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The AUC Undergraduate Journal of Liberal Arts and Sciences is a biannual, interdisciplinary publication showcasing outstanding undergraduate academic papers. The Journal aims to demonstrate the strength of undergraduate scholarship at AUC, to reflect the intellectual diversity of its academic programme, to encourage best research and writing practices, to facilitate collaboration between students and faculty across the curriculum, and to provide students with opportunities to gain experience in academic reviewing, editing and publishing.

FOREWORD

This volume of student writing, the second open submissions issue of the AUC Undergraduate Journal of Liberal Arts and Sciences¸ is the result of dedication and united effort. The open submissions issue is a primarily student-led endeavour, but also represents sustained collaboration throughout the year between InPrint, AUC faculty and the AUC Student Association.

Our shared goal has long been to produce an undergraduate academic journal, which we have continued to pursue despite considerable changes within InPrint since its formation around a kitchen table. With a new name and a new group of enthusiastic students on board we have found ourselves, once again, grateful for the enthusiasm and contributions of students and faculty alike.

It is thanks to all the support, contributions, and assistance we have received that we can now present a published platform for the communication of ideas, in the spirit of the liberal arts and sciences. The process involved in creating this journal has been quite an education in itself; we have discovered some of the workings of academic communication, publication, and interdisciplinary research, while trying to find a place within the AUC community for a collaborative, peer-reviewed, journal.

We hope to have found that place, and that students will continue to contribute to our board as editors, peer reviewers, and of course as authors. Out of the many excellent submissions our editorial board, comprising students and faculty, decided to publish the following nine articles based on the quality of writing and research, and the insight they provide into the liberal arts and sciences at AUC. With new ideas, and new insights into older ideas, these articles hope to broaden horizons and inspire; and we think they do.
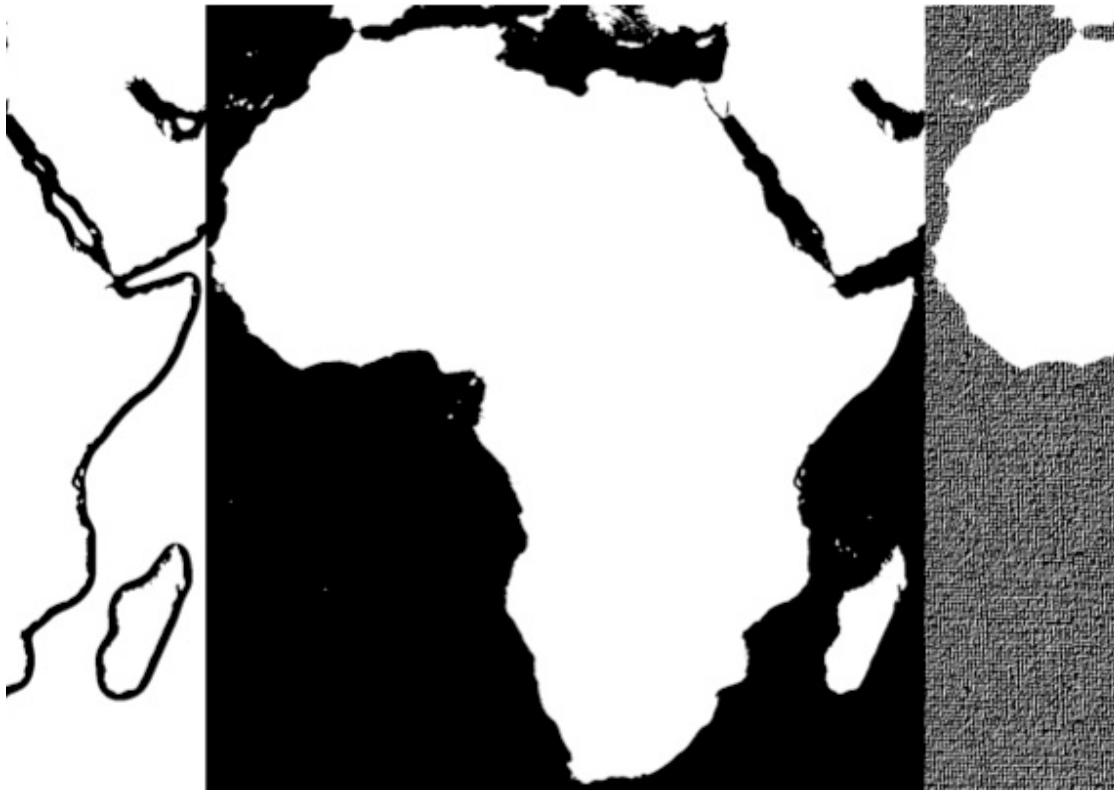
Sanna McGregor, on behalf of InPrint

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Beyond the Pride Lands: *The Lion King* seen through a postcolonial lens

Marley Hasselbach

ABSTRACT

Discussions generated by postcolonial theory have been effectively applied to a multitude of literary texts with an obvious and often intentional colonial nature. However, the same methods might also be applied to more popular cultural expressions that, though not dominated by clear colonial undertones, are laced with them nonetheless. This essay exemplifies this application through the use of *The Lion King* as a case study. Its analysis reveals that *The Lion King's* perceived innocence shields a variety of racial undertones that can be identified through the application of critical theory. Bhabha and Said's postcolonial theory is centralised in this analysis. Said's ideas about Orientalism reveal the nature and origin of certain ideas generated about groups such as the urban underclass and homosexuals. Bhabha's theories on mimicry and stereotypes help us identify stereotypical portrayals of these groups and reveal the internal contradictions that accompany them. Ultimately, a postcolonial analysis suggests that the narrative climax in itself satisfies a dubious colonial morality. The case study of *The Lion King* suggests that applying postcolonial theory to popular cultural expressions is a rewarding process which serves worthy academic and moral purposes.

When *The Lion King* was released in theatres, it quickly became the highest grossing animated film of all time (Hooton, The Independent). This was due not only to its immense popularity among children, but also to the adult component of its audiences, which can be explained by the fact that the film contains many sub textual elements that appeal to adults, and grab the attention of an intellectual and/or mature audience. Thematically and artistically, its narrative has even been compared to works such as Shakespeare's Hamlet (Gavin, 55). On the surface, the film is an entertaining coming-of-age story about a young lion princeling who has to deal with the loss of his father and rise to power to restore peace to a warmly colourful version of sub-Saharan Africa. However, a critical analysis could reveal that the film is not, in fact, about animals, or even about Africa. Rather, it is a story about how a white upper class conquers an underclass of cultural minorities, and why this is, in the end, morally justifiable. This essay will provide a reading of *The Lion King* through the lens of postcolonial criticism, in order to reveal and analyse some of its underlying themes and messages. The use of postcolonial theory to evaluate popular culture and deepen our understanding of it has received some previous recognition. The focus here will be on the work of two leading postcolonial theorists, Bhabha and Said, as their theories are most obviously applicable to *The Lion King* and its colonial context.

First, Said's theories of Orientalism will be applied to the film and some of the characters it portrays, after which Bhabha's concepts of stereotyping and mimicry will be connected to the movie. The aim of this essay is twofold: to deepen understanding of *The Lion King* as a text and to assess the usefulness of certain postcolonial theories in analyzing cultural expressions. Using *The Lion King* as a case study, it will be demonstrated that postcolonial theory can be of essential use in unveiling the discourses that may underlie popular cultural texts.

WHAT THE LIGHT DOES NOT TOUCH: ORIENTALISM AND *THE LION KING*

The colonial and political context of *The Lion King* is established in the very first scene, where we witness (almost) the entire animal population paying tribute to the royal family and their newborn son, Simba. The sovereignty of this small upper class of lions is never questioned within the realm that they rule over, which, as king Mufasa solemnly explains to his young son later in the movie, consists of "everything the light touches" (Walt Disney Studios, *The Lion King*). The only two locations outside of this utopian realm are the jungle Timon and Pumba inhabit, and the elephant graveyard occupied by the hyenas and Scar. Both these places, and their inhabitants, display different versions of the Orient as viewed by the hegemonic West, and provide intriguing, seductive, but ultimately unappealing alternatives to the monarchic pride lands.

The first of these realms we are introduced to is the elephant graveyard. Simba's interest in this place is typical of the naïve interest that, in Said's view, Westerners often have in the unknown orient: a natural curiosity for something that is forbidden, dark, and seductive (1870). Because of the way it is mediated to Simba and the audience by the dominant part of the population, the elephant graveyard is firmly established as an uncivilized place of nature before we even see it. Its mediation is similar to the way that Said argues the Orient is mediated (Parker, 278). When at last we see the graveyard for ourselves as Nala and Simba enter, its primitive, dangerous, and dark nature is immediately reinforced by its visual representation as a dark, gloomy locale that forms a stark contrast to the colourful Pride Lands. Whereas everything we have seen of *The Lion King's* Africa radiates vitality and cheerfulness, this is a place of death and desolation. The dismal nature of the graveyard is especially highlighted upon encountering its inhabitants: three hyenas, two of which are ethnic stereotypes while the third suffers from some form of mental disability. They fit into orientalist discourse perfectly: they are dishonest, ruled by emotion, cruel, primitive, and irrational, all characteristics that are typically attributed to the East (Parker, 278). These three hyenas act as a gang, assaulting everyone that ventures into their 'territory'.

This invites comparison not only with a seductive though ultimately unappealing Orient, but also between the elephant graveyard and an urban ghetto, turning Nala and Simba into the naïve, affluent white children who foolishly venture into a part of the city no affluent white citizens should venture, and where they only barely manage to escape a pack of bloodthirsty cultural minorities. The commonality between the Orient and the urban ghetto is of crucial importance, and arises from the fact that both are primarily inhabited by non-whites or minority groups: individuals Said would refer to as part of the 'other' (Said, 757). The Orientalist discourse created here does not concern the East, as it did in Said's paradigm, but instead constructs the urban under class as primitive, cruel, irrational and dishonest (Parker, 758).

This makes sense when looking at the agents that produced *The Lion King* in the same way Said analysed Orientalism by highlighting the fact that a hegemonic class of Westerners is responsible for constructing the image of the Orient (Said, 1869). From this perspective, *The Lion King* is the cultural expression of Walt Disney Studios: a powerful, conservative, imperialist, company, based in the highly socially polarized urban environment of Los Angeles. The film can be seen to reflect the anxieties that the white West feels regarding the urban underclass and the dangers it presents (Said, 1870) to their privileged lifestyle, creating a discourse that serves both as an expression of these anxieties and as a warning. This is a discourse that, much like the Saidian discourse surrounding the Orient, is based on a power relationship (1870), with the lions dominating the other animals like the West has traditionally dominated the East and the urban upper class dominates the underclass (Said, 1870). When this very underclass rebels under the leadership of Scar, an estranged member of the dominant upper class who 'went native' in order to become king, the situation immediately becomes despotic, with huge masses of identical hyenas marching off to war and happily chanting "It's great that we'll soon be connected with a king who'll be all-time adored" (Tim Rice, Be Prepared). What is showcased here is another mediated characteristic of the East experienced as particularly fear-inducing by westernerse: despotism and a lack of individuality (Parker, 278).

A wholly different perspective on the Orient is presented when Simba flees the pride lands, out of shame for a crime he did not commit. He reaches another area outside of the dominant influence of the lions: the jungle where Timon and Pumba live their hakuna matata lives. Different, though equally typical, attributes of orientalist discourse can be identified here: this lush green paradise and its lazy inhabitants are exotic, seductive, and ruled by emotion. (Parker, 278). Timon and Pumba's exotic, carefree lifestyles as well as the racial stereotyping that accompanies them become even more apparent in localized versions such as the Dutch translation of *The Lion King*, in which they speak with a Flemish accent as opposed to the Dutch dialect used by all other characters in the film.

The discourse that is mediated here displays a different but just as typical image of the East as a place of utter decadence, where one can live a lazy, sensual life and be guided by emotions and primitive urges rather than rationality. This jungle corresponds with everything typically associated with what is perhaps the more positive Western image of the orient, the image of a place of exotic delights and lazy escapism (Said, 1871). Ultimately, however, this form of the Orient, although perhaps more positive than the one represented in the elephant graveyard, also proves inferior to its Western counterpart. In the end, life in the orientalist jungle starts feeling meaningless to Simba, leading to his climactic return to the Pride Lands and confirming Said's hypothesis that, from a Western perspective, life in the occident is always seen as superior to life in the orient (Parker, 280).

Summarizing, two of the locales and their inhabitants create typically orientalist discourses: the elephant graveyard and the jungle Simba retreats to. In the case of the jungle, this discourse shows the typical exotic eastern or southern retreat for the white upperclass man. In the case of the elephant graveyard, the discourse reflects white anxieties about an urban underclass. The fact that Said's theories can be applied not only to the East as he sees it, but also to the way cultural minorities are portrayed, speaks for their usefulness (Said, 1872). Thus, discourses based on orientalism can also dominate the portrayal of internal minorities such as queers and racial minorities, and Said's principles can help us understand and recognize such discourses.

THE HYENAS ARE US: STEREOTYPES WITHIN *THE LION KING*

According to Bhabha, stereotypes are more complexly constructed than is often believed (Parker, 282). Rather than false, oversimplified, images that are either positive or negative in their nature, stereotypes are projections of fears, felt by the stereotyping culture, on an identifiable "other" (283). Bhabha's arguments on stereotyping provide interesting insights into several sub textual elements of *the Lion King*, particularly the problematic, and memorable, antagonist figure provided by Scar. Scar's position as a despicable other is established by his very appearance: his colouring is darker and his mane is black, as opposed to all the other lions. The association of dark colouring with evil is a recurring pattern in many forms of cultural expression, as well as a reference to colonial discourse regarding the white Occident and the coloured Orient (Said, 1872). Although Scar is part of the dominant class he is also a stranger amongst them, and this estrangement is further accentuated by his suggested queerness, which is never explicitly stated but instead gradually established through a different accent, mannerisms, and textual hints; he even has a distinctly slimmer and more feminine build than Mufasa and the adult Simba. Examples of stereotypically queer behaviour include his tendency to use feminine hand gestures and suggestive quotes such as replying "You have no idea." to Simba's telling him he is "weird" (Walt Disney Studios, *The Lion King*). Based on these characteristics and Bhabha's view on stereotypes, it can be concluded that Scar, as a queer and 'coloured' character, is a projection of characteristics that the white, heterosexual, and patriarchal stereotyping group fears itself to possess: cowardice, cruelty, feminine characteristics and lust for power (Parker, 283). From a critical perspective, Bhabha's theory on stereotypes is useful in a wide array of cases, since it reveals not only the inherent ambivalence of stereotypes, which stem from the self-reflective fear which accompanies them, but also the hidden truths about the stereotyping group and its motives. Bhabha's account of mimicry and its use in colonial discourse also invites application here, with mimicry defined as a form of colonial behaviour that attempts to copy the dominant colonizing party (Parker, 283).

The subtext of *The Lion King* becomes even more complex and intriguing when Scar teams up with

the hyenas, who, as we have established, represent stereotypical members of an urban underclass that in this case genuinely lives off the scraps their 'betters' decide to leave them. Using post-colonial theory, this narrative turn of events can be interpreted in different ways. It can be seen as an attempt by Scar to mimic his dominant brother's heteronormative monarchy, a type of mimicry similar to the mimicry performed by colonized individuals (Parker, 283), which ultimately leads to the ruin and visible decay of the landscape, mocking homosexuals' lack of reproductive capabilities. Alternatively, it can be interpreted as the expression of a deep, white, heterosexual, capitalist fear of (urban) minorities uniting and overthrowing the dominant class in a fury of despotism, in the same way that stereotypes can be laid out as representations of inherent fears (Parker, 282). Lastly, Scar's coup establishes a hierarchy within minorities: members of the racially diverse underclass willingly uniting under the rule of an estranged, potentially queer, member of the upperclass, confirming the rule that those close to the dominant class are naturally superior to those further from it.

The uniting of these distinctly hostile minority groups and the fears it articulates relate to an observable and well-established social phenomenon defined as the minority group threat hypothesis. This hypothesis describes how white individuals living in an urban environment have internalised an inherent fear of minority groups uniting, and reason that an increase in minority representation leads to a higher crime rate (Kane et al., 959). Though this reasoning has been shown to contain some degree of truth in some cases, such as the concentration of Latino's in urban areas, with other groups and in other areas it has been exposed as a fallacy (Kane et al., 957).

On a concluding note, *The Lion King* is a complexly constructed film with a layer of meanings that can be discovered through the use of postcolonial criticism. The fact that postcolonial theories can be fruitfully applied even to a supposedly 'innocent' case study such as *The Lion King* highlights their value and usefulness for a wide range of media, including media that are not obviously influenced by colonial discourse. Said's theories are evidently the most useful in this case, allowing us to draw conclusions about the underlying medium of cultural expressions by looking at the group that produces them (Parker, 278). In

the analysis of stereotypes and the deeper meaning that can be found through them, Bhabha's view on stereotypes is extremely revealing and helpful.

The value of postcolonial theory in analysing popular discourses is evidenced by the ways in which Said and Bhabha's theories allow us not only to expose the deeply colonial nature of *The Lion King*, but also to deepen comprehension of this colonialism and reveal a potential source, in this case anxieties experienced by a Caucasian urban upper-class. Messages that might not be consciously observed by most viewers but are evidently mediated in *The Lion King,* such as the warning against uniting minority groups and the importance of not venturing into territories controlled by such groups, demand interpretation and exposure. In achieving this, post-colonial critical tools such as those employed in this analysis of *The Lion King* are of essential value and importance. The choice between theories is primarily a methodological one, although as seen is this case study, different theoretical approaches allow us to reveal a variety of central political motives and contexts. As showcased through this analysis, it can be fruitful to apply critical thinking even to cultural expressions as innocuous as *The Lion King*, and considering the popularity and the widespread exposure of our youth to such expressions, doing so might also be of moral importance.

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Comparing the Role of the Teacher: Platonism and Confucianism

Paul Verhagen

ABSTRACT

Platonic philosophy has arguably shaped modern Western thought; most philosophers can trace their own works back to Plato's. Both in terms of societal and intellectual development in the West, it is crucial to consider Plato's influence. This development can be seen in Chinese history as well, where Confucianism fulfills a similar role within Chinese and Asian culture in general. While Confucianism and Platonism have been of similar importance, there are important differences between them. In this essay I will attempt to show these differences and illustrate how the superficial similarities can be re-analyzed in terms of a subtle difference in approach, with the former being focused on the collective and the latter on the individual. This article is a first step towards a deeper and more comprehensive understanding of both Confucianism as well as Platonism by way of comparative philosophy; I will specifically analyze the more general issue of the education of the leader and its importance in shaping a society.

INTRODUCTION

The education of the soul is an often discussed topic in philosophy, as is evident from both the *Republic* by Plato, as well as from the Confucian classics such as *Mencius* and the *Analects*. Both the Platonic and Confucian tradition have written extensively on the best way of educating philosophers, in particular describing how a nation should be ruled and how it's leader should be educated. The problem of how to choose a leader is strongly intertwined with the journey from the uneducated towards enlightenment in both philosophies. Ultimately both Plato and Confucius attempt to describe some sort of virtue ethics through their works, and they both draw a similar conclusion, namely that the philosopher should rule the nation, for only he is sufficiently equipped to deal with such a task. Despite this convergence in conclusions, there are several subtle differences between the two traditions. This paper will attempt to analyze how the role of the teacher and the purpose of teaching are described in both Platonic and Confucian philosophy. In order to do so I will first analyze some key aspects of both philosophies on teaching, using both the *Republic* as well as the *Analects*, and subsequently compare the two. Finally I will argue that the difference between Confucian and Platonic notions on teaching can be interpreted as the 'classic' struggle between the collective and the atomized individual.

Teachers have played an instrumental role throughout history; many of the great philosophers strove to educate, and leaders of nations sought to have them as their advisors and tutors. Many of the emperors of China had tutelage from Confucian masters, just as Aristotle famously tutored Alexander the Great. These teachers were often highly influential, and have arguably changed the course of history. The teacher-student relationship is thus of profound importance, yet the teacher has a distinctly different role when compared. Integral in this is the relationship between the teacher and the learner, as the teacher is the conduit through which knowledge can be achieved, and thus all teaching is biased by the way the teacher positions himself in regard to his student. While Confucian studies have been considered somewhat of an academic backwater in the wake of the Cultural Revolution, attempts have been made by the Communist Party of China to reincorporate Confucianism into Chinese culture since 1990. This development has reinvigorated academic interest in Confucianism and subsequently bolstered the field of

comparative philosophy, particularly between Chinese and Western philosophies (Deluty & Schell, 2013).

PLATONIC TRADITION

Plato's notion of the uneducated man is one of woeful ignorance, of being enslaved to the world that he sees, and having no comprehension of 'the true state of things' (Republic, 514a). The famous Allegory of the Cave illustrates his ideas; the uneducated man is slave to the senses, being unable to release himself from the way the world appears to him, thinking every shadow is the realest thing he will ever witness. All men are born into this ignorance and only through education can one be freed from the natural state of things and achieve the ideal state of true knowledge. The ultimate goal is to 'turn the soul to the light', and thus to ascend from the darkness of the cave into the light of comprehension (Republic, 525d). The purpose of Platonic education is intrinsically linked with the notion of truth, as the natural state of man is a falsehood to be revealed. Plato's education is therefore one of truth, and a philosopher should strive to ascertain the true nature of things, which in Platonic metaphysics is the Idea of the Good. This by nature also makes Platonic education an idealistically polarised endeavor, as it categorizes knowledge as either being true or false (Republic, 508c-509a).

The method of turning the soul to the light, as Plato describes it, is of particular interest; in the Allegory, the freed prisoner is dragged, seemingly against his will, from the cave and into the light. Once he has acclimatized to the sun and is no longer blinded, he realizes the depth of his ignorance, having thought for his entire existence that the shadows on the wall were the true state of things. Armed with his newly acquired knowledge and insight, he heads back down into the cave to illuminate his fellow prisoners, only to be ridiculed (Republic, 515e). The remaining prisoners kill him for his world view, which is now incompatible with that of the unenlightened. Plato argues that enlightenment cannot be done abruptly and that the subject might (initially) not even want to be released from his ignorance. The process of becoming enlightened is not without its perils, and Plato also insinuates that it is not a painless process, as it requires the rejection of 'accepted' truth.

The role of the teacher is to facilitate this

enlightenment, a responsibility that has three distinct steps. This first responsibility is to descend to the level of the student, to understand the level of the student and recognize the depth of his ignorance. By taking pity on those that have not yet been enlightened, the teacher can motivate himself to help raise the student from darkness (Republic, 518e). This immediately presupposes a one sided relationship. As the only person who gains from the teaching is the student. The teacher himself will not gain anything from training the student, besides raising another person from ignorance and thus creating a more perfect society. In other words the relationship between teacher and student is not a symbiotic one: only one party stands to gain directly, whereas the other only gains indirectly.

Secondly, the teacher decides the direction of the inquisitive journey; that is, the teacher will guide the student in the appropriate direction, rather than teach the student the ability or power to 'see' the truth. It is a misconception that the teacher is helping the student acquire a skill. Plato believes that the human soul already has the potential to understand, and simply needs to be pointed in the right direction. An example of this is the passage where Socrates teaches a young boy the principles of geometry from simply questioning him. Thus Socrates has not so much taught the boy the art of geometry, as much guided the boy to a conclusion of his own, from which the boy extrapolates the principles of geometry (Meno, 84c-85d). This type of teaching shows a strong focus on the individual's ability to recognize how profound the master's questions can be. It is also arguably a mechanical form of teaching, as it could be considered a 'brute force' approach. The master points the way for the student to follow, and this eventually leads to the student obtaining deeper knowledge.

The third responsibility the teacher has is to ensure that the student does not skip steps on the path towards enlightenment. As is evident from the Allegory, the consequences of imparting knowledge onto a subject that is 'not ready' can have such disastrous consequences it is to be avoided at all costs. Socrates also has the tendency to gravitate towards subjects without giving a conclusive answer to questions posed by the student (Meno, 71d). This willingness to discuss the topic, yet simultaneous

desire to take a tentative position, can be read as an indication that Socrates considers the subject unprepared for the answers to his questions. In addition, the highly hierarchical structure of Platonic metaphysics demands that the students obtain fixed levels of abstraction in a certain order. This not only improves comprehension, but also facilitates the next level of philosophy and thus provides the only viable way of reaching the final goal of enlightenment (Shim, 2008). The teacher's function, to ensure that the student takes the right steps, thus originates from both the necessity to protect the student from his own ambition as well as ensuring the efficacy of Plato's teachings. However the Republic leaves little room for adaptation according to the needs of the student. The (lengthy) timescale set for educating the leader is fixed and precise, and it is assumed that the student will gain the necessary insight within each time frame posed. While Plato would most likely dismiss those that fail to achieve knowledge within the timeframe as being inferior, it is worth noting that there is little, if any, flexibility within the path to enlightenment.

CONFUCIAN TRADITION

Confucianism is often associated with humanism, and has traditionally been described as a philosophy of morality. Human nature, according to Confucianism, is innately moral and the purpose of education is to develop the inherent morality of man into moral behavior. Of immense importance to Confucian education is the interaction of the philosopher with others. Many of the virtues proposed by Confucianism describe relationships between men, and Confucianism can accordingly be interpreted as an ethics.

Because of the interrelated focus of Confucianism the role of the teacher is of a symbiotic nature, as both the teacher and the student stand to gain from the process of teaching and learning; these two activities are inherently linked and form a purpose in itself. This can be seen in many passages in the *Analects* such as: *Is it not pleasant to learn with a constant perseverance and application*? 學而時習之，不亦口乎 (Analects 1.1). Teaching is considered to be a form of self-cultivation, and, according to Confucius, it is a joyous life to spend one's days teaching. It is further argued that the act of teaching furthers the teacher's knowledge, as it requires the organization and logical order of knowledge to be transmitted into the student. This, in

turn, leads to greater understanding of the material being taught, and thus serves both the teacher as well as the student. Teaching is also a form of relationship, and the practicing of such things is directly related to the practicing of virtues. The purpose of teaching then, is twofold; it constitutes both an opportunity for self-cultivation as well as the practicing of morals and, by extension, virtue. The role of the teacher is one that leads to knowledge as well being a step on the path to the ever elusive Junzi, often translated as 'the Gentleman' although this term is somewhat controversial and will be further examined below (君子) (Analects 2.13).

As mentioned before, the role of teacher towards others is crucial in Confucian learning. In order to analyze this interaction, it is useful to consider the relationship of the teacher to three different agents: the student, the teacher himself, and society as a whole.

The way the teacher interacts with the students is hierarchical. In fact the relationship between the two is an application of the highly patriarchal hierarchy of Confucianism. Filial piety is an important concept in this, where both parties in a hierarchical relation must know their place, such as the father ruling over his son and the king ruling over his ministers (Ruiping, 2002). Confucianism describes the teacher-student relationship as a father-son relationship, where the father and teacher are undoubtedly higher than the son or student. While this might initially seem incompatible with the idea of a symbiotic relationship, the application of filial piety allows for a somewhat unexpected turn. While the teacher is superior to the student it not unacceptable for the student to question the teacher, because it is the duty of both parties to ensure that filial piety is conserved. If the teacher is inadequate in explaining a concept it is the student's duty to ensure that the teacher be made aware of his shortcomings by challenging the appropriate view. This is comparable to a domestic conflict, in which the question arises whether or not it is acceptable for a son to run away from his enraged and unjust father. To accept a beating out of blind obedience would mean that the son allows his father to lose virtue. It is thus mandated by filial piety that the son runs away from his father, to prevent him from committing an immoral

act. The exercising of filial piety through running away supersedes the act of being blindly obedient to one's father (Bai, 2010). It is therefore acceptable to question a teacher if doing so is an application of filial piety. In addition to the argument of filial piety, it could be argued that it is fruitful to debate ideas held to be true with those that hold a different view, as it might lead to insights that had not been considered yet. All in all ,the role the teacher, and student, plays is ultimately one that they play together, both seeking to practice their morality and virtues accordingly.

The (Western) misconception that all philosophers search for knowledge is one that could cause some confusion when considering the role the Confucian teacher has to himself. While it is true that the teacher seeks knowledge, the ultimate goal is not to achieve knowledge, but rather to build character. This is evident from the famous citation: "At fifteen, I had my mind bent on learning. At thirty, I stood firm. At forty, I had no doubts. At fifty, I knew the decrees of Heaven. At sixty, my ear was an obedient organ for the reception of truth. At seventy, I could follow what my heart desired, without transgressing what was right." 吾十有五而志于學，三十而立，四十而不惑，五十而知天命，六十而耳順，七十而從心所欲，不踰矩。(Analects 2.4). Once again this passage should be read in relation to others; while the last sentence might seem highly hedonistic ('I could follow what my heart desired, without transgressing what was right'), it implies that Confucius is so aware of his relationship to other men that he never breaches morality in the pursuit of personal desires. This concept is referred to as the aforementioned Junzi 君子, originally (and arguably incorrectly) translated as 'Gentleman' by James Legge. In contemporary versions it is often translated as 'the superior man', and while this term more accurately describes the concept, Legge's original translation does capture some of the intent behind becoming a Junzi. An important aspect is knowing one's relationship to others, and being considerate of others, never acting so as to infringe upon another's life. The concept of Junzi thus describes a state in which the moral virtues have been so well practiced that they have become second nature, and the Junzi will inherently act morally.

Finally, the role of the Junzi to society is akin to that of a role model. The Junzi, having mastered the moral virtues, are effectively an avatar for correct civil behavior. Masters of the Confucian tradition were often selected to become either teachers for high ranking officials, such as the emperor, or became administrators themselves. Mastery of the Confucian classics was associated with the capacity to rule, as a true master would also be a Junzi, and accordingly be able to understand how to rule a nation in a morally virtuous way. Several institutions were created to facilitate the selection of Junzi, such as the Imperial Examination, which, despite waxing and waning over time, was utilized to find scholars who were morally virtuous and thus fit to rule. Considering the prestige and esteem an administrative position brought to a family, mastery of the Confucian tradition was considered to be highly desirable. Competition between participants in the Imperial Examination was often fierce and led many to find highly creative ways of cheating in order to gain the positions promised to successful applicants (Yao, 2000). While the act of cheating is incompatible to the notion of Junzi, someone who became a Junzi undeniably held a position which was both admired and envied, even if the reasons for it being desirable corrupted some of its philosophical purposes. Nonetheless, the role of the teacher was, and to some degree still is, highly respected in Chinese society.

COMPARISON

There are several key similarities that merit attention. Firstly, both traditions dedicate several chapters to describing how the uneducated can be educated. Both agree that the only suitable leader for a nation is the philosopher, and that the leader should go through extensive training before being able to obtain such a position. Both methods also believe in man's potential to learn, and free himself of his ignorance, thus obtaining what is described as a virtuous life. In addition, there are distinct similarities in the role that the teacher plays in the educating process. Both are expected to act as a mentor to their students and guide the student according to the student's needs. Secondly both agree that the way of the philosopher is the only way to becoming virtuous, and go to great lengths to describe why not being virtuous is undesirable. Yet the purpose of becoming virtuous and the societal position that the virtuous man holds is different. Platonic philosophy is driven by the desire to know what is true; much of the education of the leader is dedicated towards the abstraction of thinking that would allow a ruler to apply these concepts to the government of a nation. In order to achieve this, the soul must be turned towards the light, learn to break the chains of perception, and ascend to a purer, more rational, realm where the ultimate idea of the good resides. In contrast Confucian tradition is not driven by epistemology but rather by ethics; whereas Platonic tradition deals with the question of whether or not something is true, this question is of lesser significance to a Confucian. Rather than uncovering the falsities of the world, the Confucian is dedicated to understanding how to act towards others.

The ultimate difference between the two traditions can be interpreted as the classic struggle of the atomized individual on the one hand, and the collective interaction on the other. Many of the subtle differences in mindset between the Platonist and the Confucian can be reduced to this fundamental problem. An example of this is the position the teacher holds, the Platonic teacher is focused on turning the student's soul towards the light, gaining little for himself in the process. Conversely, the Confucian teacher is both teaching and learning at the same time, and the relationship with his student is much more interactive as both stand to gain from it. Furthermore, teaching the leader is depicted as a duty rather than a pleasure in the Platonic tradition; the teacher will teach physical exercises for a fixed number of years, followed by statecraft and astronomy and so forth. There is no obvious indication that the Platonic teacher ever enjoys teaching his pupil, and it is suggested that it is simply a task that is to be done. Again the contrast with Confucianism is stark, because the Confucian claims that there is no greater joy than that of teaching, and, by implication, learning. Ultimately the goal of both traditions is markedly different. The Platonist desires to turn his soul to the light and obtain the nature of the truth, seemingly without regard for his place in the world. The Confucian wants to know his place in the world as it relates to others. The final avatars of the two paths show this in some form: the lone philosopher-king ruling a nation on the one hand, and the gentlemanly Jinzu on the other.

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Louis XIV's France and the Start of Haute Cuisine

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ABSTRACT

The reign of Louis XIV was a foundational stage in the development of what is now known as French haute cuisine. This paper traces the evolution of the cuisine of the French upper classes from the elaborate but coarse banquets of medieval lords to the exquisite creations of famous royal chefs. It also explores how this development was rooted in changes in the cultural, political, economic, and social climate of upper-class France, which peaked during the reign of Louis XIV. A major trend that emerges is the decline of the position of the nobility in all fields except that of social prestige, which was exacerbated by Louis XIV's successful strategy of domesticating the potentially dangerous high nobility. As a result, nobles began to increasingly rely on conspicuous consumption as a status symbol in order to assert their dominant social position, and consuming exclusive, high-quality food was a part of this. This demand for refinement, combined with the trends towards rationalization and innovation that were dominant at Louis XIV's court, created a climate in which top chefs could develop a range of new recipes that were based on skill and high-quality ingredients as distinguishing factors: haute cuisine was born.

In present times, sophisticated, high-class gastronomy has come to be associated primarily with French *haute cuisine.* It therefore seems fitting that this particular style of cooking originated in a social setting that may be unparalleled in its extreme sensitivity to class distinction: the French aristocracy under Louis XIV. This paper will examine how elite French cuisine changed drastically during his reign as a result of societal changes that strongly affected the position of the nobility. In order to frame this development in its historical context, the paper will start with a brief outline of both the culinary and larger cultural situation in France during the centuries before Louis XIV. Following this, an analysis of historical developments leading up to, and during, Louis XIV's reign will show how strategies employed by the Sun King combined with existing societal factors to create a political, social, and cultural, climate that shaped the beginnings of the *haute cuisine* we know today.

CULTURE AND CUISINE BEFORE THE 17TH CENTURY

For many people, the notion of the medieval banquet evokes associations with plain, rustic, food in large amounts and, especially, large quantities of meat. This image is partly correct. At a time when the majority of the population lived barely at subsistence level, the consumption of food in copious quantities was indeed a distinguishing sign of the nobility. Meat was a luxury product, and thus an important element of a banquet – there was even a certain disdain for dairy and vegetables among the upper classes (Mennel 46). The "French" cuisine of this time could also justifiably be called rustic, since most nobles lived off their own lands and cookery was not what we would call "refined" by today's standards . However, the food that these nobles ate was far from plain: in fact, due to its liberal use of spices, as well as sweet and sour ingredients, several scholars have compared the medieval cuisine to contemporary Indian cookery (Mennel 52; Wheaton 14). Unlike in

Indian cuisine, however, sauces were often based on vinegar and were so pungent that they entirely masked the flavor of the bland food they accompanied (ibid); for modern palates, this flavoring would likely be far too strong and incongruous to be enjoyable, but in the Middle Ages being generous with –expensive – spices and sugar was a sign of wealth, and was thus much appreciated (Albala 8). Furthermore, Mennel hypothesizes, French elites would have highly valued extravagant seasoning because of the associations it had with the "sophisticated Mediterranean world" (53).

Indeed, the cuisine of the French elite was strongly internationally oriented, to the point where there was actually a greater difference between the different social strata of French society than between the cuisine of French and other European elites (Mennel 40). It would thus be impossible to identify a national "French" cuisine for this period. Another reason for this is the fact that what exactly was eaten was not yet a priority; naturally, banquets were extremely important for displaying the wealth, power, and generosity of the host (Wheaton 3), but the quality of the food served did not play a primary role in this. Quantity did, as did the presence of wild game, since hunting was a distinguishing privilege of the nobility (Albala 8). But the most important aspect of these meals appears to have been their overall effect: the food formed part of the spectacle of the banquet, and just like the mealtime performances, mainly had to look spectacular (Wheaton 15).

In the sixteenth century, the medieval style of cooking continued, although Barbara Wheaton identifies three major societal changes that would affect French cookery: the first being the introduction of the printing press (27-28). In theory, this could have facilitated the publication of a large amount of cookbooks, but in reality, the number of cookbooks published in this period is surprisingly low, which can be explained by the fact that most cooks were illiterate (Wheaton 28). What did appear, though, were books written by physicians about what foods should be eaten to remain healthy, as well as books about ancient Greek and Roman eating habits (27). This triggered the second development: an increased interest in food and diet among the educated classes (28), which in turn caused a third change: eating gained a much more prominent role in court festivities

and ceremonies (27). The food that was served at these events, however, was still strongly medieval in nature (Wheaton 43), and radically different from what French cuisine had become by the end of Louis XIV's reign: distinguishably "French", a symbol of refinement throughout Europe, and simplified in terms of ingredients but demanding more technical skill. How could such a drastic change occur over the course of just one century? In order to begin to answer this question, it is necessary to examine the social, cultural, and political context in which this change occurred: the reign of Louis XIV.

THE IMPACT OF THE FRONDE
Most historians agree that the rule of Louis XIV was largely shaped by an event that occurred early in his life: *the Fronde*. This multifaceted civil war, which lasted from 1648 to 1653, took place while Louis was already king but still a child (Beik 19). The war was (at least partially) caused by discontentment with the regency of Louis' mother, the Spanish Anne of Austria, and her adviser, the Italian Cardinal Mazarin (Beik 22). The fact that the country was ruled by two foreigners, who, to make matters worse, were suspected of having a secret affair, was enough to make the regime extremely unpopular (ibid). On top of that, a wide array of other grievances such as high taxes, interference in the parliamentary system by Mazarin (ibid), and jealousy among high nobles (Beik 20), caused all layers of society to get involved in the rebellion (Sturdy 26). Although the Fronde posed a serious threat to the regime, the lack of unity among the different groups ultimately led to its failure, which strengthened the position of the king (Beik 49), especially in relation to the nobility with whom French kings had struggled for power for centuries (Elias 211). Charlie Steen argues that the poor political policy displayed by the nobility at their moment of greatest power during the Fronde greatly undermined their political credibility: by the time Louis started his personal reign in 1661, they only had significant power left in the social domain, not in government (62-63).

Louis learned two important lessons from the Fronde. The first was that ineffectual royal power could lead to great unrest: he would have to maintain strict control and unquestioned power to safeguard his position and ensure stability (Beik 22). Aided by intellectuals such as Pascal, Racine, and

La Fontaine, who propagated a pessimistic view on human nature as corrupt unless controlled by strict order and authority, he managed to construct a form of absolute monarchy in which he controlled not only politics and society, but also culture (Steen 63-64). State centralization, the institutionalization of the arts and sciences in academies, and the fabrication of a majestic image of himself, were only a few of his far-reaching policies of regulation (ibid). The second lesson the Fronde taught the king was that he must never let one group gain too much power. His task was to divide and rule, especially when it came to that most dangerous of groups: the nobility (Beik 22).

THE "DOMESTICATION" OF THE NOBILITY
Factionalism and division among Frondeurs was an important, if not defining, factor leading to the eventual collapse of the Fronde (Sturdy 31). Drawing on this wisdom Louis XIV would manipulate those who could form a potential threat to his position if they gained too much power – which primarily meant the highest nobility, or *grandees* (Elias 245). He did this by keeping all groups dependent on him, rather than each other, for status and power. What played a crucial role in his strategy was the construction of a court society, in which nobles, having lost most of the military, political, and even financial, supremacy that they had enjoyed during the heyday of feudalism, were left with just their social pre-eminence, for which they were largely dependent on the king (ibid). It would be incorrect to say that Louis XIV single-handedly created this situation. As Norbert Elias notes, the transition from the knightly feudal society of Henry IV and his predecessors to an aristocratic court society was a gradual one, and dependent on many factors (215). He mentions, for example, the influx of gold and silver from the New World in the sixteenth century, which led to an inflation that virtually destroyed the landed nobility's livelihood, since peasants by that time were often no longer serfs but paid a fixed rent, which now became virtually worthless (217). The king, on the other hand, had other means of affirming his income (e.g. taxes), which resulted in an increase of his (economic) power in relation to the nobility (218). Another significant change was that rulers began to rely less on the knightly nobility for their wars, and instead increasingly employed a professional army in which the nobility had to compete with rich merchants for high-ranking positions (Mennel 110).

This loss of military influence was a heavy blow to the nobles' position. The outcome of the Fronde, then, had delivered a third blow, this time to the nobility's political influence. Power had thus already shifted from the provincial mansion to the royal court by the time Louis began his personal rule, but, as Beik argues, he should be credited with bringing it to an extraordinary "level of perfection" (50). Through art, festivities, and rituals, he turned the court into a glamorous centre of social life, luring the nobles in, while simultaneously taking advantage of their diminished position (Steen 65). The impoverished and disempowered nobles became increasingly reliant on the king's personal favors, such as debt cancellations, pensions, and prestigious positions (Elias 282-283). By bestowing these favors on some but denying them to others, Louis XIV created a climate in which nobles were pressured to live at court or at least make regular appearances (Elias 279), to do his exact bidding, and to compete with each other for his affections (Steen 66).

Louis not only pitted high nobles against each other, but also against the rising bourgeoisie. This group turned out to be extremely useful for the king, as they were willing to offer him money and service in exchange for a noble title (Steen 66). It was this new *noblesse de robe*, that he granted most bureaucratic offices, thus keeping the old *noblesse d'épée* ("of the sword") out of government (Beik 53). At the same time, however, the *noblesse de robe* was excluded from social prominence: the *noblesse d'épée* living at Louis' court remained exclusively prestigious (Elias 255). This was important for the king for two reasons: first, it prevented the politically powerful robes from gaining too much importance; second, Louis needed the nobles to be prestigious because not only was he himself a noble, but they also formed his direct environment and primary company, and were thus his primary tool for setting himself off from the rest of society (Elias 214).

CONSUMPTION AS A STATUS SYMBOL
Social prestige became the single most important aspect of the aristocracy's lives, and closely linked to prestige was living a life of luxury and refinement (Mennel 112). In a time when behaving in an economically rational manner was associated with the urban merchant class, excessive spending became

a tool for distinguishing oneself from lower strata of society (Elias 93). It is in this context that the phrase '*noblesse oblige*' emerged: living extravagantly was an absolute necessity, indeed obligation, for those who wished to maintain their high-ranking position (94). This "conspicuous consumption", as the American sociologist Veblen called it (qtd. In Elias 93), had long been a part of the political strategies of the aristocracy, as the medieval banquets from the beginning of this paper exemplify. During the reign of Louis XIV, however, an important change in this consumption took place, which, as we shall see, would prove to be fundamental for the development of *haute cuisine*: while medieval lords had been content showing off their wealth through the sheer quantity of food they presented their guests with, the focus now came to be increasingly on *quality*. Historians have presented several explanations for this shift: Ken Albala attributes it to a change in the identity of the courtier: medieval nobles had been warriors, and ate like warriors; seventeenth-century aristocrats, on the other hand, had become 'domesticated', and exchanged their military identity for a more 'refined' and cultured image, and their eating habits changed accordingly (8). Stephen Mennel hypothesizes that, in their frenzied competition for prestige, nobles simply reached the physical limits of consumption (32): there is only so much a stomach, even a noble one, can take. They thus resorted to an increase of quality; exclusive ingredients, skillfully crafted dishes, and culinary innovation now became highly desirable (33). It should therefore not be surprising that this period saw the rise of the virtuoso cook as not only a highly valued and status-giving staff member, but also, finally, as an author of cookbooks.

THE FRENCH COOK

One such cook was François La Varenne, whose 1651 book *Le Cuisinier François* is generally seen as not only the first great cookbook but also the founding text for *haute cuisine* (Wheaton 14-15).Unlike earlier cookbooks, which often just reprinted older, already known, material, it presented a plethora of new, original recipes, which may account for its almost immediate success (Wheaton 119). Perhaps more importantly, it introduced a new, revolutionary, approach to cooking: instead of completely independent recipes that each followed their own set of steps, La Varenne wrote down several basic

formats that could be used for a wide array of dishes. His book started, for example, with a basic recipe for broth that could be used for 61 different soups (Mennel 71). Similarly, he invented the roux, a mixture of fat and flour that would become a standard element for various thick sauces in French cuisine (Wheaton 116). This style of cooking is called Modular Cooking, and not only proved to have great practical benefits; it also facilitated experimentation and innovation (Beaugé 6). Another novelty in La Varenne's work was the creation of individual "made dishes" (Mennel 72): in sharp contrast with the large roasts and pies that medieval banqueters would serve themselves from, courtiers were now served small, delicate, portions on their own plate, which fit the new general trend of "quality over quantity". Finally, La Varenne gave instructions with an unprecedented precision of measurement, especially in his second book, *Le Patissier François* (1953) (Civitello 168). This was in line with the general cultural trend towards rationalization and conventionalization in the second half of the seventeenth century (Wheaton 112).

It should be noted that La Varenne published his work when Louis XIV was still a child, and it thus could not have been a direct consequence of his reign. Rather, it can be seen as a product of cultural trends that were already emerging before Louis took over government, and as owing part of its lasting influence to the fact that these trends came to a high point during Louis XIV's reign, embraced by the king in his elaborate political play. As Wheaton puts it: "Louis's court combined an insistence on a classicizing adherence to rules with a demand for novelty, ideal circumstances for La Varenne's modular approach to luxurious, large-scale cooking" (129).

La Varenne was still largely a transitional figure, though, showing many characteristics of medieval cookery, such as his use of spices (Mennel 72). While in the Middle Ages spices had been expensive and thus a symbol of wealth, improved trade had now made them accessible to a much wider portion of the population, and aristocratic preferences shifted to the use of native herbs, applied with subtlety by skillful chefs (73). This shift was reflected in the many popular cookbooks that followed La Varenne's, some of which, such as that by a cook known by the initials L.S.R., ruthlessly denounced his 'unrefined' concoctions

just twenty years after the publication of *Le Cuisinier* (74). This shows how conscious the French chefs were of the change that was taking place, and how much keeping up with the rapidly changing fashions was valued. This same L.S.R. offers a description of the fashions of his time which aptly sums up the need for control and correctness, as well as the vital importance of refined luxury, that were characteristic of the reign of Louis XIV:

> Nowadays it is not the prodigious overflowing of dishes, the abundance of ragouts and gallimaufries, the extraordinary piles of meat which constitute a good table; it is not the confused mixtures of diverse spices, the mountains of roasts, the successive services of *assiettes volantes*, (…) It is rather the exquisite choice of meats, the finesse with which they are seasoned, the courtesy and neatness with which they are served, their proportionate relation to the number of people, and finally the general order of things which essentially contribute to the goodness and elegance of a meal. (L.S.R. 1-2, quoted in Mennel 73-74).

French cookery, it has been shown, developed in conjunction with French society. Whereas it was enough for medieval feudal lords to show off their military and economic power by consuming copious

amounts of rich, mainly meat-based, food, the 'domesticated' courtly aristocracy of Louis XIV, whose position mainly depended on their social prestige and distinction from lower classes, had to engage in a quality-oriented form of "conspicuous consumption" that was associated with luxury and elegance. Thus a distinctly French style of cooking started to take shape which has, up to the present day, remained internationally renowned for its finesse and linked to the wealthier classes. Naturally, *haute cuisine* still had a long way ahead: the three centuries between Louis XIV's time and ours would see many great chefs, cookbooks and innovations. However, it cannot be denied that the seventeenth century signalled a radical break from the past, not only in culinary terms, but also on a wider societal level.

An important lesson from these findings is that cookery, just like other art forms, is strongly imbedded in the cultural and social fabric of a given time, and, rather than experiencing an isolated development, it follows general patterns in history. The history of food has often been considered somewhat of a fringe discipline, but the importance of food as a tool of social distinction during the reign of Louis XIV shows that it can easily be connected to more "central" branches of the historical field, such as political, social, and cultural history.

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An Assessment of Fugitive Methane Emissions Emanating from Shale Gas Rigs

Paul van Baal

ABSTRACT

The greenhouse gas footprint of shale gas is crucial to identify the role of shale gas in the global energy future. An important factor in assessing this footprint is the prevalence of fugitive methane emissions. This paper looks into the factors which cause difficulties in assessing the impact, like the time-dependent global warming potential (GWP), and the high uncertainty of current scientific estimations on the amount of methane emissions. Estimations vary considerably among scientific publications, which have listed values as high as 7.9% and as low as 1.5%. In order to get a definite answer, direct measurements of the methane emissions are necessary.

Shale gas is a relatively new topic in scientific literature, and recently the term has been showing up in newspapers and popular magazines as well. Shale gas has sparked many people's interest because it promises to be a clean fossil fuel, which is a combination of words that we do not often see. Of the three conventional fossil fuels – oil, coal, and natural gas – coal has the highest greenhouse gas emissions per unit of energy, and the difference is significant. Coal emissions are approximately twice as high as those of natural gas, and burning coal releases higher amounts of other air pollutants like CO, NOx and SO2 (US Department of Energy, 2009). In spite of this, coal is still the fossil fuel from which most of the world's electricity is generated (IEA, 2011). Using natural gas rather than coal for electricity generation is therefore an effective way to reduce greenhouse gas emissions and, hopefully, slow down global warming. The exploitation of new natural gas reserves, like shale gas reserves, is often justified by this promise of lower greenhouse gas emissions. The increased media attention that shale gas is receiving shows that, even though renewable energy sources offer much lower emissions than any type of fossil fuel, fossil fuels still appeal to the public and the industry.

Even though natural gas might be the better option in comparison to coal, whether shale gas fits this bill as well remains a topic of heavy scientific debate. The scientific community has yet to reach a consensus on several key aspects of shale gas, of which the prevalence of methane emissions is the most critical. Methane, which is the main constituent of shale gas, is a powerful greenhouse gas. A certain amount of methane leaks into the atmosphere during the production process of shale gas. If these fugitive methane emissions are high enough, shale gas would be a more polluting energy source than coal.

This article will investigate these fugitive methane emissions, because of their vital role in determining shale gas' place in the global energy future. It will first explain the

GWP Methane	Low	High
20 y	72.0	105.0
100 y	25.0	42.0
500 y	7.6	7.6

Table 1. Global warming potential ranges for methane, taken from Hultman et al. (2011). Low estimates are currently accepted values from the Intergovernmental Panel on Climate Change (Solomon, 2007). High estimates were modified from Howarth, Santoro and Ingraffea (2011). Global warming potential (GWP) is defined as the relative greenhouse strength of a certain gas in comparison to carbon dioxide, in which GWP is consequently defined as 1 on all time scales.

problems in assessing the greenhouse impact of methane. After this, the discrepancies and uncertainties in the academic literature about fugitive methane emissions will be discussed. Finally, an overview of the estimations of the prevalence of these methane emissions will be given. This information will be combined to explain why, and where, further research on shale gas is necessary.

When assessing the consequences of switching from coal to shale gas, the first problem that arises is comparing the greenhouse strength of methane to carbon dioxide. In contrast to carbon dioxide, methane reacts with other molecules in the atmosphere. This causes methane to disintegrate after it has been released into the atmosphere. In consequence of this, methane only exerts its greenhouse strength for the relatively short time of approximately twelve years, whereas carbon dioxide could theoretically remain in the atmosphere indefinitely. It is therefore impossible to compare the greenhouse impact of methane to that of carbon dioxide, or of shale gas and coal as energy sources, without specifying a time frame. The article by Hultman, Rebois, Scholten, and Ramig (2011) gives an excellent discussion on the global warming potential of methane. The paper presents high and low estimates with time frames of 20, 100 and 500 years (see Figure 1). The global warming potential of carbon dioxide is defined as 1. The numbers in Figure 1 show that methane could be more than a hundred times more powerful than carbon dioxide.

It is common practice to use 100 year global warming potential values for calculating greenhouse gas footprints. However, some articles use the 20 year values due to the fact that global warming is expected to happen within that time frame (Howarth et al., 2011). Whether using 20 year global warming potential values can provide fair conclusions is heavily debated. The reason for this debate can be most easily explained by making an analogy with a pot of water. Imagine rapidly heating this pot for a short time or heating it slowly for a much longer time, representing the respective effects of methane and carbon dioxide on the atmosphere. The intense heating might not boil the water, but the slow heating will eventually make the water boil if it is left on long enough. You can compare the boiling of the water to global warming reaching an arbitrary critical point.

Global warming potential values are calculated in order to compare how strongly different gases affect climate change. However, these numbers cannot fully explain the effect that switching from coal to shale gas for electricity generation would have on climate change. In order to fully understand this effect, complex climate models are necessary to compare the short, powerful, effect of methane to the much longer and weaker effect of carbon dioxide, and to estimate what amount of atmospheric methane would 'boil the water' in the previously mentioned analogy.

The difficulty in assessing the climate effect of methane is not the only reason why the effect of the fugitive methane emissions from shale gas production is so heavily debated. Accurate numbers on the amount of methane leaking into the atmosphere during the exploitation of shale gas are not yet known (AAPG, 2011). This is because shale gas exploitation is still a relatively new phenomenon, which has not yet been thoroughly studied. The exploitation of shale gas reserves only began in the 1990s, when cheaper production techniques were devised (Asche, Oglend, & Osmundsen, 2012). Even though factual numbers do not yet exist, estimations of the amount of fugitive methane emissions have been made. Howarth et al. (2011) were the first to provide a serious estimate of the greenhouse gas footprint of shale gas. Their estimation was that 3.6-7.9% of produced shale gas is leaked into the atmosphere. They concluded that total shale greenhouse gas emissions are significantly higher than coal greenhouse gas emissions – up to two times as high even – and only in their low estimate on a 100-year time scale were the emissions less than those of coal per unit of energy. Their paper reached a large audience, mostly because it was covered by popular media all around the world, including the BBC (Black, 2011) and the New York Times (Zeller, 2011). Their paper was even debated in the British Parliament, due to the vastness of British shale gas reserves (Entine, 2012). It caused quite some commotion, because shale gas was seen as a climate friendly fossil fuel. However, many scientists disagreed with the conclusions drawn in the Howarth et al. (2011) paper. According to John Entine in Forbes magazine (2012), Howarth is considered 'an activist, not an independent scientist' by his peers.

After the publication of the Howarth et al. paper in 2011, other scientists conducted their own research on shale gas' fugitive methane emissions. Venkatesh,

Jaramillo, Griffin and Matthews (2011) reported a leakage rate of 1.5-3.2% – their 'best estimate' being 2.2%. This is less than half of the value that Howarth et al. (2011) reported. If we consider the high 20-year estimate from table 1, a single percentage increase of fugitive methane emissions could approximately double the greenhouse gas footprint of shale gas, showing just how important even a small difference in methane emissions can be. Other studies (EPA, 2011; Burnham et al., 2012; Jiang et al., 2011; Pétron et al., 2012) came to similar conclusions. Figure 1 is a visual representation of these and other estimates of the prevalence of methane emission from several recent scientific publications.

One of the articles used to construct Figure 1 was a direct response to the Howarth et al. (2011) paper. This paper, by Cathles et al. (2012a), was published approximately half a year later in the same journal. It meticulously breaks down every argument and assumption Howarth et al. (2011) make, and comes to a much milder conclusion about fugitive methane emissions. To illustrate: they start off the article by saying, 'We argue here that their analysis is seriously flawed...' (Cathles et al, 2012a, p. 525). The article instigated a similar response by the media as Howarth et al.'s article (2011) did. For example, the New York Times, which in 2011 reported, referencing Howarth et al., that shale gas was bad for the climate (Zeller, 2011), now published an article (Riley, 2012) which stated exactly the opposite.

This war of written words did not end here. As a direct response to Cathles et al.'s article (2012a), Howarth et al. published another article (2012) in the same journal. They strongly disagreed with the findings of Cathles et al. (2012a) and reiterated their initial conclusions. Shortly hereafter, Cathles et al. issued a press release in response to the criticism of Howarth et al., continuing the loop of criticism (2012b). The debate between Howarth et al. and Cathles et al. accurately represents the type of scientific discussion occurring about shale gas in general.

The fact that scientists are starting to critically analyze these fugitive methane emissions is a good development. Fugitive methane emissions are crucial in assessing the greenhouse gas footprint of shale gas, because methane is such a strong greenhouse gas. Yet the greenhouse gas footprint is not the only topic of concern to climatologists. The main

technological advance that made shale gas reserves exploitable was hydraulic fracturing, more commonly known by the term 'fracking'. This procedure poses some serious environmental risks, like groundwater contamination and induced seismicity, which are already reason enough for some not to pursue the shale gas path. However, the fugitive methane emissions could be the conclusive counterargument condemning shale gas exploitation.
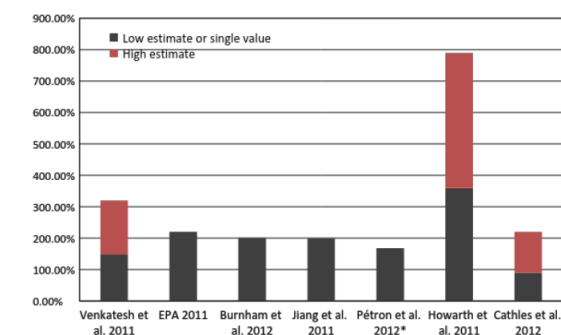
Figure 1. Bar chart depicting estimations of the amount of fugitive methane emissions as a percentage of total shale gas production as taken from several recent journal articles. Articles which specified a range estimate are shown bicolored, bars of articles which reported a single value have been given a single color.
*While they note a value of 1,68% they also write the actual emissions could be slightly higher due to their high uncertainty in accounted gas

They could also be the final argument in favor of shale gas: we can accept the environmental risks, which can be mitigated with better equipment and surveillance, if it means we can lower global greenhouse gas emissions and slow down global warming.

Even though the fugitive methane emissions are important, they remain insufficiently understood or researched. Their importance has only recently been described in the academic literature, and research into these emissions by different scientists has shown just how difficult it is to assess them. Even though it is unlikely that as much methane leaks into the atmosphere as Howarth et al. reported in 2011, a small difference in the amount of methane emissions is enough to drastically change the climate friendliness of shale gas. For this reason, the high uncertainty in methane emission estimations needs

to be reduced. This can be done either by measuring methane emissions on-site or by comparing how much methane is taken out of the ground and eventually used in the power plant. No conclusions about the relative advantages of shale gas over coal can be drawn yet, because there is no sound data; any conclusions drawn would be based purely on intuition or preference.

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Modeling the Joint European Torus Ramp-up in RAPTOR

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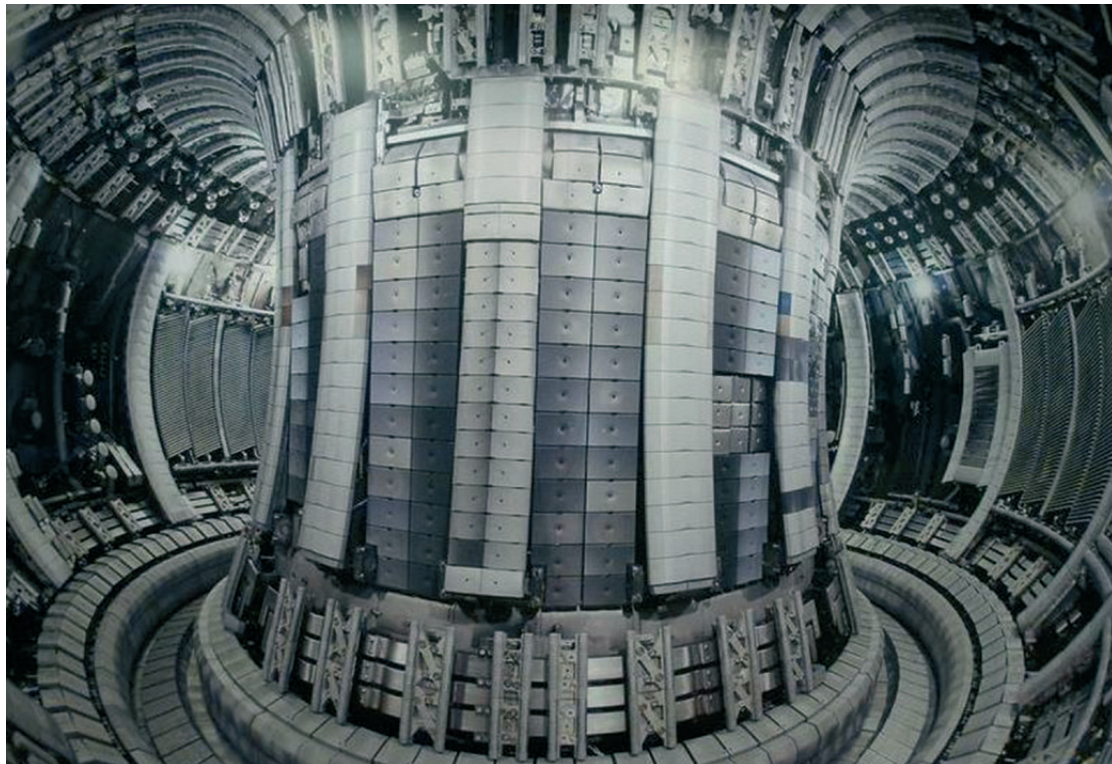
ABSTRACT

Nuclear fusion energy has the potential to solve the world energy crisis, but physical and technical challenges in plasma physics must still be overcome. Since experimentation in plasma physics is very expensive, computer models such as CRONOS and ASTRA are used to extend experimental data. However, these models are often too computationally intensive to be used in applications such as real-time plasma control. To this end, the RApid Plasma Transport simulatOR (RAPTOR) has been developed; this paper will use it to model the Joint European Torus (JET). The model is compared to experimental data for electron temperature and safety factor for a specific shot. The modeled temperature is significantly lower than observed during ohmic heating, but performs well during neutral beam injection (NBI) with an average relative error of -1.9 %. The safety factor is also well modeled, with an average error of +5.5 %. RAPTOR's lightweight yet accurate character will allow future numerical optimization to improve JET's ramp-up procedure, and produce better plasma conditions for fusion.

1. INTRODUCTION

Nuclear fusion has the potential to provide the world with clean energy for the foreseeable future, with minimal waste and fuel that is easily extracted from seawater. In a fusion reaction, the nuclei of two atoms (usually deuterium) join to produce one larger nucleus. Since this is a preferred energetic state, the reaction releases energy which can be used to generate electricity. The most promising current reactor design, the tokamak, induces nuclear fusion in an ionized gas (called a plasma) that has been confined using magnetic fields, and heated to extreme temperatures. Containing material at these extreme temperatures and controlling the instabilities of magnetically confined plasma are currently the main challenges for nuclear fusion energy. Overcoming these challenges is an active effort that brings together physicists and engineers at research facilities worldwide, including the Joint European Torus (JET).

JET is the world's largest tokamak and is located in Culham, England. It operates with an annual budget of £60 million and consumes the equivalent of 1-2% of the UK's total annual energy usage (EFDA 2013a).

The high cost of tokamak experiments necessitates other methods for probing the behavior of plasmas. Computational modeling provides a convenient, and cost-effective, solution to the problem. There are many plasma models available, most of which are focused on simulating physical situations as accurately as possible to extend knowledge gained through experiments. These models tend to be computationally intensive, and therefore slow.

However, another application of modeling is to control experiments in real-time as they progress, for example by adjusting heating power in response to changing plasma conditions, thereby creating better control systems. This may lead to better quality plasmas with more favorable conditions for fusion. Conventional plasma models are often too computationally intensive to model plasma control in real time, so a new code has been developed for this purpose: RAPTOR, the RApid Plasma Transport simulatOR (Felici 2011). RAPTOR can be run either in 'interpretive mode' for the analysis of experimental data, or in 'predictive mode' for the prediction of experimental outcomes. RAPTOR's simplifying physical assumptions permit its light weight, but it

still has the power to reproduce most features of results from more involved codes (Felici 2011).

Like many models, RAPTOR is not entirely self-contained. It depends on pre-computed results from other codes, including the CHEASE code for toroidal magnetohydrodynamic equilibria (Lutjent et al 1996). Magnetohydrodynamics (MHD) is the theory of electrically conducting fluids, which include the plasma used in tokamak reactors. The toroidal shape is an important feature of tokamaks, which is why this code is focused on that geometry. MHD combines the equations of fluid dynamics and Maxwell's electrodynamics to form a powerful but mathematically complex theory, which can be solved numerically by CHEASE. Importantly, CHEASE admits toroidal geometry (see Figure 1) with an asymmetric cross section, which JET has.

ASTRA (Automated System for TRansport Analysis), like RAPTOR, is a transport simulator (Pereverzev and Yushmanov 2002). 'Transport' refers to the ill-understood process of particle movement through a plasma. ASTRA is considered to be one of the most precise transport simulators available, and has served as a benchmark for the performance of more recently developed transport models, including RAPTOR. Despite its heavy computation requirements, Sevillano et al (2011) created a system in which ASTRA is repackaged for real-time tokamak control. However, the authors did not demonstrate its use in the control of heating mechanisms.

This paper will explore the capabilities of RAPTOR's predictive mode by modeling the heating (a.k.a. 'ramp-up') of Joint European Torus plasmas. First, an overview of JET's relevant device-specific characteristics will be presented. Next, the RAPTOR model of JET will be detailed. Finally, simulation results will be compared to experimental data to examine the quality of the model.

2. JET CHARACTERISTICS
The Joint European Torus is a tokamak *(see Figure 1)*, so the main plasma chamber has a toroidal shape with a major radius R = 2.96 m (EFDA 2013b). JET's cross-section is not circular; it has a minor radius a = 1.25 m and 'vertical radius' b = 2.10 m. The minor radius is commonly normalized for convenience. In this paper, the normalized radius will be denoted as p, with p = 0 in the center and p = 1 at the edge of the cross-section. This model assumes a triangularity ∂ = 0.3.
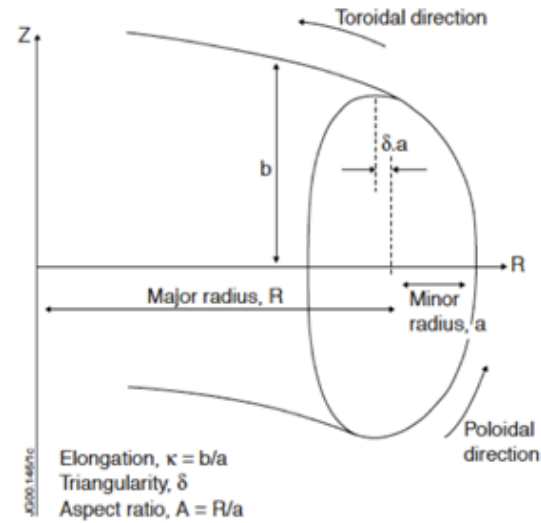
Figure 1: Geometrical parameters of tokamak cross-section (Euratom 2013. p.11.1)

The primary plasma heating systems at JET are ohmic heating and neutral beam injection (NBI). Ohmic heating uses the resistivity of the plasma to dissipate power into it by driving a current. However, unlike most conventional materials, a plasma's resistivity (and thus the ohmic heating efficiency) decreases with increasing temperature. This implies that ohmic heating is only effective for relatively low temperatures (Friedberg 2007). JET can drive up to 5 MA of current, with a maximum ohmic heating power of 4 MW (EFDA 2013b).

NBI is JET's most significant source of heating. In NBI heating, high-energy neutral hydrogen atoms are injected into the plasma. These atoms ionize and become part of the plasma, raising the average energy level. Neutral beams can be injected at specific points along the radius of the cross-section, making NBI effective at achieving temperature gradients within the plasma. This paper assumes a maximum NBI power of 24 MW in accordance with normal JET operations (personal communication from D. Hogeweij, 2013 Oct 31). The power deposition model will be addressed in the following section.

Further heating systems at JET include microwave heating and ion-cyclotron resonant heating. Microwave heating will be neglected in this paper as it provides little power relative to the NBI

systems. Ion-cyclotron heating, which energizes plasma ions (as opposed to electrons), will also be neglected, as ion temperature will be inferred from the electron temperature in the model.

3. RAPTOR MODEL
The first stage of modeling JET in RAPTOR is modifying the RAPTOR configuration to accommodate this new tokamak. JET is the third tokamak to be implemented, after TCV in Lausanne (Felici 2011) and an ITER scenario (Van Dongen 2013). The configuration file contains the geometrical properties from Section 2, as well as a number of default settings that may be altered to match a specific shot. Tokamaks typically operate in short bursts called 'shots', and each shot can be performed under different conditions that, if different from the default, must be prescribed before a predictive RAPTOR simulation. The configuration file also specifies the equilibrium conditions towards which the plasma evolves. These conditions are particular to a given geometry, and are pre-computed by CHEASE.

To verify the model, it is tested against data from specific JET shots. Due to time constraints, only one shot will be used for the purposes of this paper. The shot information is a combination of measurements and data that has been interpreted by CRONOS. CRONOS is a transport code that, like RAPTOR,

can operate in interpretive mode to extract extra information about a plasma from the available data (Artaud 2010). This suite of codes is more precise than RAPTOR, but also requires greater computing time. The combination of experimental data and interpreted results will from here on simply be referred to as 'the JET data'.

The JET shot begins with a long period of pure ohmic heating, lasting about 44 seconds. Since the majority of the power comes from NBI heating, only the last few seconds of this phase are modeled, with modeled data beginning at t_0 = 41.5 s. The current drive (which provides ohmic heating) and NBI power follow the trajectories in Figure 2. The NBI power deposition is modeled as a simple Gaussian, centered at p = 0.1 and with a full width at half maximum of 0.3. NBI is assumed to drive negligible current.

The power losses modeled are Bremsstrahlung (the emission of x-rays when electrons collide with ions and decelerate) and radiation by the plasma. In these and all other calculations, the ion temperature is assumed to be equal to the electron temperature. For this reason, electron-ion thermalization is ignored.

Importantly, this shot enters a state called high confinement mode (H-mode) once the NBI power is engaged. H-mode is characterized by sharp gradients, called pedestals, in spatial profiles such as
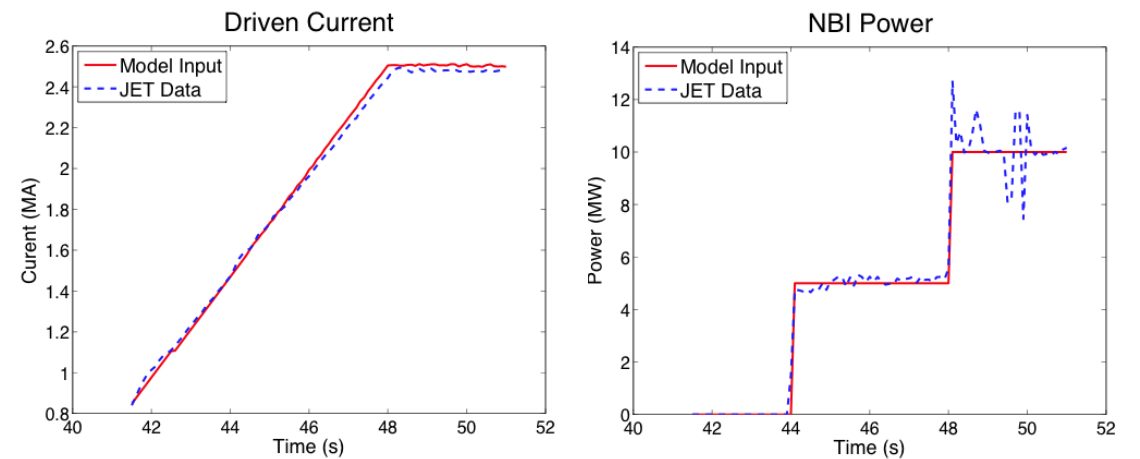
Figure 2: *JET* Heating trajectories. Note that the data begins at 41.5 s. Current is steadily ramped from 80kA to reach its maximum of 2.5 MA at 48s. NBI power is switched to 5 MW at 44 s and to

density, and temperature at the edge of the plasma. H-mode is activated in RAPTOR by specifying the time at which the transition into H-mode occurs, the location of the edge of the pedestal, and the desired electron temperature at the top of the pedestal. From the JET data, these parameters were determined to be t_H = 44.1 s, $þ_H$ = 0.95, and $t_{e,ped}$ = 0.57 keV (note the use of eV as the temperature unit). The electron temperature at the edge of the plasma is held fixed at 109 eV to match the data.

Another property of H-mode is the reduction of particle transport near the plasma edge. The plasma transport model used is the semi-empirical Bohm/gyro-Bohm diffusion model. Although the details of the model are beyond the scope of this paper, the interested reader may see Erba et al (1997) and Parail et al (1998).

Three quantities at the beginning of the shot are defined to exactly match the JET data. The first is the effective charge profile of the ions. The effective charge Z_{eff} is a measure of the purity of a plasma, and is given by

$$Z_{eff}(\rho) = \frac{\sum_i n_i(\rho)Z_i^2}{\sum_i n_i(\rho)Z_i},$$

where n_i is the number density and Z_i the atomic number of ion species i. Zeff determines the strength of electromagnetic interactions on the plasma ions. The other two matching quantities are the electron and ion density profiles. These quantities and the parameters described in this section provide the input for a RAPTOR predictive simulation of the JET shot.

4. SIMULATION RESULTS
The most important modeled result is the electron temperature spatial profile, i.e. the temperature curve in real space. The error in the electron temperature T_e is indicative of the quality of the model as a whole, since many computed quantities depend crucially on this profile. It is important that the predicted profile shapes of T_e are consistent with the observed data. The average relative error between a simulated profile x(Ð,t) and the data is computed as follows:

$$\Delta x(t) = \frac{1}{N} \sum_{n=0}^{N} \frac{x_{MODEL}(\rho_n,t) - x_{DATA}(\rho_n,t)}{x_{DATA}(\rho_n,t)}.$$

Here N is the number of discretized þ points, which are being calculated. Since þ is discretized uniformly, this measure assigns equal weight to each spatial point. Given the simplifying physical assumptions made by RAPTOR, a target of ΔT_e = ±15 % is established (personal communication from F. Felici, 2013 Nov 13).

From Figure 3, it is clear that the RAPTOR-simulated electron temperature is much too low during the ohmic heating phase, with an average relative error between the shot and the data of $\Delta T_{e,ohmic}$ = −27 % during this phase. However, after neutral beams are engaged at t = 44 s, the model quickly approaches the experimental profiles and remains within the established target range for the remainder of the shot. During neutral beam heating, the average error is $\Delta T_{e,NBI}$ = −1.9 %. The cause of the discrepancy in the quality of the model between ohmic heating and NBI currently remains undetermined.

Another important quantity is known as the safety factor, q. The magnetic field lines in a tokamak (which must always form closed loops by Maxwell's laws) circle in both the poloidal and toroidal directions (see Figure 1). The safety factor at a given Ð is the number of toroidal turns made by a magnetic field line per poloidal turn. For example, at a radial point Ð, where the magnetic field line makes two loops around the torus while only making one loop around the cross-section, the safety factor would be q = 2.

The safety factor is so-called because of its relation to plasma stability. Since plasmas respond to electromagnetic fields but flow like fluids, their state may undergo sudden (and often undesirable) changes, called instabilities. For q < 1, new instabilities arise. The main instability relevant for this shot is known as the sawtooth instability. This instability entails a periodic and dramatic increase in particle transport in the affected area, which flattens profiles such as density and temperature. In JET, sawteeth have a period of about 0.1 s (personal communication from
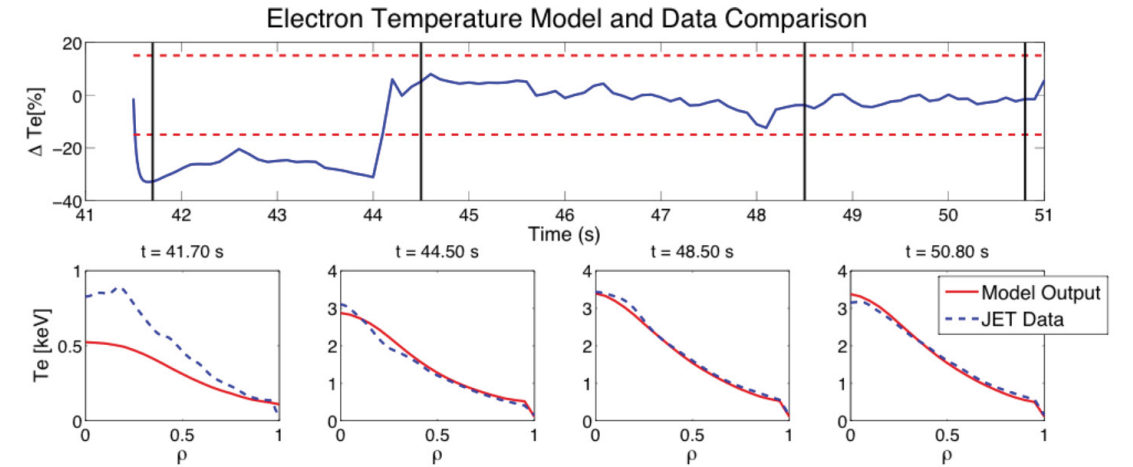
Figure 3: Top: Error between the electron temperature data and model in time. The modeled temperature is too low during ohmic heating, but within ±15% (dashed in red lines) of the data during NBI heating.

Bottom: Electron temperature profiles at times corresponding to black lines in top graph. From Left to right: 0,2s after start of model, 0.5s after NBI power switch, 0,5s after second NBI power switch, and 0.2s before end of model. Note that by t = 44.5s the plasma is clearly in Hmode as prescribed in section 3
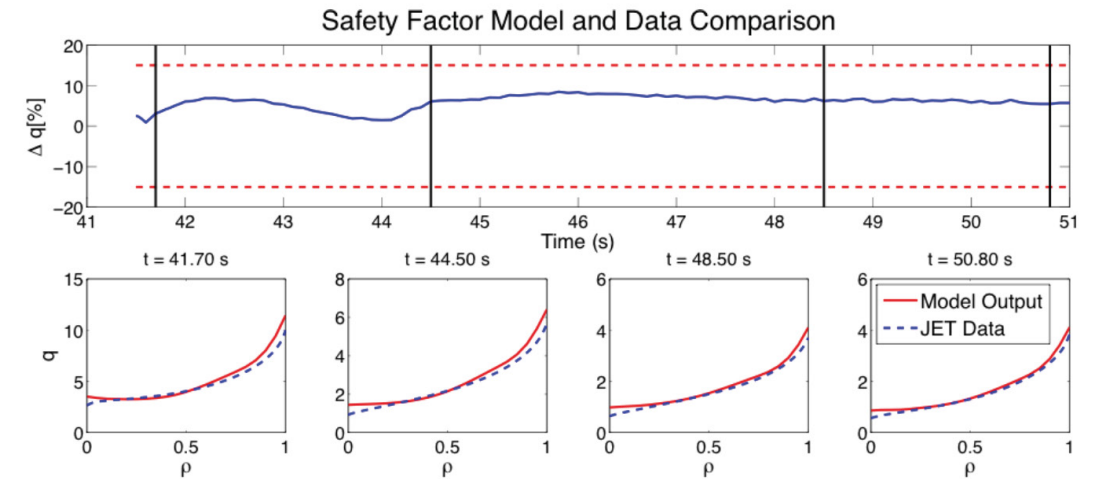
Figure 4: Top: Error between the safety factor data and model in time. The safety factor is well within ±15% of the data for the duration of the shot, reaching a maximum error of +8.4%.

Bottom: Safety factor profiles at times corresponding to black lines in top graph

D. Hogeweij, 2013 Nov 22). Since q is lowest at the centre of the tokamak cross-section, this is where the instability occurs.

Simulation of q yields the results in *Figure 4*. The safety factor is consistently within the target range, with an overall average error between the computed and measured profiles of Δq = +5.5 % and reaching a maximum of +8.4 %. Importantly, however, the modeled q is consistently higher than that of the data in the centre. This is likely due to the fact that sawteeth are not included in this model, so some deviation from the data at low q is expected.

5. CONCLUSION

RAPTOR was used to produce a model of the Joint European Torus by taking into account JET's geometrical features and available heating systems. The model was tested against experimental data from a specific JET shot. The simulated temperature data displays serious (but consistent) inaccuracies during pure ohmic plasma heating, but performs well during neutral beam injection, with simulated profiles remaining within an average relative error of ±15 % from the data during this period. The safety factor simulation could benefit from inclusion of the sawtooth instability, but nonetheless agrees with the data, averaging +5.5 % error and never exceeding ±8.4 %.

Since the model has been verified for NBI heating, it can be used to predict results for different heating trajectories than the simple two-step trajectory displayed in *Figure 2*. A numerical optimization can then be performed to determine new viable trajectories. This would allow the cheap exploration of a wide variety of alternate heating trajectories without the need for massive computing power or expensive experiments. The results of such an optimization could then be used to guide experiments towards the generation of better quality plasmas for fusion power generation.

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The Genetics of Athletic Performance

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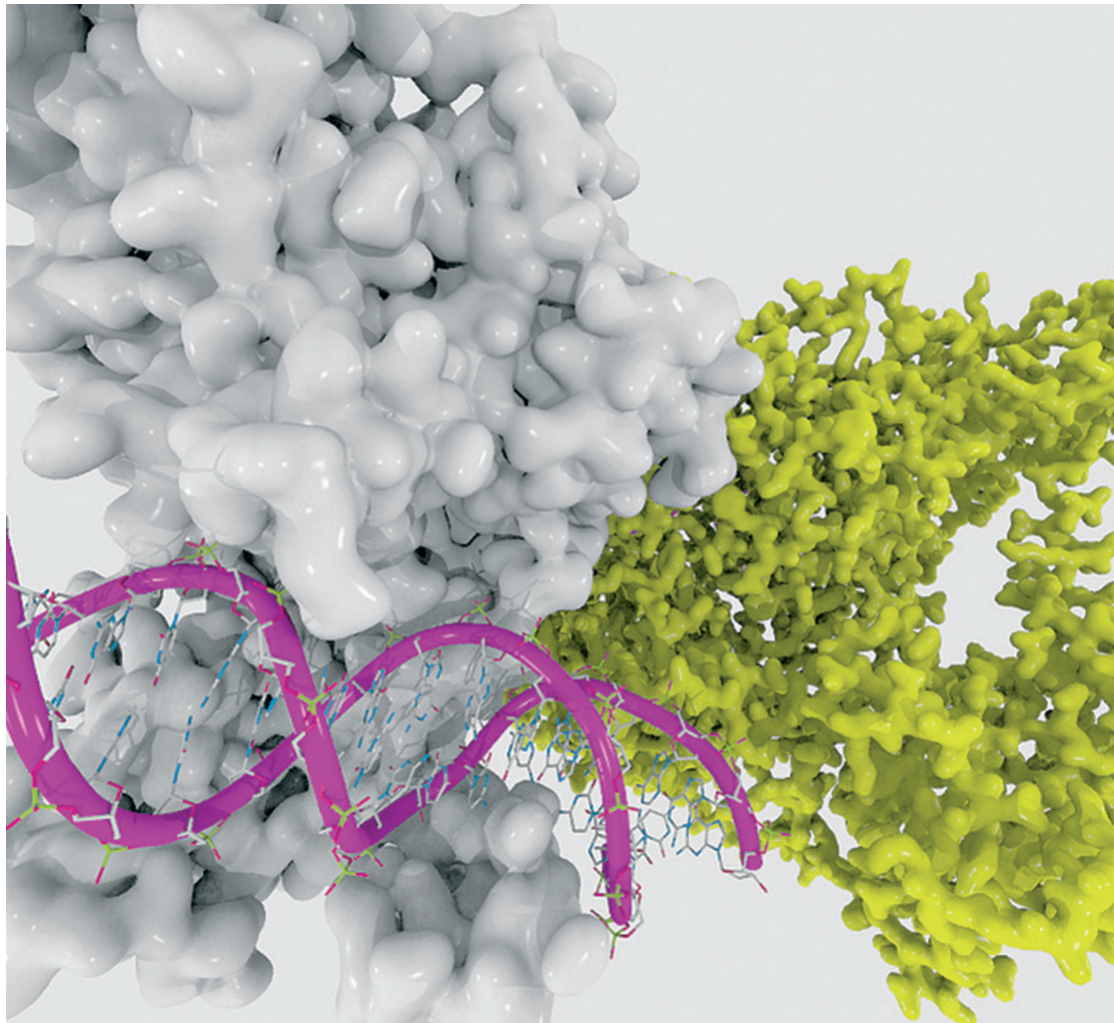
ABSTRACT

By researching the heritability of athletic performance genes, sport scientists aimed to surpass current costly and lengthy procedures for the identification of athletes. While research on 'sports genes' has been going on since the 70s, predetermination of performance capacity is still subject to ongoing debate. Genetic predisposition does not seem to offer a full explanation for the level of athletic performance. By means of a literature review, this paper explores the relationship between genetics and physical performance capacity, thereby extending beyond genetic heritability. We show in this paper that epigenetics is an important factor in determining athletic performance, and conclude that the relationship between genes and physical performance is much more complicated than was initially expected. It is argued that, in order to select elite athletes in the future, testing for performance capacity should include both inherited genes and epigenetic mechanisms. Once we fully understand both the genetics and epigenetics of 'sports genes' we might be able to select our athletes much more efficiently.

Sport scientists have always been interested in the relationship between genetics and physical performance capacity. Differences in individual predetermination for performance capacities are still a subject of ongoing debate in the field of Sports Sciences, while the heritability of physical performance traits has been investigated extensively by various researchers [1]. During the Human genome project (1990-2006) researchers investigated potential athletes and sought to identify those who were genetically predisposed for elite performance. Genome sequencing methods were expected to offer the ideal solution to replace the current extensive and costly procedures for identifying athletes able to compete at top levels [1]. The early results from the study were promising, showing significant heritability levels for variance in the trainability of individuals. However, this genetic information did not enable the researchers to unmistakably distinguish athletes from non-athletes based on their genetic material, hence the ongoing debate between Sport scientists. This paper aims to further explore the relationship between genetics and performance capacity of

athletes participating in elite sports, and will try to clarify why the results of the human genome project do not enable us to make a clear-cut distinction between elite athletes and 'average performers'. By reviewing previous studies conducted in the field of sports genetics, this paper will show that the relationship between trainability and genetics is much more complicated than was anticipated during the Human-Genome era. While heritability is shown to be involved in physical performance, gene-association studies indicate conflicting results [2,3]. It is suggested that environmental factors affecting gene-expression through epigenetics may provide the explanation for these conflicting outcomes in gene-association. In addition, it is argued that epigenetic research is essential in our quest for finding elite athletes; becoming a top level athlete involves both inherited genes and epigenetic predispositions.

Physical performance in sports can be divided into four qualities: endurance capacity, maximal strength, power, and coordination. Different athletes typically require various types of performance attributes to be

able to perform optimally in their chosen sport. That is why these qualities have been the main focus of sport scientific research. In the 1970s, scientists first conducted research to determine whether genetics influence physical capacity. These studies found strong evidence for genetic predetermination for elite performance in sports [1]. Furthermore, Wilmore et al. (1997) concluded from their family heritage study that variance in performance traits can be explained by heritability 50% of the time [4]. Bouchard et al. (1999) came to a similar figure of 47%, as displayed in figure 1 [5]. In their study, heritability of aerobic exercise physiology traits was tested in a 20 week cycling workout program among 98 two-generation families, in which 481 adults were tested in total [5]. Each bar in figure 1 indicates one family. The line connecting the ranked family averages shows a correlation between genetic inheritance and endurance capacity. Strength trainability is related with a slightly lower heritability than endurance [1]. Thus, a significant heritability factor was found to influence performance capacity. The remaining 50% determining performance in sports was assumed to be influenced by factors in the environment that stimulate the individual to perform in sports [1].

Once heritability for performance capacity was demonstrated, researchers started to conduct association studies relating specific genes to certain physical performance traits. There are numerous factors affecting trainability that have been associated with genetic material [1]. These factors include, for instance, gender (females naturally possess less muscle mass than men), the types of muscle fibers
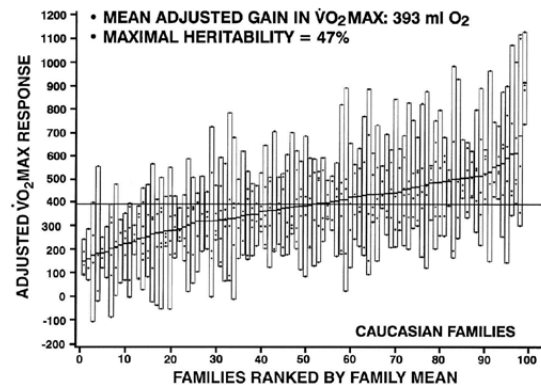

Figure 1. [5]

and related genes, speed of muscle contraction, resistance to fatigue and muscle acidification, resistance to injury, and also many psychological factors that influence athletic determination.

ACE and ACTN3 are the most thoroughly explored genes for association with athletic performance [1]. ACE is a gene responsible for factors such as vasoconstriction, tissue oxygenation and muscle efficiency. While an I/I genotype for the ACE gene has been associated with increased endurance performance, the D/D genotype was related to increased power performance in several studies. Nevertheless, the reliability of the results is questionable, since 7 studies found these associations, while on the other hand 5 studies that tried to replicate these findings did not get the same results [6]. Similarly, ACTN3 gene studies show different outcomes. While the C/C genotype had been associated with increased strength, and the T/T genotype with increased endurance in some research studies, similar associations were not found in other studies [6]. Overall, performance association studies often show contrasting results [1].

It has become the general consensus that these hereditary / genetic differences are under polygenic control [1]. Bray (2009) published the Human Gene Map for Performance and Health-Related Fitness Phenotypes listing all genes that are likely to influence physical performance in humans [7]. However, gene variants are added if at least one study could link the gene with athletic performance, even if other studies failed to confirm this [7]. This results in very few validated polymorphisms related to fitness.

Even more problematic seems the outcome of the study of Williams and Folland in 2008; by looking at the 23 polymorphisms that had been associated with increased endurance performance, they established that the probability of finding the perfect endurance athlete, who possesses all 23 polymorphisms, among the total world population would be no more than 0,0005% (see figure 2) [8]. The length of the bars in figure 2 indicates the number of people required to find a person with the given number of polymorphisms. As shown by the figure, in order to find a gifted athlete with all 23 polymorphisms we need more people than the current world population. In addition, the impact of these 23 polymorphisms has not even been established yet.

Figure 2. [8]

Clearly the genetic component of physical
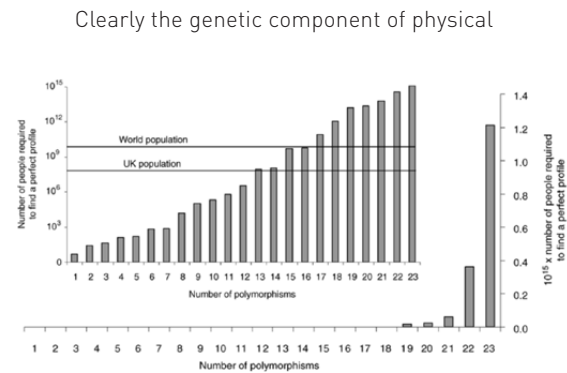
performance is not yet completely understood. The results indicate that the current design of association studies – even when performed genome wide – might not be able to uncover the genetic determination for physical performance. A possible explanation for this may be that there are many mechanisms influencing gene expression [1]. Epigenetics may explain the contrasting findings of many association studies. Also, it may explain the strong outcomes in heritability in twin studies, since twins are often exposed to similar environmental factors.

Epigenetics is understood as all the hereditary/ genetic changes in gene expression that occur, aside from changes to the DNA sequence itself [9]. Scientists discovered that not only was inheritance important for information processing in human cells, but epigenetic mechanisms also greatly influence molecular processes [9]. Epigenetics modifications occur due to interactions of genes with the environment and developmental status of an individual. DNA methylation and histone modification are considered to be the most important epigenetic mechanisms, by determining how susceptible genes are for transcription epigenetics to regulate gene expression [6]. For instance, when a methyl group is bound to the '5 strand of DNA, transcription of a certain gene becomes very difficult because the methyl group inhibits the unraveling of DNA in order to translate it into proteins. Patterns in epigenetics, and susceptibility for influences from the environment, are very specific for each individual. Individual susceptibility for certain epigenetic changes predisposes the individual to a higher or lower capacity for physical performance [1]. Epigenetic regulation is very complex and consists of

many different processes.

By connecting epigenetics to physical performance, sport scientists have found that environmental factors like lifestyle and amount of exercise are equally important to the individual's phenotype as genes are [1]. Exercise and diet have been found to cause epigenetic changes. Myomirs (muscle specific miRNAs) are for instance up-regulated directly after single bouts of endurance exercise [1]. Furthermore, Barrès et al. (2012) showed that the intensity of aerobic exercise drives gene expression in a dose-dependent manner, and that promoter methylation levels are also reduced depending on exercise intensity (see figure 3) [10]. Figure 3 shows the levels of methylation and expression of several genes directly, and 3 hours, after exercise.

The studies mentioned above are just a few of the epigenetic studies that showed associations between epigenetic modifications and exercise. Several other researches showed correlations between epigenetic mechanisms and sports [1]. Nevertheless, not much is known about the relationship between epigenetics and physical performance capacity yet [1].
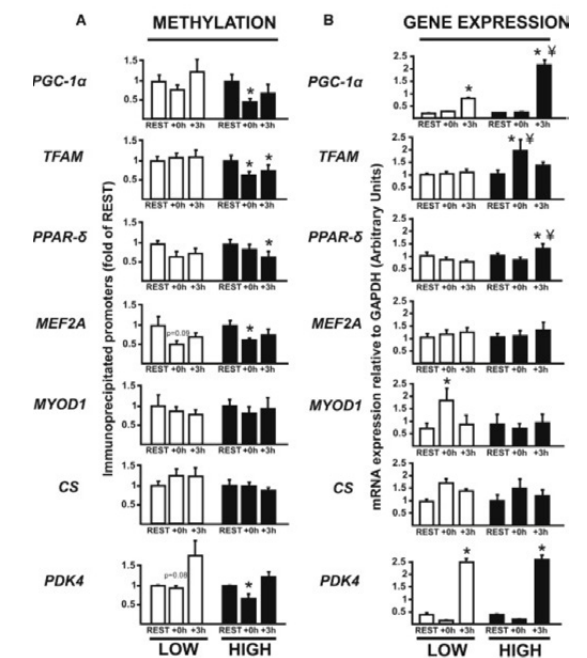

Figure 3. Source: Barrès et al. (2012)

It can be concluded that the relationship between genes and physical performance is much more complicated than would have been expected. Several earlier studies have shown heritability for performance-related traits of approximately 50%. However, the specific molecular relationships between performance-related genes and the phenotype are not well understood. Association studies focusing on single genes resulted in contrasting results between studies, and many genetic polymorphisms have not been validated. In addition, adopting a combination of polymorphisms to assess trainability did not appear to be practically feasible, and showed that identifying the elite athlete is currently impossible. It was suggested in this paper that the problems encountered in association studies may be due to the complicated relationship between gene-expression and environment. Several studies have already associated epigenetic moderations with exercise, however, extensive research about the gene-environment interactions related to physical performance has not yet been conducted. Additional research into the associations between trainability, epigenetics, and DNA, should be conducted in order to clarify the relationship between genes and physical performance. Furthermore, we do not know whether the 23 listed polymorphisms comprise the complete list of genes that are important for athletic traits. One of the shortcomings of this study is the lack of focus on the mental capacity of athletes, in terms of dedication and determination. Psychological factors seem important determinants for athletic performance. In order to select elite athletes in the future it should be noted that a complete picture of performance capacity includes both inherited genes and epigenetic mechanisms. In addition, we will have to look into determinants related to psychological traits that are important for athletic capacity. Once we fully understand both the genetics and epigenetics of all the 'sports genes' we might be able to select our athletes much more efficiently in the future.

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The Creation of a Common Identity in the 15-M Movement in Spain

Jorge San Vincente

ABSTRACT

In May 2011, what started as a regular demonstration in the streets of Madrid evolved into a massive protest without recent precedent in Spanish history. Tired of the high unemployment rate, the corruption, and a political and financial class with no answer to the crisis, thousands of people occupied the squares of Spain's major cities as a sign of disapproval. Almost three years later, what legacy has this movement left behind? The theoretical part of this paper looks into the new concept of citizenship that Chantal Mouffe proposes. Her theory is an alternative to the struggle between the libertarians, represented in this paper under the ideas of John Rawls, and the communitarians, as explained by Amitai Etzioni. Mouffe takes the Rawlsian idea of freedom and equality as basic rights of the citizens, and turns it into a common identity, which can be shared by a collective of people belonging to different communities. The paper then goes on to use the case study of the 15-M movement as an example of how Mouffe's theory can be taken into practice. Through analysing the development of the events, the manner in which the inclusive nature of the movement(s) has formed an identifiable association around the cause of 'indignation' among citizens can be seen. Independently of their particular identities, the citizens unite around their common interest: the demand for basic democratic principles. Precisely this new 'common identity' has been the biggest legacy of the movement, as it has created a network and narrative under which a number of actions and organizations can continue to pursue their more specific goals.

On 15th May, 2011, an almost unprecedented demonstration shook the streets of Madrid. Thousands of people came out to protest the economic situation, the corruption, and the ineptitude of the Spanish political and financial classes. Over the following months, an impressive mobilization was organized in an attempt to change the status quo. Almost three years later, its impact is still perceivable. While many have critiqued the lack of more tangible results (for instance, the refusal to create a political party linked to the movement), perhaps its biggest achievement was the awakening of the Spanish citizens. Using the extensive network that the 15-M created, as well as a similar narrative, subsequent movements have targeted similar, more specific issues (Sánchez, 2013). Although extracted from a very mundane situation, this could be seen as an example of Chantal Mouffe's concept of a common identity. Her discourse arises as an alternative to the constant struggle between communitarians, who look for the benefit of a common good, and libertarians, who position their personal autonomy over that of the whole society. Is there a way to bring together both theories? Could the smaller communities join around a common interest without losing their autonomy? Mouffe proposes her theory of Radical Democracy, in which she redefines the concept of citizenship to create a common identity. In this paper, I will first use the theories of John Rawls and Amitai Etzioni to look into their definition of citizenship and how this may

model Mouffe's theory. Afterwards, I will introduce the 15-M movement as an example of a constructed common identity to illustrate how theory and practice can be brought together.

THEORY

John Rawls' theory is based on the idea of the 'original position', a state of mind in which a person is under a 'veil of ignorance' without preconception of the good, and no self-interest can be defended. His first principle arises as an obvious consequence of such a state: "each person is to have an equal right to basic liberty" (Rawls, 1971, p. 60). These basic liberties are clearly stated by Rawls: political liberty, with freedom of speech and assembly, liberty of conscience, freedom of thought, freedom of the person along with the right to hold personal property, and freedom from arbitrary arrest and seizure (Rawls, 1971, p. 61). As we will later see, it is crucial for Rawls that these liberties remain equal to all citizens. The second principle, in contrast, states that: "social and economic inequalities are to be arranged so that they are both a) reasonable expected to be in everyone's advantage, and b) attached to positions and offices open to all" (Rawls, 1971, p. 60). Rawls differentiates between social primary goods and natural primary goods. The former are goods like economic wellbeing or healthcare, which, under the first principle, should be distributed equally by the state. The latter, however, we are born with. Differences in talent, skills, or abilities, are not subject to state distribution. What the state should do, however, is guarantee that these inequalities are directed to everyone's advantage. This can be achieved by safeguarding equal citizenship and equality of opportunity. Rather than holding back those with natural advantages, it must encourage them to work for the benefit of the least well-off. As long as there are positions open to all, and the first principle dictates the distribution, inequalities are permitted. But most importantly, if both principles are respected, each citizen will be able to gain their autonomy.

Rawls' theory does not pursue a collective goal; there are no social obligations for the citizens.

This does not mean he does not believe in a form of governance over individuals. On the contrary, he is very concerned with maintaining equality of opportunity and distribution, which must be secured by a constitution and a government. But he accepts the idea that society is imperfect, and that laws cannot be to everyone's accordance. Therefore, he constructs an idea of citizenship in which the maintenance of equal liberties allows each person to pursue their individual autonomy. Citizenship entails that a person's rights are secured, which is of greater importance than the wellbeing of society.

Amitai Etzioni clearly states his confrontation with this libertarian perspective. "There are no well-formed individuals bereft of social bonds or culture" (Etzioni, 1996, p. 3), he states. Etzioni critiques Libertarian opposition to the idea of the common good and holds that emphasizing individual preferences tends to exempt individuals from a social duty. His communitarian perspective crystallises in the idea that joint efforts between individuals will always bring better results. His definition of community is based on two clauses: (1) "a community entails a web of affect-laden relations among a group of individuals" and (2) a "community requires a commitment to a set of shared clause, norms, and meanings, and a shared history and identity" (Etzioni, 1996, p.5). Consequently, he shows that a community can also have an identity and can be treated as a sole unit. This pivots around a basic liberal principle: instead of going from the individual to the society, Etzioni recognizes the communal identity as the source of individual autonomy. But for the community to be considered authentic, in the sense of really embracing its members, a third clause must be added to this definition: (3) "communities are characterized by a relatively high level of responsiveness" (p. 5). In other words, a high level of responsiveness means that a community's values reflect the needs of its members. With this last point, it seems like Etzioni shows that he is not as against the liberal concept as we might have thought. Although, can the individual needs of a community's members still be addressed in a communitarian society?

Etzioni appeals to the *basic forces* to answer this. According to that theory, communities are subject to two opposite forces. On the one hand, there are the centripetal forces. These pull the members of a community towards the common good, combating individualistic behaviors that are not aimed at benefitting society. On the other hand, we have the centrifugal forces. These, conversely, push aside communal objectives to guarantee the self-expression of the members. Together, both forces represent the clash between the need for order and the need for autonomy which exist in a community. Etzioni calls the relationship between these opposing forces an *inverted symbiosis*. The two forces coexist in equilibrium, enhancing each other up to a point. But when one of them surpasses the other the relationship will crumble. This is why, throughout history, societies have had to find ways to keep this balance: taxes, constitutions, changes of political systems, etc. A community must make a constant effort to respond adequately to its members' needs. Etzioni therefore disagrees with classic communitarians, who would suggest that a society must rely on "socializing the members to accept the community's demands" (Etzioni, 1996, pp. 10), and moves towards a middle point closer to the Rawlsian idea of autonomy.

However, this can even be taken a step further. In her essay *Democratic Citizenship and the Political Community* (1992), Chantal Mouffe proposes a synthesis of both schools of thought. To rephrase the socialist ideal in the form of Radical Democracy, Mouffe 'collects' ideas from both sides to come up with her own original theory. Let us follow her argumentation. Liberals such as Rawls have defended the idea that citizenship is "the capacity for each person to form, revise and rationally pursue his/her definition of the good" (Mouffe, 1992, p. 226). As far as the basic liberties are concerned, people will then try to pursue their self-interests. The communitarians react to this by defending the existence of a common public good, which should be placed above individual interests. Although Mouffe agrees with the latter, in that a community feeling will encourage political participation, she also warns about their refusal of pluralism. The idea of a common good is both implausible and dangerous, as it can limit basic individual liberties and lead to totalitarianism.

Similarly, she recognizes the contribution of the liberal notion of multiple conceptions of the good to the idea of a universal citizenship, though not without pointing out that this has simultaneously "reduced citizenship to a mere legal status" (Mouffe, 1992, p. 227). This liberal view shows a lack of civic concern, while Mouffe argues, based on the ideas of Quentin Skinner, that a communal idea beyond personal interests is crucial to enjoy our individual liberties. This may sound similar to Etzioni's theory of the inverted symbiosis, however, we will now see that Mouffe is not talking about a substantive common good, but rather about creating a common citizens' identity.

One of Mouffe's criticisms of Rawls is directed towards his principle of positioning the right over the good. This is precisely why the idea of the veil of ignorance is so important in his theory. The theory of justice must not be influenced by any personal preconception, but must take into account a plurality of conceptions of the common good in order to be accepted by all citizens. Mouffe identifies the impossibility of a modern democratic society achieving a substantive common good. But once again she points out a weakness in Rawls' argument, which takes for granted the fact that a particular set of institutions and values have to be established to guarantee the rule of the right over the good. This is derived from the communitarian critique of liberalism. As mentioned before, Mouffe was concerned with the fact that liberalism lacks a collective duty, resulting in "an increasing lack of social cohesion in democratic societies" (Mouffe, 1992, p. 230). Communitarianism, on the other hand, attempts to reconnect ethics and politics: a lost relationship. Mouffe tries to incorporate morality into liberal pluralism in order to define the new citizen: a person who is ruled not by self-interest or a social good, but by a common identity based on freedom and equality. In terms of political association, this will result in the creation of a new identity that can be enjoyed by people who, even belonging to different, smaller communities, will not lose their common bond with this new societasof ethico-political values. This will have created a new conception of the we (in contrast to them; the 'enemy') based on liberty and equality; "a chain of equivalence among their demands so as to articulate them through the principle of democratic equivalence" (Mouffe, 1992, p. 236).

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¹ The term with which he chooses to refer to the supporters of the 'championing of the individual' (Etzioni, 1996, p. 3), in which he includes Rawls.

We have now seen three closely interrelated approaches to the matter of citizenship. Firstly, we examined John Rawls' theory of justice developed, in which a citizen must be guaranteed their basic liberties and equal social and economic distribution in order to enjoy individual liberties. Secondly, Etzioni confronted Rawls' individualistic-centered theory incorporating the communitarian concept of the social good. In an authentic community, he explains, citizens needs should be reflected in the community's values, balancing the individual autonomy and the pursuit of the common good. Lastly, Mouffe takes the Rawlsian idea of freedom and equality as basic rights of the citizens and turns it into a common identity, which can be shared by a collective of people belonging to different communities. This can propose a solution to our initial question of how to maintain the autonomy of smaller communities in a pluralistic movement. The three approaches can be seen as complementary. Rawls proposes the liberal approach, which Etzioni incorporates into his communitarian background, and Mouffe uses the strengths of each to come up with a new form of politics. As stated, the creation of new communities in our society (i.e. social movements, women, workers, etc.) makes it increasingly difficult to come up with a means of representation. Mouffe's approach advocates that this collective of communities bond under a common set of ethico-political values. The new politics, then, should be a politics of coalition. Accepting their inherent differences, the social movements can refrain from dividing into smaller communities, and join under their shared interest in order to confront the actual political system.

CASE STUDY

Mouffe points out "the need for a new form of identification around which to organize the forces struggling for a radicalization of democracy" (pp. 225). By confronting the liberal and communitarian theories, she proposes a new concept of citizenship based on a 'chain of equivalence', through which people of different movements associate under a common interest or identity to potentially "restore the dignity to the political" (pp.238). But can this be taken to practice? The protests in Spain that developed

into the 15-M movement seem to offer a case study suited to the model of new formed identity that Mouffe proposes. In the following part, this paper will look into this case by comparing it to the theory exposed and evaluate if, indeed, it adapts to Mouffe's definition of common identity.

BACKGROUND

Prior to the protest in May 2011, when the movement emerged, the situation in Spain was growing critical. After years of growth and economic prosperity the country was deeply immersed in the financial crisis that shocked the world in 2008, and several issues troubled its citizens. For instance, 84.1% of the population identified the unemployment rate (20% among the general population and 40% among the youth) as the biggest concern to them. As the second-most pressing concern, almost 78% of the citizens polled believed that the economic situation in Spain at that time was 'bad' or 'very bad' with little chance of improvement, an opinion sustained by the danger of European intervention due to the country's bad financial situation (Beas, 2011). The political situation was equally damaged. Many politicians that were still in power were linked to corrupt operations. With upcoming autonomic elections, the two major parties, the Spanish Socialist Workers' Party (PSOE in its Spanish initials) and the People's Party (PP), were again regarded as (almost) the only options. However, the population seemed discontented with both organizations, and the general trend towards a two-party system. Barely any political figures scored higher than 5 in a scale from 0 to 10. On top of that, the same people who were responsible for the damages of the crisis (bankers, brokers, etc.) were still entrusted with leading the country out of it, and continued receiving enormous bonuses. Overall, the people were starting to find their environment unacceptable, and the disconnection with the politicians was growing.

But even in this pessimistic environment, the response to the 15-M protests was surprising. Similar protests had taken place in the months before, but these were organized mainly by leftist political organizations and labor unions and were not able to

mobilize enough people. The 15-M protests, however, had been formally organized by two mostly unknown organizations, *Democracia Real Ya* (Real Democracy Now) and *Juventud sin Futuro* (Youth with no Future), with little or no political affiliation. Thousands of people marched towards the Puerta del Sol, a square in the middle of Madrid. Police charges enraged some of the pacifist participants, who then decided to occupy the square as a sign of their discontent. More protests were organized in response to the charges, and three days later the Central Board of Elections (JEC) decided to ban the occupation of Sol due to the proximity of the autonomic elections (Errejón, 2011, p. 121).

But instead thousands of people started to attend the protests regularly, which rapidly extended to other major cities in Spain. These protests evolved into social spaces for discussion, as regular public assemblies were formed to discuss the issues bothering the citizens. The movement's organization was horizontal, with no visible leaders and no political affiliation. In fact, its political independence was one of the fundamental principles from the start (Romanos, 2011, p. 1).

The movement had its first struggles when the elections approached. Due to the heterogeneity of its supporters (protesters came from different classes, ideologies, races, etc.), there had been little consensus on whom to direct the vote towards. The campaign #nolesvotes ('do not vote for them'), which intended to prevent people from voting for the major parties, had massive support among the *indignados* (translated as 'the Outraged'), a term commonly used to refer to the protesters. But it was not clear whether this meant voting for a minor party, voting blank, or not voting at all. The elections resulted in a comfortable victory for the People's Party.

The movement continued during the summer months, gradually transforming the initial occupation of the Sol square, which caused several clashes with the government and was harming its popularity,

into a decentralization of the assemblies into neighborhoods, but always keeping a horizontal and autonomous organization (Errejón, 2011, pp. 121-122). Its impact was noticeable throughout the year and was a recurring topic on the public agenda. It is true, however, that in 2012 the movement lost its initial 'spark', and its visibility significantly decreased. One thing, however, has changed; this is the fact that people are more eager to protest injustices. The situation today is even worse that it was at the time of the first protest, with unemployment still rising, and the gap between politics and the people widening. What happened to the movement? Since its decay, a series of similar, more specific, collectives have taken on many of the causes that the *indignados* initially demanded. Such is the case, for instance, of the *Plataforma de Afectados por la Hipoteca* (PAH or, in English, Movement of Mortgage Victims), which focuses on aiding those in danger of being evicted from their homes by impeding the police's access to the house. Or the initiative 'Surround the Congress', which protested against the new and controversial Citizen Security Law. In effect, various movements, organizations, and collectives, use the networks formed during the peak of the 15-M, and are now benefiting from its identity while not taking advantage of their name (Sánchez, 2013). But what is this identity?

CHARACTERISTICS OF THE MOVEMENT

It is hard to describe such a recent social movement, with its effects still being noticed in the many actions taking place regularly. Although it is undeniable that its immediate impact, and the amount of supporters rapidly gained, constitutes a remarkable fact. How did this happen? First of all, let us point out the fact that the 15-M was an inclusive social movement and not a political party or any other sort of organization, uniting a variety of groups that shared a collective goal. As Eduardo Romanos points out, the difference between a political party and a social movement rests on the fact that the former aims for the representation of the interests of its members (a communitarian perspective) while the latter aims at redefining the

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[2] In some way, we can here identify Etzioni's idea of *layered loyalties*.

[3] The change of the electoral law to one in which blank vote was counted was also one of the demands of the indignados, as with the actual system, blank votes would beneficiate the major parties.

cultural and political sphere in which those interests operate (2011, p.2).

The same author identifies three basic principles of social movements in the success of the 15-M: equality, transparency, and inclusivity (Romanos, 2011, p.6). The first two are easily identified. The equality can be seen in the horizontality of its organization. Since the public assemblies were chosen as the strategic method of communication, these were open to everyone. Most of these assemblies took place in the street and were then divided into different categories (neighborhoods, topics, etc.) that molded to the qualities and interests of each citizen. The assembly-based system also helped to guarantee transparency. Furthermore, since the beginning of the movement, a big effort was put in recording the ideas posed in such assemblies and making them available to everyone online and in general assemblies. Lastly, the inclusivity lay in the plurality of groups embodying the movement. Here we can already see how Chantal Mouffe's theory is in practice. This inclusivity was made possible by the insistence of avoiding a connection to any sort of ideology or political organization, allowing its identification with such a wide part of the population (García Abad, 2012, pp. 4). These characteristics made it possible to turn the movement into "a common recognition among different groups struggling for an extension and radicalization of democracy" (Mouffe, 1992, p. 236).

A COLLECTIVE IDENTITY?

After developing the theoretical part of the paper and explaining the basic features of the case study of the 15-M movement, the question we encounter now is whether this movement can be interpreted under Mouffe's theory. What Mouffe proposes is to first define the new community (although not in the 'strong sense') by accommodating "the distinctions between public and private, morality and politics [...] without renouncing the ethical nature of the political association" (1992, p. 231). Does the 15-M constitute such a community? It seems that it certainly falls under the description of societas as a civil association united not by action, but by an 'identifiable association' used by the author. This association would be the 'indignation', the rejection of the actual rules of the Spanish political and economic game. The citizens,

independently of their characteristics, gather around the democratic principles they think are being violated. The protection of these principles constitutes their common interest. Furthermore, the movement is also defined by the confrontation of people-regime (*pueblo-régimen*). The identity of 'the people' against the regime is superimposed over other national relationships, such as the ideological or ethnic. It is a clash between the citizens, who embrace this new identity, and the old regime, which is trying to be changed. Thus, the ethico-political value of this identity is clear. The aims of the *indignados* could very well be interpreted as a more specific (in the sense of appealing to the conditions of Spain) interpretation of the principles of liberty and equality that Mouffe talks about. It is precisely the emergence of this common identity that constitutes the biggest legacy of the original movement, allowing such an array of actions and organizations to continue pursuing its goals.

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Governmental Role in the Reduction of Food Waste in Developed Countries

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ABSTRACT

With a rising world population, diminishing resources, and global warming, finding an effective way to reduce the amount of food waste is becoming a priority. Government intervention in the form of new policies is needed to reduce food waste in developed countries. An international literature review examined the historical background of consumer behaviour, past government intervention, and potential policies that could be implemented today. Due to cheaper food, its increased availability and disconnection with its production, the value and appreciation of food in today's industrialized society has diminished, resulting in wasteful behaviour. During the two World Wars the pressure of scarcity was not enough to change consumer behaviour, so governments successfully intervened with strict policies and big propaganda campaigns. Today, the prediction of ending resources, growing world hunger, and global warming, are less urgent than the World Wars were, making the importance of government intervention much higher. Policies are needed at retail level in the Food Supply Chain to adapt what is made available in order to change consumer behaviour and show the importance of reducing food waste. Smaller package sizes, and prohibition of food waste based on aesthetic standards, have the potential to reduce the amount of food wasted. Government action is needed to implement these kinds of policies.

Half of all the food globally produced for human consumption is wasted (Parfitt, Barthel and Macnaughton, 2010, p.3065), while 870 million people go hungry worldwide (FAO, 2012). To some, these numbers may seem alarming, and in a world with finite resources and with the prospect "of feeding a population of 9 billion people by 2050" (Parfitt et al., 2010, p.3065) one might ask why so much good food is being wasted. Several studies look at the amount of food waste in different levels of the Food Supply Chain (FSC) in order to determine where the problem lies and how improvements can be made. A difference is made between food losses and food waste. The first refers to the amount of food that is lost during the primary stages of the FSC, when food is produced and prepared for human consumption.

The second refers to "food losses occurring at the end of the food chain" (FAO 2011. p.2), namely the distribution and consumption levels. Studies indicate that, in developed countries, food waste often happens at distribution level due to emphasis on the physical and aesthetic appearance of food, as well as at the consumer level, because food waste is affordable. In less developed countries, most food is lost at lower levels of the FSC because of the weather, a lack of inadequate technology, and a lack of knowledge on how to treat and conserve the food. Whenever food is lost or wasted it is not only food being lost, but also the energy, land, and water that have gone into creating it. Since the earth's resources are not endless and global warming is 'topic of the day', it is very important to reduce the amount of food waste.

Several studies imply that this could be achieved by investing in knowledge on food treatment, production, storage, and processing techniques, in non- developed countries, and by informing and changing consumer behaviour in developed countries. These studies give a nudge in the right direction; however, they do not present a concrete explanation of how to change consumer behaviour, nor is it clear who is to blame for this type of behaviour. In an attempt to reduce the amount of food waste in the developed world, it is important to first understand the historical background of the issue, and how this culture of wastefulness developed. Secondly, a closer look will be taken at the government's role surrounding food waste in the past, before it is argued that government intervention in the form of new policies is needed to reduce the amount of food waste in developed countries.

It is necessary to look at the historical background of consumer behaviour to try and explain what has changed to make food waste acceptable in our society. After conducting an extensive review of the literature one could argue that the amount of food waste is not rising solely due to the growing population, but more importantly because of the change in the value and appreciation of food. There are several factors that influence this change in the consumer's view of food; for instance, Bloom (2010) suggests that today's generations have had a relatively easy life compared to generations that lived through the World Wars and the Great Depression. Everything, including food, is easily accessible nowadays, which could diminish people's appreciation of it. Additionally, another factor that should be taken into account is that food has become cheaper over time. This is partially due to the Industrial Revolution in the 19th century, which resulted in more food being produced with much less effort.

Moreover, "yields have improved substantially, through the implementation of improved cultivars, engineering and field practices" (Institution of Mechanical Engineers, 2013, p.9), resulting in lower food prices. Another influential factor that one should consider is the large set of agricultural subsidies that started in the 1930s, helping keep food prices artificially low (Edwards, 2009, para. 5). Research conducted by the United States Department of Agriculture (2012) states that the portion of the disposable personal income spent on food in the U.S.

went from 23.4% in 1929 to 9.8% in 2011. According to Parfitt et al. (2010), consumers tend to waste more food as they spend a smaller proportion of their income on it. This is also suggested by the FAO (2011) which concludes that food is wasted in developed countries simply because it is affordable. Benson (2011) argues that there is yet another factor which changed the value of food; before urbanisation most people lived on farms where they produced their own food, they had a better view of how much effort goes into the production "and, thus, [understood] quite a bit more about the real value of food" (para. 6). It could be argued that an interplay of circumstances influenced consumer appreciation of food, and in order to reduce food waste in developed countries a change in the consumers' view of food is needed.

Over the past few years many initiatives have been started in the hope of making consumers more conscious about the amount of food being wasted and the importance of reducing food waste. Though these initiatives reach millions of people and save tonnes of food from being unnecessarily disposed of, "they are a mere drop in the ocean against the true scale of the problem" (Bond, 2009, para. 3). Government policies, however, have had good results in the past, thus they could probably also be made to work if implemented in the present. During the two World Wars there was a great scarcity of food in the U.S. and Europe, in response, several campaigns to reduce food waste were launched. The U.S. government, for example, urged their citizens to adjust their peace-time routines through the use of an extensive publicity campaign that included putting up posters conveying messages like 'Serve just enough', 'Save what will keep' and 'Eat what will spoil' (U.S. Food Administration, 1917) all over the country. By doing this an environment was created in which food waste was not accepted, thereby altering the consumer's value of food. In addition to the posters, the legislators during the First World War considered passing a bill limiting the amount of food distributed to restaurants, hotels, and others, in order to reduce the amount of food waste (New York Times, 1918). Similarly, the British government introduced rationing measures during both World Wars, and introduced legislation that made food waste illegal in August 1940(Simkin, n.d., para. 12). Some might consider these laws too strict, but desperate times called for desperate measures. In fact, the effect of these policies is still

visible today, since several studies "suggest that young people waste more than older people" (Parfitt et al., 2010, p. 3077). It might be suggested that when consumers live in an environment where they feel the pressure of scarcity, the value of food is automatically heightened. But history also suggests that strict government policies are sometimes needed to make sure that consumer behaviour is changed. Neither global warming, nor future scarcity of resources, nor predictions of hunger seem to be pressing enough to change consumer behaviour. Awareness initiatives are important to make the problem more vivid, but alone they are not enough to change behaviour. Government policies, on the other hand, have the power to impose certain behaviour, which is why the help of legislation is needed to reduce food waste in developed countries.

There are many different policies that governments can implement to reduce food waste. Possibly a good starting point would be the implementation of stricter rules on a retail level of the Food Supply Chain. It might seem paradoxical to implement policies on a retail level in order to change behaviour on a consumer level, but this is based on the assumption that people buy what is made available. Policies are, therefore, needed to change what is made available in order to change consumer behaviour. A first step that governments could take is reducing package sizes sold in supermarkets. This is because over the past 10 years the number of single-person households has risen by 30.1% and is expected to rise further (Euromonitor International, 2012, p.2). In their study, Parfitt et al. (2010) state that single-person households "tend to throw away more per capita" (p.3076). This could be explained by the big package sizes in supermarkets, resulting in people buying more than they need, and throwing it away when it spoils. By reducing package sizes it would ben possible to buy only the amount that will be consumed, resulting in less waste being produced. A second policy that governments could implement is the prohibition of fruit and vegetables being disposed of for aesthetic reasons. Several studies show that farmers currently leave entire crops, or portions of crops, to rot on the field because of the high aesthetic standards of retailers (Institution of Mechanical Engineers, 2013). It seems as though retailers fear that crooked cucumbers or funny looking carrots will not sell, but if government passes a bill making it obligatory for all retailers to sell these

kinds of vegetables next to the perfect looking ones, consumers will start to buy them, as this is what is made available. Because these new policies directly impact what is made available for all consumers the whole of society is reached at once, which might have a great impact on consumer behaviour. Moreover, by intervening in this way, the government is demonstrating how important it is not to waste food. Thus the government could set the right example, and, in doing so, coerce society into valuing food more. The amount of food wasted in developed countries has seen a high increase over the past decades. In Britain the food wasted at consumer level went from between 1 and 3% in 1939 to 25 % in 2010 (Parfitt et al., 2010, p.3074). A literature review suggests that increased accessibility to food and a smaller portion of the consumer's income spent on it (due to a more efficient production resulting in cheaper prices and an increased disconnection with the production process), contribute to a decrease in the value of food resulting in billions of tonnes of food being wasted annually (Institution of Mechanical Engineers, 2013, p.2). A growing world population, increasingly scarce resources, and global warming, suggest that this behaviour is becoming problematic, but these issues do not seem to be pressing enough for behaviour to change. Government intervention has been needed in the past, when the pressure of war was present in society, which indicates that government help is even more important now that the urgency is not as tangible. It may be that as strict government policies altered the value of food and imposed certain consumer behaviour in the past, such measures could also work in the present. The list of suggested policies in literature is extensive, however, policies on retail level should be the first step governments take. Reduced package sizes at retail level would give consumers the opportunity to buy just what is needed, and by obliging retailers to sell fruit and vegetables that would previously have been discarded, consumers could be stimulated to buy them. By implementing policies on a retail level a change is made in what is available to society as a whole, which could directly influence its behaviour. Furthermore, governments setting a good example would seem to enhance the appreciation of food, and a society might be created in which food waste is unacceptable. One should keep in mind, however, that these are not the only policies that might work; extensive research has been done

by different agencies in various developed countries and they all suggest potential for change. Rather than invest further research in this direction it may be time for a drastic change in governments' food policy.

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The Caveman in the Classroom: evolutionary gender difference in conscientiousness as a mediator for academic performance?

Imca Hensels

ABSTRACT

In recent years, a gender difference in academic performance during childhood and adolescence has been systematically reported, with girls generally scoring higher than boys. In the search for an explanation for this variance in academic performance, a corresponding gender difference in conscientiousness currently seems to be the most promising. To provide a possible mechanism with which the gender difference in conscientiousness can be explained, this paper argues that increased conscientiousness in women has evolved as an evolutionary adaptation. The proposed mechanism is based on the theory that recklessness, as opposed to conscientiousness, is beneficial for men, yet harmful for women. Women are deemed the higher-investing sex and the primary caregivers, the conscientiousness of the mother is likely to be an important determinant of the offspring's well-being. The fact that the gender difference in conscientiousness has been replicated across multiple age groups, as well as cross-culturally, presents compelling evidence for a possible evolutionary foundation of the personality trait. This recognition has important implications for the way in which the current gender difference in academic performance is dealt with, and should be considered when making an attempt to diminish this discrepancy in academic performance between the sexes.

In recent years, a number of articles have been published that systematically report a sex difference in academic performance among adolescents, with girls generally receiving higher grades than boys (cf. Heaven & Ciarrochi, 2012, p. 519; Komarraju, Karau, Schmeck & Avdic, 2011, p. 474). So far, a convincing explanation for this phenomenon has not yet been provided. One hypothesis that has been ruled out is the notion that women are simply more intelligent than men; besides their well-established advantage of generally having better results in class than boys, girls do not seem to score higher on "standardized tests, including the SAT", and the IQ test (Duckworth & Seligman, 2006, p. 198; De Fruyt, Van Leeuwen, De Bolle & De Clercq, 2008, p. 167; p. 168). A different hypothesis that has been offered for consideration is that the difference in academic performance stems from a corresponding gender difference in conscientiousness, which, together with 'neuroticism', 'openness to experience', 'extraversion', and 'agreeableness', make up the Big Five of personality traits. Within this commonly used assessment of personality, conscientiousness is the trait that includes "self-discipline, achievement striving and dutifulness" (De Fruyt et al., 2008, p. 169), and is positively correlated with academic performance (Duckworth & Seligman, 2006, p. 204; Heaven & Ciarrochi, 2012, p. 518; Komarraju et al., 2011, p. 476; De Fruyt et al., 2008, p. 169). In line with this hypothesis is the fact that a gender difference in conscientiousness has indeed been established on multiple occasions (cf. De Fruyt et al. 2008, p. 169; Duckworth & Seligman, 2006, p. 205). Where this difference originates, however, is still highly under researched and will be the focus of this paper. In the nature versus nurture debate that

usually around the question of a personality trait's origin , this paper will argue that there is reason to believe that increased conscientiousness in women as compared to men has emerged as an evolutionary adaptation. To provide a foundation for this hypothesis a number of components will be addressed that are necessary when arguing for an evolutionary origin using Tinbergen's model of ethology (1963, p. 411). Section one will present a possible mechanism for conscientiousness as an evolutionary adaptation to assess the function of the behaviour. The second section will review evidence regarding the age at which the gender difference emerges in order to track the ontogeny. The last section will consider the cross-cultural replication of the gender difference in conscientiousness to support the mechanism proposed in section one.

THE PROPOSED EVOLUTIONARY MECHANISM
To explain higher conscientiousness in women from an evolutionary point of view, one could make use of the parental investment theory (Buss, 2012, p. 108). The basic assumption of this theory is an unequal division of investment in offspring between the father and the mother; in this division, women are the higher-investing sex (Fischer & Hills, 2012, p. 531). This means that when a child is born, the mother, as opposed to the father, is generally the primary caregiver, which makes having children more time-consuming and costly for females. This, paired with the fact that childbearing in general is a risky endeavour, forces women to be more selective when it comes to mate choice (Buss, 2012, p. 108). As such, the burden of showing off high dominance in order to gain access to female mates generally falls onto the men. This, coupled with the fact that from an evolutionary point of view males demonstrate their mating value by showing off their prowess and physical fitness in dangerous situations, shows that they are necessarily also the more risk-taking and competing sex (Fischer & Hills, 2012, p. 531).

Theoretically, a personality trait that goes hand in hand with this kind of risk-taking is impulsivity (ibid., p. 533), as "male intrasexual competition" should

make males more prone to "venturesomeness" to show off their dominance (Cross, Copping & Campbell, 2011, p. 103). Indeed, men have been shown to score significantly higher on impulsivity than women (p. 111). This result is compatible with the fact that conscientiousness is measured to a larger extent in women, as conscientiousness and impulsivity can be regarded as two mutually exclusive traits: conscientious individuals are generally characterized as being structured and self-disciplined rather than impulsive (De Fruyt et al., 2008, p. 169). Therefore, from the point of view of the parental investment theory, conscientiousness is more befitting for women: as children are most dependent on their mothers, women need to be reliable caregivers, planning their actions around the needs of their children. In prehistoric times, rash actions on the mother's part could get her injured, leaving her children utterly unprotected, and result in the death of her offspring and failure to pass on her genes (Buss, 2012, p. 108). Thus, being reliable, cautious, and generally conscientious instead of rash, would give a female's children better chances of surviving and reproducing themselves. Therefore, conscientiousness increases the reproductive success for females more than it does for males, possibly explaining the manifestation of a gender difference with regards to academic performance in adolescence better than earlier-mentioned hypotheses such as a difference in IQ.

DEVELOPMENTAL EVIDENCE
According to Tinbergen's model (1963, p. 411), merely outlining a plausible explanation of the function of a specific behaviour is not sufficient to establish that the behaviour has developed as an evolutionary adaptation. Additionally, the ontogeny, or development across age groups of animal behaviour, must be mapped (p. 411). While the assessment of temperament in children does not actually encompass conscientiousness, it does measure a different dimension that is commonly used as its equivalent: effortful control (p. 35). The definition of effortful control by Elze-Quest et al. (2006) especially illustrates the large overlap between effortful control and conscientiousness , as they define

effortful control as "[including] dimensions such as attention focusing and purposeful shifting, perceptual sensitivity, persistence, and inhibitory control ..., [reflecting] personality traits such as attention, inhibitory control, and achievement motivation" (p. 35). In their meta-analysis, Elze-Quest et al. (2006) showed that although there hardly seem to be any striking gender differences in temperament overall – as measured in a population of children ranging from 3 months to 13 years of age – a large difference in favour of girls does exist for effortful control (p. 57).

But this observation in itself does not necessarily mean that the sex difference is evolutionarily determined. After all, even children of a young age could already very well be influenced by prevailing social gender roles. However, the studied population included a sizeable group of children below 2.5 years of age, which is generally used as the cut-off age after which children become aware of their own gender and start internalizing the social roles that are linked to it (LoBue & DeLoache, 2011, p. 663). Therefore, the finding that children even younger than this critical age of 2.5 years display a significant gender difference in effortful control poses strong evidence for the idea that this specific temperament trait has its roots in an evolutionary adaptation.

CROSS-CULTURAL EVIDENCE
Besides the onset of the gender difference, another factor that needs to be considered when determining the existence of a female biological predisposition for conscientiousness is the degree of cross-cultural replication of the findings. Even though the same gender roles are not upheld everywhere, a trait occurring cross-culturally is usually regarded as compelling evidence for a trait to have a hereditary basis stemming from an evolutionary benefit for the carriers of the gene in question (Buss, 2012, p. 243). With regard to conscientiousness, the cross-cultural evidence that has been found so far is mixed. In a meta-analysis concerning this subject, Schmitt, Realo, Martin and Allik (2008) investigated gender differences

in the Big Five personality traits across 55 different cultures and found a widespread gender difference in favour of women for conscientiousness.

It should, however, be noted that the discrepancy found, although systematically reported, is only of moderate strength, and that considerable variance exists between all countries for which the difference was found (pp. 168-174). For instance, a bigger disparity between men and women was uncovered in individualist cultures than in collectivist cultures (p. 169). The authors themselves provide an evolutionary explanation for this last finding, claiming that the difference between collectivist and individualist cultures could stem from the fact that women in individualist cultures are arguably freer in their development of personality, while more rigid social roles exist in countries with a collectivist culture (p. 169). This, the authors argue, could result in the fact that the personalities of women in individualist cultures reflect the natural predispositions of women better, as they are less restrained by socially constructed gender roles (p. 178). Following this line of reasoning, the larger sex difference in individualist countries further supports the proposed model. While cross-cultural evidence is far from irrefutable, this study, coupled with the study of sex differences in conscientiousness across age groups (Elze-Quest et al., 2006, p. 57; Schmitt et al., 2008, p. 168), could be interpreted as evidence for an evolutionary adaptation.

CONCLUSION
All in all, there is a large body of evidence suggesting that the gender difference in conscientiousness, which research suggests can manifest itself in a gender difference in academic performance, could have its roots in a female evolutionary predisposition for this personality trait. Naturally, to establish that a personality trait is a result of evolution, one always has to make do with indirect evidence, necessarily making it impossible to draw any definite conclusions on the matter. Nevertheless, the two conditions that are commonly applied when attempting to establish

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[1] Throughout this paper, the terms 'sex' and 'gender' will be used interchangeably; it is recognized that there is a subtle difference in meaning, but as it is unclear whether previous studies have intentionally used either 'sex' or 'gender' with this semantic difference in mind, this review will also not differentiate between the two.

[2] Conscientiousness is not commonly measured in age groups younger than adolescence, since "personality", as measured by the Big Five, is a term that is not used in reference to children (Lightfoot, Cole & Cole, 2013, p.148). Instead, one speaks of "temperament" when discussing children's personality characteristics. However, children's temperament has been shown to correlate highly with the personalities that they later develop (Else-ÐQuest, Hyde, Goldsmith & Van Hulle, 2006, p. 34), so the two can be used as an equivalents.

an evolutionary mechanism for an adaptive behaviour have been fulfilled, namely that the behaviour can be found across different age groups and that the finding has been replicated cross-culturally. Therefore, the possibility that women indeed have a natural disposition towards higher levels of conscientiousness than men must be considered. Conscientiousness is a strong predictor of academic performance: it encompasses discipline, self-control and efficient planning (De Fruyt et al., 2008, p. 169), which are salient characteristics of high-performing students (Duckworth & Seligman, 2006, p. 204). So when trying to combat the difference in boys and girls on an academic level, the realisation that it is an evolutionary past – rather than socially constructed sex roles – that is at the root of this discrepancy should be kept in mind. Regardless, to strengthen the proposed evolutionary mechanism, future research will have to show whether the reported difference in conscientiousness is situation-specific or whether it also manifests itself in other, non-academic settings, and whether the gender differences in academic performance, mediated by conscientiousness, can be replicated across cultures.

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