

# **The simulation within a play: an evolutionary analysis of Hamlet**

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## **Context**

This paper was written for a workshop organised by Raghavendra Gadagkar, Stephen Greenblatt, and Meredith Reiches at the Wissenschaftskolleg zu Berlin in 2013. The workshop brought together scholars from different disciplines, including literary scholars, historians, economists, biologists and journalists, to reflect on the subject of “succession”.

Each participant read William Shakespeare’s ‘Hamlet’ and wrote a paper interpreting its text from their respective disciplinary perspectives to contemplate the following types of questions: ‘How are families, populations, hives, communities, and states renewed? What are the mechanisms for determining who succeeds to a position of authority, be it executive or reproductive? How are the procedures of succession established, and what happens when they do not work?’

This is the piece I wrote, wearing my evolutionary anthropology/ behavioural ecology hat.

Disclaimer: This paper assumes familiarity with the basic plot of 'Hamlet'.  
<http://en.wikipedia.org/wiki/Hamlet>

## **Abstract**

In this paper I focus on two relationships in the play Hamlet. First, between Hamlet and his uncle Claudius and second between Hamlet and his mother Gertrude. I argue that through the conflict built into these two relationships, the play captures the most central trade-offs that, according to evolutionary biologists and anthropologists, define succession in humans but also in other animal societies.

## **1. Introduction**

One of Shakespeare's trademarks is his ability to recognise and describe conflicts that most people face in a lifetime. In *Hamlet* he does so by turning to a subject that is a fundamental concern of every human being (and arguably every living being) – the accumulation of wealth and power. In this paper I focus on two relationships in the play. First, between Hamlet and his uncle Claudius and second between Hamlet and his mother Gertrude. I argue that through the conflict built into these two relationships the play captures the most central trade-offs that, according to evolutionary biologists and anthropologists, explain patterns of succession in humans and possibly also in other animal societies.

## **2. Hamlet and Claudius**

### ***2.1 The conflict***

Hamlet has an antagonistic relationship with his Uncle Claudius right through the play. To begin with Hamlet's resentment towards his Uncle stems from Claudius's "incestuous" (e.g. Act I, Scene II) marriage to Hamlet's mother only months after the death of his father, King Hamlet. This resentment soon turns into animosity once Hamlet begins to believe that Claudius was responsible for his father's murder. A third and better concealed source of anguish is Hamlet's disappointment at having lost the crown of Denmark to his Uncle. We see evidence for this latter source of bitterness only twice in the play. Once, when he responds to Rosencrantz' question, "How can that be, when you have the voice of the king himself for your succession in

Denmark?” by answering, “Ay, but sir, 'While the grass grows,'-the proverb is something musty” (Act III, Scene II) and on a second occasion when he describes Claudius to Horatio as, “He that hath...Popp'd in between the election and my hopes” (Act V, Scene II). In summary, Hamlet feels wronged by an Uncle who murdered his father, stole his crown and consolidated this power by marrying his mother.

It is not surprising that an audience should empathise with this tormented Hamlet; the murder of one's father and appropriation of one's rightful inheritance would enrage most people. However, what makes the situation exceptional and really stirs moral sentiment is the fact that in murdering King Hamlet, Claudius murdered his brother, stole his nephew's crown and married his sister-in-law. It is this “unnatural” (Act I Scene IV) wronging of one's kin that is the core of the conflict between Hamlet and Claudius. To understand what drives it the question we must ask is - why would most audiences morally condemn Claudius for harming his kin? In the next section I use evolutionary theory to address this question.

## ***2.2 Helping and harming kin – an evolutionary perspective***

Natural selection should favour traits that increase the fitness of an organism (Li 1967; Price 1970; Robertson 1966), where fitness represents the lifetime number of offspring an organism produces. This means that all living organisms, including humans, should have evolved to produce as many offspring that they can while ensuring that these offspring in turn survive and reproduce. Hence, where possible, we should expect individuals to invest available resources in the production and

survival of offspring. This explains why King Hamlet would want his son to succeed him as king and inherit his wealth.

However, every organism is comprised of a complex of genes, part of which it passes on to its offspring. As a result not only do parents share a proportion of their genes with their children but also siblings share some genes with each other, each others' offspring (nieces and nephews) and so on and so forth to varying degrees. Taking this genes-eye view (Dawkins 1976) we expect natural selection to favour traits that increase the direct fitness (own offspring) of an individual but also traits that increase indirect fitness (the offspring of kin) because our kin share some of our genes. William Hamilton therefore suggested that the reason that kin are likely to preferentially help each other is because by helping our kin increase their fitness we indirectly increase our own fitness (Hamilton 1964a; Hamilton 1964b; Hamilton 1975). Conversely, by harming our kin or their offspring we decrease our indirect fitness. There's the rub. This explains why it is intuitively "unnatural" and morally condemnable for our audience that Claudius decided not only to murder his brother but also to steal his crown and deny it to his nephew.

### *2.2.1 The trade-off between direct and indirect fitness*

As unnatural as it may seem, the conflict between Hamlet and his uncle is not uncommon. Brothers at war (e.g. Indian magnates Anil Ambani and Mukesh Ambani), quarrelling sisters (e.g. Kate and Bianca from Shakespeare's 'Taming of the Shrew'), fathers and sons locked in combat (e.g. Henry II and Richard I of England, Akbar and Jahangir of the Mughal Empire), both literature and real life are strewn

with tales of feuding kin across the world. So if harming our kin is detrimental to us, why are these stories so frequent and familiar? Does evolutionary theory fail to explain human behaviour or can we explain both the tendency to help and harm kin within the framework of natural selection?

It is theoretically possible to explain both the tendency to help and harm kin within an evolutionary framework. While it may be beneficial to help your kin, in order to do so you often have to give up resources that you might otherwise invest in your own offspring. Thus, if helping your kin and increasing your indirect fitness comes at a cost to your direct fitness then whether you help or harm your kin will depend crucially on this cost to benefit ratio. In some instances it may make sense to invest all your resources in your kin and their offspring, if for example you don't have any offspring of your own. However, in other circumstances you may want to channel all your resources into your own offspring, who share with you the largest component of your genes; this would make even more sense if you had very limited resources to distribute amongst your own and your kin's offspring. Hence, central to whether we cooperate or compete with our kin is this trade-off between direct and indirect fitness (West et al. 2002). Evolutionary anthropologists have examined the degree to which uncles and aunts invest in their nieces and nephews in several populations and find that the results are mixed (Sear & Mace 2008). There is some evidence to suggest that childless uncles and aunts are more likely to invest in nieces and nephews than those with children (Pollet & Dunbar 2008). In fact even grandparents vary in their effects on child survival (Sear & Mace 2008) and an analysis of historical data from Viking populations demonstrates that the likelihood that they would murder kin decreased as the degree of relatedness increased (Dunbar et al. 1995).

### *2.2.2 Paternity uncertainty*

The question of how much one should invest in one's kin is even more complicated for paternally related kin than it is for maternally related kin. This is because, while a mother and all her genetic relatives can be certain that her offspring (produced from an egg fertilised within her body) carry her genes, a father and his genetic relatives can never be completely sure; the offspring may well have been produced from the sperm of another man. This "paternity uncertainty" means that kin from the patriline cannot guarantee that investing in patrilineal kin will in fact improve their indirect fitness (Alexander 1974). On the other hand, if matrilineal kin invest in each other they can be sure that their investment is directed towards their own genes. Thus, patrilineal kin should only invest in each other when paternity is certain. Gaulin et al. (1997) found some evidence to suggest that matrilineal aunts and uncles are more likely to invest in their nieces and nephews than patrilineal aunts and uncles. The conflict between Hamlet and Claudius is therefore less surprising given that they are patrilineal kin than if Claudius had been Hamlet's mother's brother.

### ***2.3 Marriage and inheritance systems in humans***

Anthropologists have spent considerable time and effort recording the tremendous variation in marriage and inheritance systems across human populations (Murdock 1949). Eighty two percent of human societies allow polygynous marriage, where a man can take multiple wives, while approximately 17% prescribe monogamous marriage and either forbid or disapprove of polygyny (Fortunato 2012). About 1% of

societies in the world follow a clear pattern of polyandrous marriage where a woman can take multiple husbands; among the most famous examples are the Sherpa and Toda of India and the Marquesans of Polynesia (Starkweather & Hames 2012; Starkweather 2009). The diversity in marriage practices is accompanied by variability in inheritance systems. In societies with patrilineal inheritance wealth is transferred down the male line, most often from father to son. Matrilineal societies are organised around matrilineal kinship and wealth is often transferred from a maternal uncle to a sororal nephew (Fortunato 2012). Other criteria that affect inheritance are the age, gender or status of the inheritor (Fortunato 2012). For instance, wealth can be transmitted to the eldest offspring (e.g. English and Portuguese nobility), a practice known as primogeniture, or the youngest (e.g. Krummhörn of Finland) known as ultimogeniture (Barrett, Dunbar & Lycett 2002; Hrdy & Judge 1993).

A vast literature attempts to explain this variation in social organisation and patterns of succession in humans. Human males make a much lower investment in sperm compared to the investment that human females make in egg cells. Internal gestation and lactation further increase the cost of reproduction for females and the difference in reproductive costs for males and females. It is therefore relatively simple to understand the prevalence of polygynous marriage which reflects the typical pattern of polygynous breeding seen in most other mammal species where males invest more in mating multiple females and females invest more in offspring (Fortunato & Archetti, 2010) in order to maximise their fitness.

It is more difficult to explain the prevalence of monogamous marriage, especially given that it may significantly constrain the number of offspring that males are able to

produce. Fortunato and Archetti (2010) suggest that monogamous marriage may have evolved as a mechanism of ‘monogamous transfer’ of resources as opposed to a monogamous mating system. Their argument is as follows. In humans, inherited wealth is often a major determinant of reproductive success. While males may increase the number of their offspring by mating with multiple females, whether those offspring survive and reproduce in turn will depend to a great extent on their access to wealth. Females aim to maximise the amount of wealth available to their offspring and in societies where wealth is controlled by males, females benefit from male investment in their offspring. Thus, in polygynous societies the wealth of a man is often divided equally between his offspring from different wives. However, division can often deplete the value of a resource. For instance, certain kinds of wealth (e.g. cattle) are renewable and therefore useful to an offspring even if it inherits only a small proportion of it. In contrast, other types of wealth (e.g. land) are not renewable and may become unviable as a means of sustenance if divided into very small fractions. In the latter scenario, it may make sense to channel wealth to a limited number of offspring and thereby ensure their survival and reproduction.

But males should only invest in offspring when they are certain that they are the biological fathers. If they are very uncertain about the paternity of an offspring then they may be better off investing in their sisters’ offspring since they can be certain that they share genes with the sister and her offspring (see Fortunato 2012 for a more detailed analysis of the origins of such matrilineal inheritance). At the same time, females benefit from only granting paternity to males who are likely to invest in their offspring. Fortunato and Archetti (2010) demonstrate via a game-theoretic model that this trade-off between resource investment (Section 2.2.1) and paternity (Section

2.2.2) combined with the divisibility of the resource can lead to the evolution of monogamous marriage. They demonstrate that monogamous marriage can evolve if (i) the fitness value of wealth is depleted by division and (ii) if females grant males paternity certainty in exchange for investment in their offspring. Their findings are qualitatively supported by historical and ethnographic evidence suggesting that polygyny is more prevalent in pastoralist societies while the emergence of monogamous marriage in Eurasia accompanies the emergence of intensive agriculture which made land a limiting resource. It is notable that these monogamous societies have strong norms enforcing sexual fidelity that promote high paternity certainty (Fortunato & Archetti, 2010) and include some extreme methods of ensuring female fidelity such as the chastity belt. Fortunato (2012) extends her work on monogamous marriage to predict the conditions under which matrilineal inheritance may evolve.

Patterns of succession in humans but also other species may reflect mechanisms that have evolved to best direct resources towards increasing an individual's inclusive fitness in different ecologies.

### **3. Hamlet and Gertrude**

#### ***3.1 The conflict***

Hamlet is deeply aggrieved by his mother Gertrude's marriage to his Uncle Claudius within months of his father's death. Depending upon their age, gender and life-stage, members of the audience may well sympathise with either Hamlet or Gertrude in this

scenario. On the one hand, most people can sympathise with the loneliness that follows losing one's partner and the desire to find another companion. Audiences may vary in the degree to which they condemn Gertrude for having married her late husband's brother as opposed to an unrelated man (a factor that weighs heavy on Hamlet), but many would unquestioningly accept her decision to remarry. On the other hand, it is instinctively distressing for a person to imagine their father being replaced by another man. Individuals from societies across the world resist the remarriage of a widowed parent. To understand this conflict between Hamlet and Gertrude, the question we must ask is – why do people resist the remarriage of a parent? In the next section I address this question from an evolutionary perspective.

### ***3.2 Parent –offspring conflict***

Recall that living organisms should have evolved to produce as many offspring that they can while ensuring that these offspring in turn survive and reproduce. Thus, the interests of a parent and its offspring are aligned to the extent that it is beneficial for both if the offspring survives and reproduces in turn. However, a parent aims to maximise its reproductive success and therefore may wish to divide available resources and other forms of investment among its offspring. Similarly, the offspring aims to maximise its reproductive success and the more resources and investment it receives from the parent, the better are its chances of doing so. This creates a conflict of interests between parent and offspring where the optimum per capita investment that a parent should make may be lower than the per capita investment that an offspring would benefit from (Trivers 1974). Moreover, a step-parent who is genetically unrelated to the step-offspring has no interest in investing in it as this

brings no fitness benefits. A large body of work demonstrates that the incidence of child homicide and abuse is much higher in families with step-parents (Daly & Wilson, 1988a, 1988b, 2005, 1996)

Furthermore, since each offspring benefits from channelling the parents' investment towards it, this creates competition between siblings (Trivers 1974). Sibling competition is partly mitigated by the fact that siblings share a component of their genes and therefore gain indirect fitness via each other. Therefore, the intensity of sibling competition increases as the degree of relatedness between siblings decreases. Full siblings gain higher indirect fitness via each other than half siblings and are therefore likely to compete for parental resources to a lesser degree. A substantial empirical literature demonstrates the effects of sibling competition in humans for a number of domains including individuals' height, school performance and land inheritance (Lawson & Mace 2011; Pollet & Hoben 2011; Gibson & Gurmu 2011).

Hence, children resist the remarriage of a parent as this can divert resources away from them to other less related half-siblings and increase their chances of being exploited by a step-parent. It is noteworthy that Hamlet's step-father is also his Uncle meaning that Hamlet would be more related to Gertrude and Claudius' offspring than if Gertrude had married an unrelated man. He would therefore gain more indirect fitness from any investments made in such step-siblings and should be less resistant to their succession than if Claudius had not been his kin.

#### **4. Conclusion**

In evolutionary and economic game theory, a Nash equilibrium is defined as an outcome where each of a set of individuals involved in a co-dependent interaction has taken the best decision that s/he can, given the decisions of the others. In other words, it is an outcome where no individual can benefit from changing their decision as long as the other individuals in the set keep their decisions unchanged. In light of the evolutionary analyses presented above, I now suggest that the actions of Hamlet, Claudius and Gertrude, the three central characters of the play, may be in Nash equilibrium.

Let us first consider Claudius, the character who precipitated the events in the play. Claudius could never have become King while his brother King Hamlet was alive and the likelihood of him succeeding his brother would only diminish as they grew older. We can assume that he had no wife or progeny and one reason may be the absence of a substantial enough inheritance. Historical accounts suggest that in societies practicing primogeniture younger brothers, especially of the nobility, often struggled to acquire wealth and wives and were condemned to wage wars in distant lands or join monasteries (Barrett, Dunbar, & Lycett 2002). Once Claudius took the decision to murder his brother it made sense for him to marry the queen in order to gain a wife in hope for an heir, while consolidating his power. This way he could stay in the queen's good books and exert influence via her on the most likely contender to his crown, Hamlet, whom he later tried to assassinate. Thus, in one fell swoop he acquired wealth, power, a wife and the hope of an heir and cleared the path for his direct descendants to succeed him.

Given that her husband, the king, had suddenly died, Gertrude was also in danger of losing her crown and possibly her son's inheritance. Hence, by marrying Claudius not only did she secure her station as queen of Denmark but also acquired the ear of the new king and a chance to protect her son and his inheritance. In the unfortunate event that she should lose her son or that Claudius should refuse to leave the crown to Hamlet, she also created the possibility of having children with Claudius so that one way or another she could ensure that the crown of Denmark and its associated wealth could be inherited by her offspring.

Hamlet was still relatively young, a university student, when his father died and his Uncle usurped the crown. The death of his father made the future uncertain and he could not be sure that Claudius would deliver on his declared intent to make Hamlet the king of Denmark after his passing. Thus, Hamlet could only ensure his inheritance by removing Claudius from his path. However, murdering or vanquishing an Uncle without just cause may not sit well in the eyes of his compatriots (see Section 2.2). Establishing Claudius' guilt in the murder of the former King is an opportune solution to his problem.

Perhaps it is no coincidence that individuals in evolutionary game-theoretic models are referred to as actors. Plays may sometimes be experimental simulations without any direct consequences that clarify the logic underlying why humans behave the way they do.

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