the story is told but not the story itself.

Several formal techniques have been developed to analyse plot. Vladimir Propp

(1928) initiated the "linguistic method," categorizing the elements in Russian folktales by their abstract functions, and describing the patterns that appear in the corpus of tales. Kissam (1977) applied the technique to mediaeval romances. More recent work has paralleled developments in linguistic theory and has investigated "story grammars" (e.g., Alker, 1987, and the works he cites). Prince (1973) tackled the interesting question of what makes a story a story rather than a mere string of facts. More than Propp's work, this study deals with the causal and relationships among the elements, and in general these researchers are moving from a syntactic view of a story toward a semantic one. However they themselves express frustration in their strivings to get at the "meaning" of the plot (Ryan, 1981). "Meaning of the plot" is a linguist's way of putting it; a game theorist would say that they do not deal with the strategic structure of the game, they do not treat characters' acts as directed towards goals.

Further formal methods to study plots have sprung from the "Romanian school of poetics," led by the mathematical linguist Solomon Marcus (1970; in English, see for example, Marcus, 1977, 1984, and Brainerd and Neufeldt, 1974). An example is the use of signed graphs along with the hypothesis that events move towards a state of "structural balance" (Martindale, 1976; Lalu, 1977). Teodorescu-Brinzeu (1984) represents the sequence of thought in soliloquies using symbolic logic. The statistical analysis of joint presence of pairs of characters on stage is another theme. Although these techniques are interesting, they work at the periphery of the plot while game theory aims at the center.

More than a dozen papers have applied game theory to stories, as Table 1 shows. Oskar Morgenstern presented the Holmes/Moriarty dilemma non-mathematically in 1928 and 1935, and later in his book with von Neumann defined it as a formal game. Rapoport's analysis of *Othello* was detailed and advanced for its time. Other papers range from informal game analogies to Mehlmann's use of differential games. He addresses the puzzle of why Faust was saved after he had lost his wager with the devil. Mystery and detective stories, heavy on plot, are frequent subjects, as are stories with explicit bargains detailing each possible outcome, e.g., *The Merchant of Venice*, *Faust*, and the present study. One topic not in the table is informal game models of an author trying to maintain suspense versus the reader trying to discover the story, e.g. Bruss (1977) and Davey (1984). Brams (1991) discusses the prospects for game theory in the humanities.

Conventional scholars have ignored these studies, and some of the papers give them good grounds for doing so. Some models do not take the literary work seriously; they are inconsistent with important elements in the story, and do not compare their game interpretation with details from the text. I will give the two examples that are the easiest to relate, admitting that my criticism is somewhat unfair since the authors devised them more to illustrate game theory rather than to study a plot.

von Neumann/Morgenstern 1944	<i>The Final Problem</i> , Conan-Doyle	2-person zerosum
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Williams 1954	<i>Merchant of Venice</i> , Shakespeare	2x2 zerosum
Rapoport 1960	<i>Othello</i> , Shakespeare	various
" 1962	<i>La Tosca</i> , Puccini	Prisoner's Dilemma
Vorobev 1968	<i>Eugene Onegin</i> , Pushkin	informal, duels
"	<i>Gift of the Magi</i> , O. Henry	Battle-of-the-Sexes
Howard 1971	<i>The Caretaker</i> , Pinter	metagames
" 1980	<i>Dr. Zhivago</i> , Pasternak	“
Teodorescu-Brinzeu 1977	<i>Othello</i> , Shakespeare	3x4 non-zerosum
Steriadi-Bogdan 1977	<i>The Mousetrap</i> , Christie	ext've, perfect info
Lalu 1977	<i>Richard III</i> , Shakespeare	ext've, perfect info
Brams 1980	<i>Old Testament</i>	various finite games
Hintikkas 1982	<i>Silver Blaze</i> , Conan-Doyle	informal ext've form
Carlson 1984	Numerous mystery novels	informal
Mehlmann 1989, 1990	<i>Faust</i> , Marlowe, Goethe	differential games

TABLE 1. Game theory studies of literary plot.

The first is the opera *La Tosca* treated as a Prisoner's Dilemma. The Chief of Police Scarpia has condemned Tosca's lover to death but offers to fake the execution in exchange for Tosca's favours. She consents, but after he has sent off the order, she seizes a knife and stabs him. He, however, had already doublecrossed her, and had written an order that her lover be really shot. The pair come to an inefficient outcome like the players of a Prisoner's Dilemma, but if we scrutinize the model, flaws appear. If Scarpia knew that Tosca might stab him, why did he leave a knife lying out? And if she knew his set of strategies, could she not have demanded to see her lover safe out of the country first, and so on? Prisoner's Dilemma is a valid model only if the information conditions are right; ending up at an inefficiency is not enough. The model cannot explain why they limited their moves in this way, or why they made the bar gain in the first place. The analysis of O. Henry's short story *The Gift of the Magi* also overlooks the data. A fond husband and wife plan to surprise each other with Christmas gifts. She cuts her hair to buy him a watchchain, but, ironically, he has sold his watch to buy a clasp for her hair. Vorobev cast it as a Battle-of-the-Sexes game, symmetrical with two strong equilibria as in Figure 6. (The interpretation of the payoffs in this "battle" has each worrying mainly about the other's material welfare.) The model accurately reproduces what happens in the plot; since the players in the abstract game have no way to coordinate their choices, it is reasonable that they might end up at an inefficient non-equilibrium. However O. Henry's trademark was the surprise ending, and an analysis that predicts that his story will turn out as might be expected, clearly has not captured the story's essence. When they reveal their gifts to

each other, the characters are stunned. This fact is inconsistent with the simple matrix analysis. We need methods that go deeper, perhaps using recent work on information and knowledge in games.

Lacking a method for examining characters' overall strategies, scholarship on the plot of *Sir Gawain and the Green Knight* has taken several directions. A few critics have tried to construct new motives for the actions of Gawain, the Green Knight or Morgan Le Fay. However most conventional analyses of plot (Bloomfield, 1961) have dealt with the symbolism of the characters (Does the Green Knight's hue symbolize nature or Christmas or death or the fairy world?), or with the social meaning of various elements (Is his manner to Arthur rude, or appropriate to a challenger? Is Arthur's demeanour seemly for a king?), or with motifs shared with other stories (Where else do we see a challenge by a stranger, or an exchange of blows?) This third subject of recurrent themes is prominent in the critical literature on the poem (Catalini, 1979; Benson, 1965; Kittredge, 1916; Brewer, 1973). The findings are fascinating; for some deep reason, challenges by strangers to test one's virtue, exchanges of blows and magical survivals of deadly wounds abound in folk and mediaeval literature. However the comparative study of plot elements is limited in what it can reveal. One could not learn much about checkers and backgammon by comparing the physical shapes of the pieces. The element can have different functions in different stories, or conversely, similar functions can be fulfilled by different elements. The Green Knight's bough of holly and Duach's insult to the giant correspond strategically, as I argued, but are different physically. Munremar's challenge to the bachlach's offer has the same role as Arthur's impulsive seizing of the axe, even though the events themselves are dissimilar. The element of Munremar confronting a stranger appears in *Scela Mucce meac Da Tho*, The Tidings of Mac Datho's Pig, another Old Irish claims problem about the champion's portion of a meal and the ownership of a marvellous hound (Chadwick, 1927), but there its strategic role is quite different. Mediaeval writers borrowed and combined familiar ideas without compunction, and the meaning of an element was not inherent, but arose from the context. Strategy-oriented methods can bring out similarities of function across different settings.

SUPERPOWER RIVALRY IN THE THIRD WORLD

Mediaeval challenges possibly had a defensive purpose. A knight ready to fight in single combat would be seen as more reliable in a battle, so courts looked for ways to display their willingness to fight. In the language of modern strategy studies, chivalric challenging may have served to enhance deterrence, and the same could be said of children accepting dares. Nuclear weapons have reemphasized the problem of reputation in deterrence, although it is now called the problem of credibility (Jervis, 1979; Morgan, 1985; Powell, 1990). Because a nuclear crisis could lead to a catastrophe beyond precedent, each government has sought to convince the other beforehand that it will resist if its interests are crossed.

A model along the lines of the daring game can be devised for the international case.

It could take this form: Country 1 commits itself to a given issue or does not commit itself, then Country 2 fights with it on that issue or does not. If the commitment is made and challenged, both lose pay a conflict cost, and also receive the reputational payoff. They have a strong desire for this reputation, a desire generated through its usefulness in future situations. The added self-referential element in a side's payoff, the value for reputation for valuing reputation, outweighs the cost of resisting in some conflicts and make threats credible.

To check the validity of the model we can identify its key features and look for them in international interactions. The important elements are the same three as in the daring model: first, a language act that triggers the reputational goal; second, the goal of reputation for valuing reputation, as incorporated in payoffs like reputational weight \times [others' estimate of reputational weight given your action] - conflict cost, or the more competitive form of Figure 1; and third, the model's consequence that the parties will fight over issues where winning is of no benefit to them. To the extent that Cold War contests show these three elements, the model deserves more credence.

The first feature of the model, the performative utterance, is prominent in the international context. One side often declares or reasserts its "commitment" to defend some interest. At first it is puzzling why words should matter in the realpolitik of world struggle, but this issue was the very one raised by the Green Knight's remarks to Arthur, and the answer again involves Austin's theory of performatives. A difference between the mediaeval and the modern case is a dare comes from the disturber of the status quo, whereas a commitment is issued by the status quo supporter, but both declarations function as performatives in Austin's sense. Verbal threats by governments also fall under his theory.

In regard to the second feature of the model, seeking reputation for valuing reputation, some explanations for U.S. foreign policy seem to treat reputation, will or credibility as autonomous entities. James Payne, a supporter of U.S. policy, writes, "Hostile states tend to oppose moves by each other and each other's allies to alter the status quo because they desire to avoid the loss in threat coerciveness (or reputation for determination) which would result from the successful alteration" (1970, p.117). Robert Tucker, also a supporter, argues, "When engaged in a contest for global stakes, what may appear as a marginal interest will be invested with a significance it would not otherwise have, for almost any challenge is likely to be seen by the challenger and by third parties as a test of one's will" (1981, pp.144-145, quoted by Schoultz, 1987). Robert Johnson, a former U.S. State Department analyst and a critic of these policies, asserts, "Concern with credibility itself defines U.S. interests and plays the major role in determining the particular commitments the United States undertakes and the resolve with which it carries out those commitments; the specific situation is relatively less important" (1985, p.43). Referring to U.S. policy in Vietnam and Nicaragua, James Chace writes, "the Soviet challenge has ignited an obsession with credibility so that concerns about it determine commitments, which in turn expand U.S. interests" (1988, p.10).

These rationales are puzzling, as they construe determination, will and credibility as standing by themselves. Payne stresses reputation for determination, but "determination" to do what? If the situation involves one's interests only marginally, as Tucker allows, why is it a "test of one's will"? And what could Johnson's phrase "credibility itself" mean? These were the types of questions that led to a recursive definition of reputation in dares. The international model would state that governments seek reputation for valuing reputation, that they want to make it credible that they place a high value on that credibility. The idea is confusing in English, but innately simple and consistent, as the model shows.

The third feature of the model was the possibility of struggles over issues of no innate importance. Finding an international question of absolutely no importance is hard, of course, but based on their involvement in past policy debates, Johnson and Chace hold that commitments often lead to interests, rather than the other way around as common sense would expect. The model explains how this phenomenon could happen. Others have doubted that international struggles over pure non-issues could be sensible. Desch (1989) lists some past writings on the subject and concludes that the idea deprives credibility of any objective or rational basis (p.95). Jervis (1979, p.315) states, "Commitment can only be built on a foundation of intrinsic and strategic interest." As theory, their claims seem to be incorrect; the present model suggests that a logical government might commit itself and fight for credibility per se. According to the model, in fact, it does not matter who wins the struggle, as long as each exerts the effort of struggling.

More conflict over non-issues arise in arms building decisions and in arms control negotiations. When each superpower has over 10,000 strategic nuclear weapons, exact counts are militarily meaningless, but the US and USSR have increased their arsenals over the years, first in numbers, then in quality. Negotiations have stalled over small differences in armaments to be given up, even over the banning of weapons that neither side possessed or wanted to build, like multiple warhead cruise missiles (Talbot, 1979). Other instances of conflict over nothing were the "chicken of the sea" games played by Soviet and American warships, heading at each other and swerving at the last moment (Zumwalt, 1976, p.322), or shouldering each other off during refuelling (Lynn-Jones, 1985). Before the 1972 Prevention of Incidents at Sea Treaty, this perilous sport went on one or two dozen times a year, apparently tolerated by naval and civilian authorities.

The model predicts that players will sometimes welcome a contest. During the Middle courts went beyond responding to individual challenges, and held jousting tournaments (Vale, 1981) and *pas des armes*, in which a group of knights seized a location such as a hill or bridge and invited others to dislodge them. Modern governments often seem glad when commitments are challenged, since they have an opportunity to increase their credibility.

Does the model mean that the superpowers have acted sensibly in waging proxy wars in the Third World? Not at all, since a set of beliefs and actions may be self-consistent yet invalid. Indeed some empirically-based studies have suggested that credibility is overemphasized (e.g., George and Smoke, 1974; Lebow, 1981; Huth and Russett, 1984,

p.519; see also the references given by Jervis, 1989, p.193). Those holding power worry about credibility, however, and this paper's attempt to state the argument precisely is a step in scrutinizing it. A further reason that the model does not rationalize proxy wars, is its narrow scope. It treats what to do in a single situation, not whether Third World rivalry is sensible as a continuing practice. Looking at a larger game, the superpowers have moves that could end this system of "security." Its demands seem ill-defined, open-ended and immensely harmful. Rather than imposing its costs on the privileged, it inflicts suffering on peoples who have no power to end it.

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APPENDIX. CALCULATING THE EQUILIBRIA.

Version I. To show that all equilibria must be of the threshold type: Let the onlookers' estimates of the difference between Player G's (Gawain's) and Player K's (the Green Knight's) reputational weights, be designated D and A if G declines or accepts respectively. Assume, contrary to the threshold claim, that there are weights w and w' such that a G holding w would accept, a G holding w' would decline, and $w' > w$. The payoffs with the lower weight w from accepting and declining are $FwA-1$ and FwD , and the existence of an equilibrium involving acceptance implies $A > D$ and $w > 1/F(A-D)$. However declining at higher weight w' yields $w' < 1/F(A-D)$, a contradiction. The existence of a threshold in Player K's equilibrium strategy can be shown similarly.

Define w_K and w_G as K's and G's respective weights and k and g as their thresholds. To derive the thresholds: By the uniform prior on the weights, if Player K chooses to dare, the others' expectation for w_K is $(1+k)/2$. Also, if Player G accepts, others' expectation for weight w_G will be $(1+g)/2$, but a refusal produces estimate $g/2$. Substituting these in the payoff expressions in Figure 1, K and G get $Fw_K(k-g)/2 - 1$ and $Fw_G(g-k)/2 - 1$, respectively, when a dare is accepted, and $Fw_K(1+k-g)/2$, $Fw_G(g-k-1)/2$, when one is declined. If w_G equals the threshold g , G is indifferent between accepting and declining, so $Fg(g-k)/2-1 = Fg(g-k-1)/2$, yielding $g = 2^{1/2}F^{-1}$.

Also, at an equilibrium Player K has likelihoods $1-g$ and g of a dare being accepted or declined, respectively. Using these probabilities to calculate the expectation from daring, it follows that when K's weight is at the threshold and K is thus indifferent between the actions, then $(1-g)[Fk(k-g)/2 - 1] + gFk(1+k-g)/2 = 0$. Combining this formula with the

expression derived for g , gives $k = F(F/2-1)^{1/2}$.

Version II. To simplify the description of the equilibria, we will assume that the weights are uniform on the open interval $(0,1)$. Derivation of the threshold property is similar to Version I. Gawain and the onlookers hold probability p that the Green Knight is vulnerable and the costs will be 1 for the Green Knight and 0 for Gawain. With probability $1-p$ the costs will be 0 and 1. Abbreviate Gawain's threshold by g , a vulnerable Knight's threshold by v , and a strong Knight's by s . Everyone else's probability that the Knight is vulnerable given that he challenges will be $p' = (1-v)p/[1-s(1-p)-vp]$. This expression is used to calculate the following payoffs:

If a strong Knight challenges and Gawain accepts, the Green Knight and Gawain get $Fw_S(s/2-g/2)$ and $Fw_G(g/2-s/2)-1$ respectively.

If a vulnerable Knight challenges and Gawain accepts: $Fw_V(v/2-g/2)-1$ and $Fw_G(g/2-v/2)$. If a strong Knight challenges and Gawain declines: $Fw_S[(1-p')^{1/2} + s/2] + p'(1/2+v/2)-g/2$ and $Fw_G[g/2-(1-p')^{1/2} + s/2] - p'(1/2+v/2)$.

If a vulnerable Knight challenges and Gawain declines: $Fw_V[(1-p')^{1/2} + s/2] + p'(1/2 + v/2) - g/2$ and $Fw_G[g/2 - (1-p')^{1/2} + s/2] - p'(1/2 + v/2)$.

If there is no challenge: 0 and 0.

To calculate a strong Knight's expectations from challenging, weight the appropriate payoffs above by likelihoods of accepting or refusing $(1-g)$ and g . Simplifying the expression yields that a strong Knight expects $(Fw_S/2)[s(1-p'g) + p'gv]$ from challenging, compared to 0 from not challenging. If the expression in brackets is strictly positive any type of strong Knight will challenge (that is, $s = 0$). For a possible equilibrium with $s > 0$, the expression in brackets must be zero (it cannot be negative), implying $p' = g = 1$ and $v = 0$. Equilibria of the latter type cannot exist, however, since it can be shown that any strong Knight would be motivated to challenge given the knowledge that Gawain will surely decline. Therefore we turn back to investigate the remaining possibility of equilibria with $s = 0$. The conditions equating the payoffs for each action for a vulnerable Knight and Gawain when their weights are just at threshold, are respectively $(1-g)[Fv(v/2-g/2)-1] + gFv[(1-p')^{1/2} + p'(1/2+v/2)-g/2] = 0$ and $p'Fg(g/2-v/2) + (1-p')(Fg^2/2-1) = Fg[g/2-(1-p')^{1/2} + s/2] - p'(1/2+v/2)$. The first yields $g = (2-Fv^2)/[2-(1-p')Fv^2]$, and the second $g = 2(1-p')/F$. Equating these and including the further condition given $s = 0$, that $p' = (1-v)p/(1-vp)$, gives a quartic equation in v which can be solved numerically and interpolated for a diagram. Figure 3 uses the technique of parabolic blending.

Version III. Here Gawain is paid as if he were playing Game II, but in fact he knows that the Green Knight is invulnerable. Let $A(F,p)$ and $D(F,p)$ be the onlookers' assessment of his reputational weight minus a strong Knight's, given he accepts or declines respectively. Given the above analysis of Version II, $A(F,p) = g/2$ and $D(F,p) = g/2 - (1-p')/2 - p'(1/2+v/2)$,

where $p' = (1-v)p/(1-vp)$ and v and g are the equilibrium values calculated in Version II (thus functions of F and p). Gawain then expects $Fw_G A(F,p) - 1$ from accepting and $Fw_G D(F,p)$ from declining. He will accept if the former is greater, i.e., if $w_G > 1/F[A(F,p)-D(F,p)] = 2/F(1+v)$. Figures 4 and 5 plot the thresholds.

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