Men behaving nicely: Public goods as peacock tails

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Insights from sexual selection and costly signalling theory suggest that competition for females underlies men's public good contributions. We conducted two public good experiments to test this hypothesis. First, we found that men contributed more in the presence of an opposite sex audience, but there was no parallel effect for the women. In addition, men's public good contributions went up as they rated the female observer more attractive. In the second experiment, all male groups played a five round public good game and their contributions significantly increased over time with a female audience only. In this condition men also volunteered more time for various charitable causes. These findings support the idea that men compete with each other by creating public goods to impress women. Thus, a public good is the human equivalent of a peacock's tail.

Humans are an extremely cooperative species (Barclay, 2010; Fehr & Gachter, 2002). Nevertheless, there are notable differences between the two sexes in the domains in which they cooperate. Whereas women's helping efforts occur more often within smaller, tighter social networks–being targeted at kin, friends, and other long-term relationships–men's helping efforts tend to be more public and conspicuous; frequently targeted at complete strangers, for instance, bystander intervention and the provision of large scale public goods (Benenson, 1990; Geary, 1998; Griskevicius *et al.*, 2007; Latané, 1970; Van Vugt, De Cremer, & Janssen, 2007).

How do we explain such differences and, more generally, how do we account for the provision of public goods? Game theory models have a difficult time explaining why people voluntarily contribute to public goods (Fehr & Gachter, 2002). Here we entertain the possibility that such public good contributions serve as a mating purpose, especially when men are competing for sexual partners.

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This hypothesis is derived from an integration of two well-established evolutionary theories; costly signalling and sexual selection theory. Costly signalling theory suggests that certain traits evolve because they convey honest information about the underlying qualities of an individual, and the costlier the trait the more reliable the signal (Zahavi & Zahavi, 1997). For instance, the conspicuous peacock's tail signals to peahens that this male is healthy and genetically fit (Darwin, 1871; Petrie, 1994). Since public generosity is costly to the self, it may therefore signal important information to others, including potential mates, about an individual's quality (Gintis, Smith, & Bowles, 2001; Zahavi & Zahavi, 1997). However, not all signals need to be a communication of genetic quality, displays of public generosity could also convey desirable personality traits such as trustworthiness, caring, and nurturing (Farrelly, 2010).

Sexual selection theory asserts that men and women are likely to attend to somewhat different signals when they are evaluating potential mates (Barclay, 2010; Buss, 1989). Parental investment is generally high in humans and so it pays for both parents to invest in offspring survival. However, because the variance in lifetime reproductive success is lower for females compared to males–but their biological investments considerably higher–women have more to lose from mating with a partner who fails to invest in their offspring's survival (Bateman, 1948; Trivers, 1972). Women therefore, relative to men, tend to be choosier about selecting mates, and express stronger preferences for mates who signal an ability and willingness to take care of them and their offspring (Brase, 2006; Waynforth & Dunbar, 1995). Since females consider kindness and helpfulness to be important indicators of male attractiveness (Farrelly, 2010; Miller, 2007), an intriguing possibility is that men show off their mate qualities–ability and willingness to care for others–through providing large-scale public goods. Public goods may be a suitable arena for men to show off their mate qualities because by its very nature such contributions are (a) personally costly and (b) altruistic.

The psychological and anthropological literatures have documented various examples of conspicuous altruistic displays when men are in the presence of women. In restaurants, men tip more to female servers (Lynn, 1997), especially those wearing makeup (Jacob, Guéguen, Boulbry, & Ardiccioni, 2009). Lone men give more to female panhandlers than male panhandlers (Goldberg, 1995) and in the presence of women friends; men donate more money to street beggars of both sexes (Latané, 1970). When a mating motive is activated, men engage in more heroic forms of helping (Griskevicius *et al.*, 2007). Finally, women find altruistic men more attractive (Barclay, 2010) and in traditional societies, men who regularly provide meat and share it with others have more wives and sire more offspring (Gurven & von Rueden, 2006). It is not clear yet whether mating motives explain sex differences in public goods. Furthermore, does male-to-male competition for sexual mates actually increase public good contributions as would be predicted by our theory?

Here we use a public goods game to test various aspects of this 'costly signalling' and 'competitive altruism' theory (Hardy & Van Vugt, 2006; Roberts, 1998; Zahavi & Zahavi, 1997). In the first experiment, both men and women play a one-shot public good game in an anonymous group setting via the computer with either a same sex or opposite sex observer in the same room (or no observer). We predict that men will donate significantly more when being observed by a member of the opposite sex. Other theories and data suggest an effect of all audiences (Hardy & Van Vugt, 2006; Zahavi & Zahavi, 1997), but although this may be the case, we expect the effect should be particularly strong for males when being observed by females. In

the second experiment, we introduce male competition and expect that only men will step up their public good contributions over time yet only in the female audience condition.

EXPERIMENT 1

Method

Participants, design, and procedure

One hundred and thirty students (65 males) with a mean age of 21 years were recruited via the university research participation scheme at a large British University[1]. Participants (one per session) were seated in an experimental room, containing a desk, chair, and computer. A 2 (sex: male vs. female) $\times$ 3 (audience: same sex, opposite sex, no audience) between-subjects design was employed with participants randomly allocated to conditions. They played a one-shot public good game via the computer with the other participants while having a confederate, either male or female, or no observer in the experimental cubicle with them. The confederates were two physically attractive individuals, one man and one woman, selected from a sample of 10 female and 8 male volunteers. Twenty independent raters (10 male, 10 female) scored the photographs of these volunteers (opposite sex ratings only) on a scale from 1 to 6 (1 = not very attractive, 6 = very attractive). The independent raters did not participate in the main experiment. The confederates with the highest ratings (female $M = 5.10$, $SD = 0.77$ and male $M = 4.90$, $SD = 0.57$) were subsequently selected as confederates. These confederates sat approximately 3 feet away from the participant in the same cubicle. Participants in observer conditions were not given any explanation for the presence of the confederate in the room, only that they would not participate in the games themselves.

Each participant received £3 (approximately $5) before the game, any amount of which they could put in a private or group fund. At the end of the game, the total donation to the group fund would be doubled and equally distributed among the five group members regardless of each individual donation (a private fund contribution is the choice). It was explained to participants that the five players were not in the lab at the same time, but made their donation choices sequentially, and that the decisions of five participants would be aggregated. Thus, they did not know who the other donors were. Because participant's earnings relied upon the donations of others made sequentially in time, calculations of earnings were made at the end of the study (when it was known how much each individual in the group had donated), not directly after participation. Financial constraints meant that only six participants could receive the money earned throughout the study, participants were aware that the money they were playing with was real, that they could be one of the six people chosen at random, and therefore the money they earned could be theirs. After all data were collected, six participants were chosen at random, contacted via e-mail, and paid out. On completion of the game, participants were asked several questions including: "How physically attractive did you find the observer" (1 = not attractive at all, 7 = highly attractive), their

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[1] *Data from Experiment 1 include the data from 45 male and 45 females who participated in an original study by Iredale, van Vugt, and Dunbar (2008) which examined opposite versus same sex audience effects on charity donations.*

self-rated physical attractiveness, their relationship status, and their sexual orientation (the data of two homosexual men were subsequently removed from the analysis). In all conditions these questions were answered anonymously and confidentially in the absence of an observer. Finally, they were debriefed, paid what they earned, and dismissed.

Results and summary

All participants correctly identified whether they were being observed and, if so, identified the audience's sex correctly. The public good contribution was analysed with a 2 (sex) × 3 (audience) design (because there was no effect of being in a relationship the data were collapsed across this factor). This revealed a significant main effect for audience, $F(2, 122) = 4.54$, $p = .04$, $\eta^2 = .07$, and marginal effects for sex, $F(1, 122) = 2.83$, $p < .10$, $\eta^2 = .02$, and the interaction between sex and audience, $F(2, 124) = 2.43$, $p < .10$, $\eta^2 = .04$. Because we tested a specific one-directional hypothesis, we compared male and female donations separately, and as predicted, only males significantly differ in public good donations between the audience conditions, $F(2, 60) = 5.57$, $p = .01$, $\eta^2 = .16$, whereas female donations do not, $F(2,62) = 0.82$, $p = .44$, $\eta^2 = .03$ (see Figure 1). As expected, men contribute considerably more in the

Error bars: 95% CI
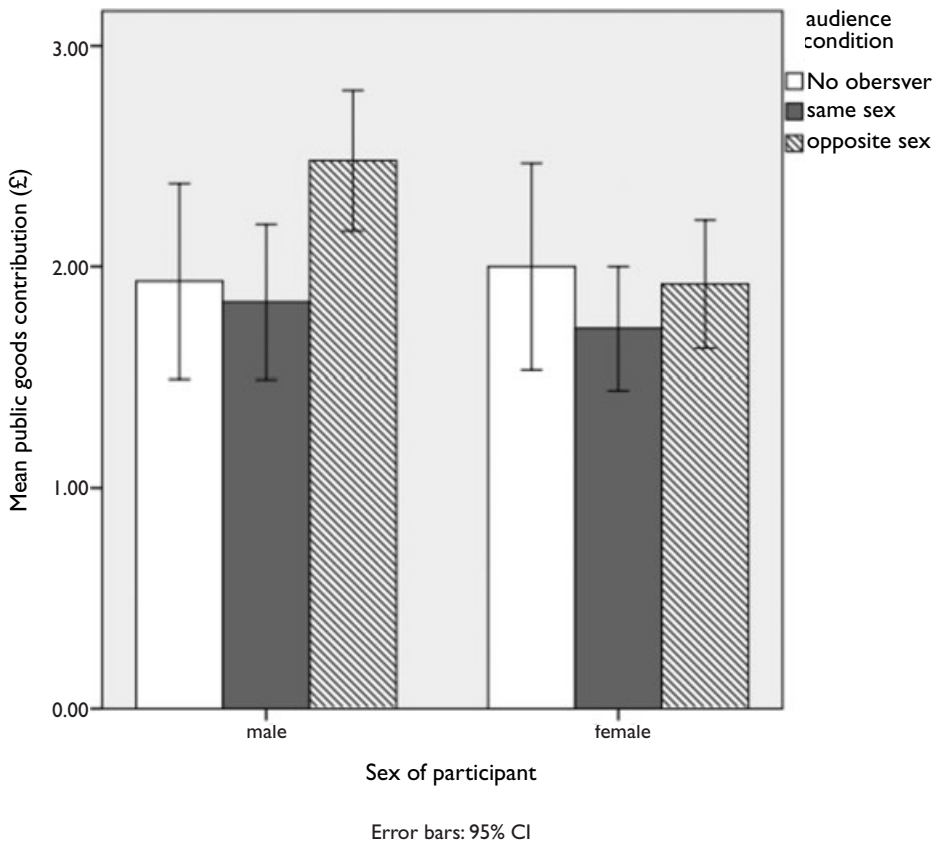
Figure 1. Comparison of male and female public goods donations across the three observer conditions.

opposite sex condition ($M = 2.56$, $SD = 0.73$) than in the same sex condition ($M = 1.84$, $SD = 0.85$), $F(1,46) = 9.99$, $p < .01$, $\eta^2 = .18$, and no audience condition ($M = 1.93$, $SD = 0.79$), $F(1,36) = 6.34$, $p = .02$, $\eta^2 = .15$. For men, the same sex and no audience conditions did not differ from each other, $F(1, 38) = 0.12$, $p = .73$, $\eta^2 = .00$. Women's contributions did not differ between the opposite sex condition ($M = 1.92$, $SD = 0.70$) and same sex condition ($M = 1.72$, $SD = 0.68$), $F(1, 48) = 1.05$, $p = .31$, $\eta^2 = .02$, or no audience condition ($M = 2.00$, $SD = 0.85$), $F(1, 38) = 0.10$, $p = .75$, $\eta^2 = .00$, and there was no significant difference between same sex and no audience conditions ($M's = 1.73$ vs. 2.00; $SDs = 0.68$ and 0.85), $F(1, 38) = 1.33$, $p = .26$, $\eta^2 = .03$.

Finally, as we predicted, men's contributions in the opposite sex condition correlated positively with their attractive ratings of the female observer, Kendall's $\tau(23) = .42$, $p < .05$ (one-tailed test), but not with their self-rated attractiveness, Kendall's $\tau(23) = .09$, $p = .31$.

EXPERIMENT 2

The aims of this experiment were to replicate and extend the previous result. First, all male groups were formed to examine if the presence of a female observer would induce male competition, resulting in greater public good contributions over time. Second, we examined if the salience of a mating opportunity also increased other types of public good displays among men such as volunteering for charitable causes.

Method
Participants, design, and procedure
Sixty male students (all heterosexual; mean age of 21 years) were recruited via the university research participation scheme at a large British University. A one-factor (audience: male, female, no) between-subjects design was employed. Participants were randomly allocated to one of three experimental conditions, a male audience, female audience, or no audience. Upon entering the lab each participant was asked to enter one cubicle along a corridor of four cubicles, containing a desk and chair.

Participants' photographs were then taken on a digital camera, uploaded onto a computer, and printed out so that each participant saw their own face and those of the three other participants on the form. They were then told that only three players could play the public good game simultaneously, and in two conditions, this person had been allocated to the role of observer (there was also a no observer condition). The observer would sit in their cubicle and watch the game being played by seeing the contributions each player made. To give the (false) impression that there indeed was an observer, we included a photograph of either a male or female face (depending on condition) on the form. A pilot study revealed they were both rated as highly attractive (6.0 on a 7-point scale).

The participants then played a five-round public goods game in a three-person all male group. Each round they were asked to fill out on the form underneath their own picture how much of £1 they would invest in the group fund. After each round, participants received a feedback sheet showing how much money each of the three group members had contributed.

After the game they could indicate how much time (in hours per term) they would be willing to donate to charity events run by RAG ('Raising and Giving', a University Union charity fundraiser). They were asked to commit their hours on RAG logo sign-up sheet and leave their e-mail address so that the charity could contact them. The charity events

were based on volunteer activities (Bereczkei, Birkas, & Kerekes, 2007) and included, for instance, organizing a day for blood donation, collecting donations for charity, and providing assistance for disabled children ($\alpha = .83$). RAG was selected because it runs volunteer activities similar to those presented in the study and students are familiar with it as a charity organizer. Although there was no follow-up of these activities, none of the participants raised suspicions about these requests. On completion of the tasks the participants were debriefed, paid what they earned, and dismissed.

Results and summary

All participants correctly identified the sex of their fellow group members and (depending upon the condition) the sex of the person observing them. Participants indicated that they knew that the Kent Unions' charity fundraising group RAG was organizing charity events as presented in the study and all participants who agreed to volunteer in the RAG activities left a contact e-mail address.

We examined the contributions in a repeated measures ANOVA with a 3 (audience) $\times$ 5 (round) mixed design. This analysis revealed a main effect for audience, $F(2, 57) = 4.28, p < .05, \eta^2 = .13$, which was qualified by the predicted marginally significant interaction between audience and round, $F(8, 110) = 2.21, p < .10, \eta^2 = .09$. Contrast analyses suggests that only the linear trend was significant, $F(2, 57) = 3.14, p = .05, \eta^2 = .10$ (see Figure 2).

We calculated the difference between the round 1 contributions and the round 5 contributions for each condition. As predicted, in the no audience-condition contributions dropped between round 1 ($M = 54.40, SD = 34.66$) and round 5 ($M = 33.55, SD = 34.46$), $t(38) = 1.91, p < .03$ (one-tailed test). In the male audience-condition there was a non-significant decline in contributions between round 1 ($M = 65.25, SD = 33.70$) and round 5 ($M = 57.10, SD = 38.35$), $t(38) = 0.71, p < .48$. Consistent with our hypothesis, in the female audience-condition there was a significant increase in contributions between round 1 ($M = 68.25, SD = 27.35$) and round 5 ($M = 84.00, SD = 28.36$), $t(38) = -1.84, p < .02$ (one-tailed test).

Finally, the amount of time (hours per term) men volunteered for different charity activities differed significantly between the three conditions, $F(2, 57) = 6.07, p < .001, \eta^2 = .03$. With a female audience, men volunteered more hours per activity ($M = 6.00; SD = 3.91$) than with a male ($M = 1.51, SD = 3.29$), $F(1,38) = 9.64, p < .001 \eta^2 = .04$, or no audience ($M = 2.73, SD = 6.26$), $F(1,38) = 3.69, p < .05 \eta^2 = .02$–the latter two conditions did not differ significantly. The greatest differences between the conditions were found for blood donation and assistance of handicap children. Please see Table 1 for a breakdown of the mean time contributions (hours per term) for each of the six volunteer activities across the three conditions.

GENERAL DISCUSSION

This research tested the hypothesis that men strategically (but not necessarily consciously) contribute to public goods to impress women. As predicted, men increase their public good contributions when being observed by a female who does not herself profit from these contributions. This finding helps to understand why particularly men conspicuously contribute to public goods because such acts of kindness enhance their reputation as mates. Men's conspicuous consumption displays, such as buying an expensive car, to impress women are well documented in the literature; yet these actions merely convey that these men are wealthy (Griskevicius *et al.*, 2007; Sundie *et al.*, 2011).
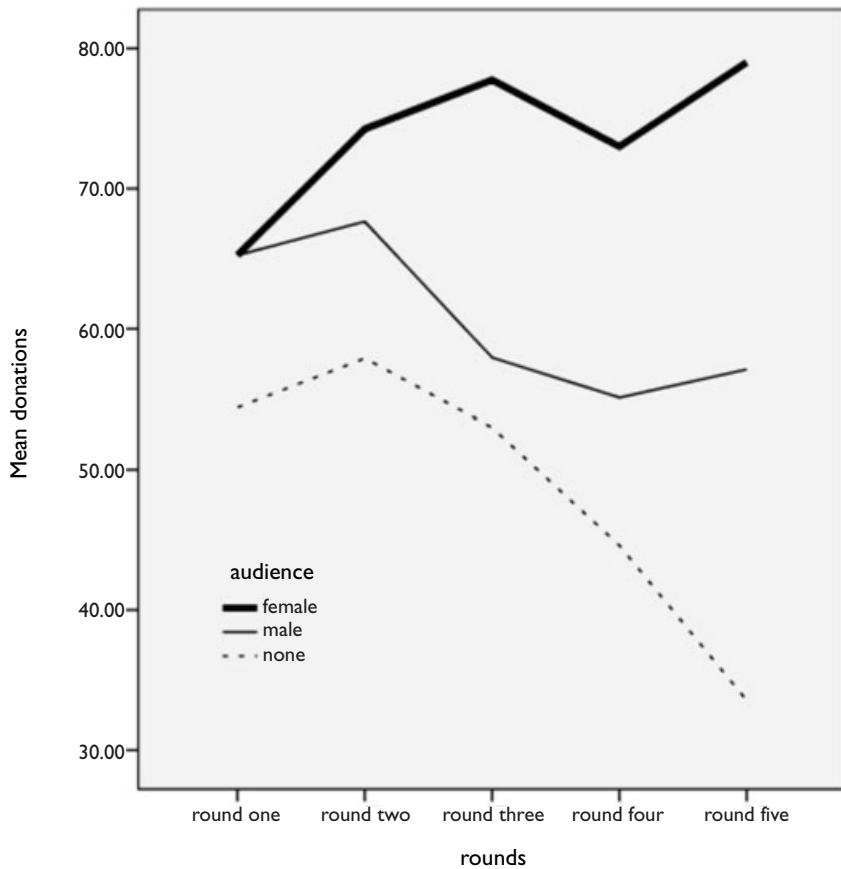
Figure 2. Comparison of men's mean contributions in each of the three conditions across five rounds of the public good game.

A public good contribution is perhaps a more powerful signal because it both conveys that men possess resources and are willing to share them (Farrelly, 2010; Kruger, Fisher, & Jobling, 2003).

How do we know that public goods signal mate quality? The condition of signalling posits that a signal must be beneficial to the signaller – if not, the signaller would cease to produce – as well as to the receiver, because if they did not benefit they would ignore it (Searcy & Nowicki, 2005). Therefore, not only should males preferentially show off public giving in the presence of a female (as we find), but women should also find this behaviour attractive. A recent study indeed showed that females preferred altruists as both long- and short-term mates (Barclay, 2010). Our study thus complements that finding by showing that males strategically signal their prosocial qualities through public giving when presented with a mate opportunity.

Our results may also contribute to public goods research. Researchers find that, over time, public good contribution plummet once people realize that do not have a shared future – the so-called endgame effect (Croson & Gneezy, 2009; Fehr & Gachter, 2002). Public good contributions can be maintained under conditions of communication, punishment, reward, or reputation-building (Ahn *et al.*, 2009; Barclay, 2004; Fehr & Gachter, 2002; Milinski, Semmann, & Krambeck, 2002; Ostrom, Walker, & Gardner,

Table 1. A comparison between conditions of mean volunteer time (hours per term) to different activities for men, Experiment 2.

Volunteer activity	Female observer condition		Male observer condition		No observer condition	
	Mean	SD	Mean	SD	Mean	SD
Help organizing a day for blood donors	7.80*	12.91	2.70	4.91	2.90	5.44
Providing assistance for mentally handicapped children	6.00*	13.91	0.90	1.97	2.75	7.16
Providing care for the physically disabled	5.10*	14.00	1.55	3.72	1.25	3.19
Providing care for the old	3.55*	11.4	0.95	1.88	2.15	5.19
Collecting donations for charity	4.75	11.86	2.30	4.97	6.30	10.05
Providing healthcare for the homeless	3.85	11.41	0.65	2.06	1.05	2.70

*$p < .05$ opposite sex condition significantly volunteers more time than same sex/no observer conditions.

1992). Here we similarly find that the 'endgame' effect also disappears when men are competing over a sexual mate. Thus, when considering the evolution of cooperation, we should consider the role of sexual selection and competitive altruism.

Both intersexual and intrasexual motives may play a role in eliciting competitive altruism (Roberts, 1998). Intersexual selection involves traits that make individuals attractive to the opposite sex (such as being nice), whereas intrasexual selection involves traits that enable them to compete with same sex rivals (trying to be nicer than the rest). Both processes were at work in our studies.

For further research it would be interesting to know if such conspicuous public good displays are associated with a surge in testosterone in men. Recent studies suggest that, when in the presence of a female, a man's social status is threatened by other men his testosterone levels go up (Saad & Vongas, 2009). Audience effects are also worth investigating further. As the ratio of males to females goes up (3:1 in our second study), public good contributions increase further due to intensified male competition. Third, we find that men donate more as they perceive the woman to have higher mate value, yet there was no such effect for their own mate value. The provision of public goods may be an alternative mating tactic for males who do not possess traits that signal good genetic quality such as their physical attractiveness (Waynforth & Dunbar, 1995). Therefore, we predict that less attractive men may contribute to public goods more than attractive men in the presence of a female (Takahashi, Yamagishi, Tanida, Kiyonari, & Kanazawa, 2006). Further research could look at more objective mate value characteristics such as a man's height, physical strength, or facial symmetry (Scott, Pound, Stephen, Clark, & Penton-Voak, 2010; Zaatari & Trivers, 2007), which are expected to correlate negatively with their public good contributions. Finally, future research should vary the costs of public good contributions to see if more costly signals are more influential (cf. Getty, 2006).

A potential limitation of the studies is the focus on economic donations, which might be a typical male signal. Like men, women may use public helping as a way of showing off their mating quality, but through other kinds of benevolence than giving money

(Griskevicius *et al.*, 2007). The findings from the second experiment show however that men also engage more in other acts of helping when signalling to women, such as volunteering time for good causes. Men volunteered in particular for causes that would reveal their physical fitness (donating blood) or commitment to children (helping children in need). The use of a student population should also be considered. We expect men who are not yet in a romantic relationship to show off more. Unfortunately we were not able to test this because although some students reported to be in a relationship, these relationships tended to be a few weeks or months old. It would be good to replicate this result in a sample comparing single men with men in a long-term relationship (e.g., married with children).

A puzzling finding is why the presence of an audience, whether male or female, did not affect overall public good contributions compared to the control condition. Competitive altruism predicts that individuals are more generous when their donations are public rather than private, regardless of the composition of the audience (Hardy & Van Vugt, 2006). Perhaps the sex of the audience is more important than previously thought. For instance, a male audience perhaps elicited competitive motivations among the men in our study, which increased their desire to earn more in those games than other men and therefore they contributed less.

To conclude, this research shows that men's conspicuous public good contributions increase when presented with a mate opportunity. Theoretically, this suggests that a public good is the human equivalent of the peacock's tail. Practically, this research shows how societies can stimulate the provision of public goods.

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