CULTURA & SAÚDE

ISSN 2595-7546
Vol. 3 · No. 4 · December 2003
São Paulo, Brasil

ARTICLE · CULTURA & SAÚDE

Everything Is at Stake

Game theory, conflicts of interest, and cooperation, from John Nash to the tragedy of the commons

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Received for publication in December 2003 · Section: Article · Language: English

ABSTRACT

The author introduces game theory as a tool for understanding conflicts between individual and collective interest. Starting from everyday examples, such as denting someone else's car or jumping the subway turnstile, he shows how rational individual decisions can produce catastrophic outcomes for the group. He presents John Nash, popularized by the film 'A Beautiful Mind,' and the concept of an equilibrium strategy. He explains the 'tragedy of the commons' through the split restaurant bill and the pasture shared by farmers, arguing that the exploitation of collective resources is only avoided with rules that reward cooperation. He applies these insights to Brazilian cases of the time, such as the energy rationing, in which the government 'fenced the pasture' by transferring individual responsibility to citizens. He concludes that much of the news can be explained by conflicts of interest.

KEYWORDS: *game theory; john nash; tragedy of the commons; cooperation; conflict of interest; energy rationing*

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Article published in Superinteressante magazine, 04/2002, and

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- You are parking your car and... "crash," you dent the fender of that gleaming BMW next to you. No one saw. You, a decent person, think of leaving a note identifying yourself and taking responsibility. But wait a moment. It's a BMW. The owner surely has money, and would not be driving a car like that around without insurance. This little dent will be nothing to him, but for you...

- It's late at night and you're at the subway station. No one around. Why not jump the turnstile and ride without paying? Clearly the subway company won't go bankrupt if you do it. The trains run with or without passengers. Why not jump the turnstile?

There is an endless number of situations in which individual interest clashes with the collective. In the case of the car you hit, the insurance pays and passes the cost on to the premiums it charges. By not taking on the loss, you end up penalizing people who have nothing to do with it. The subway case is identical: by swelling the statistics of those who don't pay, you contribute to the rise in fares for those who do.

This is a frequent dilemma in organizations — in the family, in companies, between nations. It arises from an impulse that everyone deals with in countless circumstances: the tendency to satisfy one's individual interest by acting in a way that, if everyone imitated it, would be catastrophic for all.

What games are these?

This subject is so recurrent that for more than fifty years it has drawn the attention of scientists. John Nash — the mathematician played by Russell Crowe in the film "A Beautiful Mind" — won the Nobel Prize in economics for having helped unravel part of the dynamics of this kind of situation, using a branch of applied mathematics called game theory. The film, incidentally, gives no hint about the originality and boldness of his work — the man existed

(exists, is alive), overcame schizophrenia, and did indeed win the Nobel, but the rest (as in Titanic and others) is pure cinema.

The goal of game theory is to shed light on conflicts of interest and help answer the following: what does it take for cooperation to occur? Under what circumstances is it most rational not to cooperate? What policies must be adopted to ensure cooperation?

Think of some current controversy — the FTAA, the Kyoto Protocol, the American steel quotas... All are situations in which conflicts of interest have to be resolved. Games like these are deeply connected to life in society. They always were, but today, in a hyper-connected world, they are more so.

We don't even need to go that far; the insights obtained from game theory can help us understand various current Brazilian cases: the near-blackout, what is happening in the electoral campaign, and even in Big Brother/Casa dos Artistas.

Game theory finds that conflicts of interest happen because the general rule is to maximize, above all, individual gain. That is its starting point, but don't go thinking this is a matter of a lack of solidarity or civic-mindedness. It is more fundamental than that. Not even the most civilized societies have managed to solve this dilemma. Of course, if everyone behaved altruistically (for the good of the group) there would be no dilemma at all, but real life is not like that.

Game theory is a mathematical framework that deals with the strategies one uses when there is "someone" in a conflict of interest with another "someone." It has nothing to do with morality, with "good or evil," or with "right and wrong." It has to do only with mathematics. It deals simply with players doing everything they can to maximize the chances of a certain outcome. I'll return to this shortly.

Games among friends. Friends?

Companies, countries, organizations, and people are constantly involved in potentially conflictual situations. Games.

If you go out to dinner with three friends and agree in advance to split the bill, you will very likely spend the same as you would if each person paid only for what they consumed. There is an implicit agreement to that effect.

Since you know you will bear 25% of the bill, and since you want to keep a relationship of trust with your friends, you choose dishes that cost roughly the same as those your companions ordered (if a craftier "friend" decides to order baked lobster after everyone else has ordered pizza, he will be considered untrustworthy and will lose his standing as a friend).

At the year-end office lunch with about 30 people, though, things are different. You, who are a bit short on cash, think of ordering a cheeseburger, but the first to order choose filet mignon and gratin shrimp.

You know you will pay only 3% of the bill, no matter what you eat, and you quickly switch — "The special veal for me, waiter." The incremental cost to your colleagues will be minimal, and you'll get a much better meal. But, since everyone thinks the same way, the group ends up spending far more than it would have spent if each person had paid individually for what they consumed, or if the group had split up across several smaller tables. It was no one's fault. Things simply happened that way. The group exploited itself. Each individual's rational decision leads to an irrational (negative) outcome for the group.

Technically, for historical reasons, this kind of game is called the "tragedy of the commons." The exploitation of collective resources always leads to tragedies of the commons, and they can only be avoided by introducing rules so that participants are rewarded for acting altruistically. That is to say, altruism is, in a sense, "bought."

This is what game theory shows, and this is what history confirms. Imagine several farmers whose cattle graze in the same pasture. If there are no rules, each of them will try to put as many head of cattle there as possible, which will lead to the destruction of the pasture and the death of the animals. The prevailing attitude is: "let me put one more cow here, because if I don't, someone else will." Perfectly rational, of course; but…

The right way to avoid this tragedy of the commons is to divide the pasture — which is a collective resource — among the farmers, so that each of them has a defined area for his cows, and not only reaps the benefits but also bears the costs of preserving it. In other words: the solution is to privatize the pasture. This is the reason why farmland is fenced. Seas, rivers, the air we breathe, forests: all of these are collective resources. You already know what happens if there are no rules that provide an incentive (or a punishment, it comes to the same thing) for their preservation.

Games among Brazilians

This was precisely the game in the episode of the energy rationing.

By threatening individual surcharges and cuts in supply likewise, the government transferred to each citizen the responsibility for something that until then had been perceived as belonging to everyone. It "fenced the pasture" of electricity. It used the classic solution for tragedies of the commons, and it also got lucky: it was helped greatly not only by the rains, but by something whose importance had not been realized until then: each individual "Joe" realized that he could avoid spending a good deal of money — without making life especially miserable — if he cooperated. That is: we discovered that it was in our interest to collaborate. John Nash would say that government and society reached an "equilibrium strategy." In that

case, interests cease to be conflicting, because it is advantageous to cooperate.

Look at today's newspapers. I bet that a good part of what makes the news can have its dynamics clarified by game theory. Conflict of interest, after all, is what abounds, right? For example: from mid-February to the first days of March, what was in the news in Brazil? The end of the energy rationing, the PT-PL alliance, the reaction of the PFL in the crisis triggered by the raid on the office of Roseana's husband, and, of course, who will be eliminated on Big Brother and Casa dos Artistas. Full plates (overflowing ones) of conflicts of interest. In the case of our near-blackout, as we have seen, the players ended up cooperating. The economic incentive to do so was very strong.

What is the use of the game?

Okay, "economic incentive" is a vague term. John Von Neumann invented, and John Nash later used, a formulation that goes beyond it: utility, or the utility function, as mathematicians say. Players always seek certain outcomes over others. These preferences are called utility. Utility is what players want in the depths of their souls. That "the more I have of it, the better." The utility you attach to a certain outcome is what determines your strategy in the game. To act rationally (in the context of game theory) means to act so as to maximize utility.

Think of utility as points you want to accumulate. If you play poker for matchsticks, then utility is the number of matchsticks you collect. When you play for money, money is the utility. For politicians, utility is always power.

Electoral games

Look at the PT in the presidential campaign — a game that so far (I write in early March 2002) points to an unfavorable outcome for the party. The PT has no consensus on how to maximize the utility (votes) of the game. Without consensus on this, there is no way to build a strategy, and without a strategy one wins only by luck. In February, the PT leadership had arranged an alliance with the PL. Alliances are very rational in elections, which is why they are made. A good part of the party, however, does not accept that winning votes is "all that counts in an election," and raised an outcry.

The PFL, for its part, is the opposite. Its politicians are called "professionals" precisely because they admit without scruple what they want to maximize: votes. They have been in the highest spheres of power longer than any other party. When the first polls signaled that Roseana might have a chance, the PFL immediately gave notice that its support for the government's candidate might be held over to the second round — it would try to win by leading the ticket, not by being merely the running mate. It sulked in the episode of the raid on Jorge Murad's office ("darling, I've shrunk your chances"), left the government, but is too pragmatic — it left the door open for alliances in the second round. It has no doubt about what it wants: power.

Types of games

The inventor of game theory was the Hungarian-born, U.S.-based John Von Neumann, in the 1940s. His great contribution was in the so-called zero-sum games. This is when the victory of one necessarily means the defeat of another — as in chess or tic-tac-toe. In zero-sum games, there is no possibility of collaboration. In these circumstances, Von Neumann proved that there is always a rational course of action for each player.

John Nash, for his part, dealt with situations in which the most rational thing is to collaborate. The only mention of this in "A Beautiful Mind" is a scene, in a bar, in which he convinces his ultra-competitive colleagues not to all try to win over the same girl. The most rational thing would be to distribute their efforts by choosing different targets. It was not a zero-sum game, after all.

Von Neumann was not interested in chess because "that kind of game has nothing to do with real life," according to him. Poker was something closer to what he wanted to deal with, because in poker the bluff is more fundamental. He was interested in cheating, in bluffing, in the small tactics of dissimulation, in distrust, in betrayal. Did I mention electoral campaigns? Casa dos Artistas and Big Brother? That's it.

His genius was to realize that dissimulation is not only something rational in zero-sum games, but also that it is mathematically tractable. His game theory deals with rational and distrustful beings wanting to "come out ahead" at all costs. Think of the particular game a goalkeeper plays against a penalty taker. The taker has every interest in the goalkeeper thinking he is going to shoot into a certain corner, and then he shoots into the other. To dissemble is a rational strategy for the taker. The same goes for the goalkeeper, who will try to make the taker believe that he will dive to a certain side. Dissimulation and pretense are part of the talent they must have. In zero-sum games, rational players have to bluff.

Family games

In truth, game theory is about strategies — that is, about what to do to obtain certain outcomes. Mathematics is not always needed to figure it out, and it is not always the case that, when mathematics figures it out, we manage to do what it dictates. That is where things get interesting. Let's see: a widow had two daughters. Every day, on her way home, she would bring a piece of cake, and she would try hard to divide it into two exactly equal slices. Each daughter, however, always thought her mother had given the bigger piece to the other. The mother suffered. The two — with that Machiavellianism typical of children who realize their parents can be manipulated — tormented the poor woman. It was a game. A game easily solved through

logic: it would be enough to ask one of the daughters to divide the cake, and to let the other choose first. There you are. End of the emotional blackmail. No one could complain about anyone. There really are cases in which cold logic is better, but is it always? Unfortunately not. Just ask Indiana Jones.

Indiana Jones games

Do you remember the film "Indiana Jones and the Last Crusade"?

Our hero Indiana, together with his father and a band of Nazis (how would cinema create its villains without Nazis?), reaches the place where the Holy Grail is hidden. Old Indiana had been shot and was bleeding a great deal. Only the healing power of the sacred chalice could save him from death. In an atmosphere of high tension, the two Joneses and the Nazis vie inch by inch for the honor of reaching it first. But there is a final challenge: there are several chalices, and only the right one grants eternal life; any wrong choice leads to death. The head Nazi arrives first. He chooses a beautiful gold chalice studded with diamonds, drinks the "holy water," and dies "that cinematic death that is the consequence of wrong choices" — as the authors of the book from which I took this example put it. Indiana chooses a crude wooden chalice, but hesitates: "there's only one way to find out," he says. He dips the chalice into the fountain, drinks, and… gets it right! Indiana takes the chalice to the old man (these elders of ours take a long time to die, don't they, reader?) and heals his mortal wounds. Exciting scenes, but, I'm sorry to say, Indiana used the wrong strategy. He should have first taken the chalice to his father, without drinking from it beforehand. If he had chosen the right chalice, his father would have been saved regardless; if he had chosen wrongly, well... the old man would die but Indiana would save himself. The way he acted, if he had chosen the wrong chalice, there would have been no second chance — Indiana would die because of the chalice and his father because of his wounds.

Now, imagine something that is not in the film but could be in real life. Indiana makes the rational choice. He chooses, takes the chalice first to his wounded father, and... the father dies. "Well," he would think, "I tried. It would have done no good to drink first, because now both my father and I would be dead. I'm sure the old man would have approved of what I did. It was the logical choice." Indiana tries to rationalize the situation, but does the human being we know behave like this? Rationally analyze various courses of action and choose — coldly — the most suitable one? Guilt begins to pursue our hero. Every night he dreams of the old man convulsing before him. He wakes up drenched in sweat. He cannot convince himself that he really made the best choice. He falls into depression. He becomes impotent (without a certain dramatic exaggeration these stories are no fun). He starts drinking. His wife leaves him (no one can stand depressed heroes). He seeks out alternative therapies. He reads self-help books… poor Indiana. Rationality, the logical choice, do not always solve things.

The mathematics of game theory deals rigorously with real conflicts, but it gives no guarantee of success, only the guarantee of logic. Unfortunately, success and logic do not necessarily go together. Taking into account the human being as he really is means taking into account his emotion. It has to be part of the game, and it is. Keep reading...

The game that explains the games

I said, at the beginning, that the root of conflicts of interest is the tendency to maximize individual gain, but there has to be something beyond pure self-interested rationality, otherwise life in society would be impossible. This question is very well captured by a game called "The Prisoner's Dilemma" — formulated and studied in the 1950s by mathematicians at Princeton, the same university as Einstein, Von Neumann, and Nash. It goes like this: two criminals commit a crime together. They are arrested and interrogated separately. The police have no evidence against them, and the only way to convict them is for one to accuse the other. Each prisoner has a choice: to stay silent or to accuse his companion. If both stay silent, both will be set free. The police, wanting a quick solution to relieve the pressure of public opinion, offer some incentives: the prisoner who informs on the other gains his freedom, and on top of that takes a cash reward. The other will get life imprisonment, and will also have to pay the reward to the informer. If both accuse each other, both will be convicted. What is the logical choice? Both begin to think. The best thing to do is to stay silent, since both will be released. But prisoner A knows that B is thinking the same thing, and, knowing he cannot trust his companion, he realizes that the least risky option is to inform on B. Yes, because if B stays silent, A will be free anyway (and with the reward money). If the other likewise informs on him, well... A would have to serve time regardless — at least he won't look like a fool in prison.

It happens that B thinks in exactly the same way. Result: both are led by cold logic to the worst possible outcome: mutual betrayal and prison. Remember those examples of people splitting the bill at the restaurant? They are prisoner's dilemmas played by groups of more than two people. The rational thing is for me to order lobster (betray) after the others have ordered pizza (cooperated). Why don't we act (rationally) that way? A scientist named Robert Axelrod found out. To investigate the prisoner's dilemma more deeply, he ran a tournament in which the participants submitted computer programs representing the prisoners. The various programs would be pitted against each other in pairs, and each of them would

choose to betray (inform) or cooperate (stay silent) at each encounter.

There was a detail, however: instead of playing a single time, each pair of programs would play against each other two hundred times in a row. This would be a more realistic way of representing the kind of ongoing relationship we are used to in real life. Note that in a prisoner's dilemma, the best thing for each player is to betray while the opponent cooperates (the temptation to betray has to be great). The worst thing for each player is when he cooperates while the other betrays. Finally, the reward for mutual cooperation has to be greater than the punishment for mutual betrayal.

Axelrod assigned points to each of these situations. The winner would be the program that accumulated the most points after facing each opponent two hundred times in a row. All kinds of strategy could be represented — for example, a program adopting a "generous" strategy that always forgave the other's betrayals. A "cynical" strategy that would forgive betrayals up to a certain encounter (up to the hundredth game, say), giving the impression of being nice, and then betray systematically until the end. One that would always betray. One that would betray and forgive alternately. In short, the possibilities were infinite. Which strategy accumulated the most points?

The rule of the game

Of all the participating programs, some contained very complex strategies, but the winner, to everyone's surprise, was one that adopted a very simple strategy called Tit for Tat, which loosely translates as "an eye for an eye." Tit for Tat is a program of only four lines. It always begins by cooperating, and then does exactly what the opponent did on the previous move: it betrays if it was betrayed and cooperates if it received cooperation. Tit for Tat has four characteristics (the terminology used in the original English work is given in parentheses):

1 - It is "nice" — it never betrays first.

2 - It is "tough" (retaliatory) — it never lets a betrayal pass without retaliating in kind on the next move.

3 - It is "forgiving." If, after the betrayal and consequent retaliation, the opponent starts to behave well, Tit for Tat forgets the past and engages in cooperative behavior.

4 - It is "clear." It is a strategy simple enough to allow the opponent to notice immediately what kind of behavior it is dealing with. There is no trick, no "play."

After it emerged as the winner, Tit for Tat was challenged and won even in tournaments in which the other competitors submitted programs designed specifically to beat it. For all its simplicity, Tit for Tat can genuinely lead to cooperation in a great variety of situations, some very improbable. For example, the "live and let live" strategy that appeared spontaneously in the trenches of World War I: enemy units, facing each other for months on end, avoided firing the first shot. Despite there being no formal communication, and despite being enemies, the tacit understanding that arose was: "if you don't shoot, I won't shoot." The fact that the same soldiers were living in the same situation for several months led to an agreement for cooperation.

Games of bats

Even when there is no conscious behavior involved, Tit for Tat (from here on TFT) can be adopted. Certain species of vampire bats go out in swarms at night to suck the blood of horses, sheep... Not all of them succeed. It is common for some bats that got more than they needed to regurgitate the excess blood to a companion who got nothing. The companion, days later, returns the favor. They recognize each other in the crowd of bats. Reputation counts, and a great deal. That is TFT. Since there is a time lag between the good deed and its return, these bats have to have a good memory. There are dozens of analogous examples. Cooperate with me today, and I'll return the favor tomorrow.

Games of war

The soldiers in the trench and the cooperative bats illustrate something of great importance. For TFT to be able to take hold, the relationship between the players has to have a concrete prospect of lasting a long time. There has to be a high probability of new encounters in the future. The shadow of the future has to be long, as the specialists say. If it isn't... well, if it isn't, you already know: the rational thing is to betray. Remember the soldiers in the trench. Remember when you dented that BMW at the beginning. Of course you slipped away quietly. You'd never see the owner again anyway...

Games of bacteria

Bacteria are another example. Bacteria have no brains. From a Darwinian standpoint, they are the most successful living beings there are. They have existed for billions of years and have an incredible capacity for replication. You, reader, host billions of them in your gut. There are more bacteria living inside you than there are human beings on Earth. In the words of the English biologist Richard Dawkins, they are probably involved in prisoner's dilemmas with the organisms that host them... Bacteria that are normally harmless, and even beneficial, can turn malignant and even cause lethal septicemia in an injured person. A physician would say that the "natural resistance" of the injured person decreased because of the wound, but perhaps the real cause has to do with prisoner's-dilemma-type games. Could we not see the bacteria we host as beings that normally have something to gain, but prefer to hold back? In the game between bacteria and humans, the "shadow of the future" is normally long, since a person is typically expected to live a long time. However, someone seriously injured is signaling that the shadow of the future for the relationship with the bacteria has potentially shrunk. The temptation to betray begins to appear (for the

bacteria) as a more attractive option than the reward for mutual cooperation. It's not that the bacteria "imagine" all this in their malicious little heads! Natural selection, acting over many generations of bacteria, embedded in them a practical, unconscious rule that operates through purely biochemical means.

In short: somehow the bacteria become sensitive to the fact that the "shadow of the future" has diminished. The relationship may end sooner than expected. The wound in the host organism caused it to emit certain (chemical) signals. The bacteria decode these signals, which are simply saying: "I am injured; I may die." And you know, reader, if the relationship has a date to end, "the rational thing is to betray." That is what the bacteria do.

Games at the bottom of the sea

One way to force collaboration is to lengthen the "shadow of the future." This is done, for example, by gradually increasing the frequency of interaction between the players, making them take into account that "I'm going to run into this fellow again soon." In the coral banks of Panama there lives a type of fish in which there is no sexual distinction. It is a hermaphroditic species. All the members are male/female and periodically alternate their sexual roles. During the initial phase of mating, each fish in the pair plays the role of the female, and the other that of the male. But each "female" lays only a small number of eggs at a time, until, through the continued relationship, the "male" demonstrates that he will not bail out after fertilizing them. In this way he provides guarantees that he will play the role of the female when his turn comes. Only as the trust between the members of the pair grows do both fish begin to lay larger quantities of eggs, trusting more and more that they will not be betrayed.

The behavioral pattern of kidnappers and victims who, after a long time in contact, end up developing forms of mutual sympathy (collaboration) — the so-called Stockholm syndrome — perhaps has to do with this influence of the "shadow of the future." Who knows, maybe some psychologist will be interested in investigating this phenomenon in the light of game theory?

Games of power

After the bacteria, let's look at the politicians (I admit: some have brains). No one makes a deal with a politician who has no chance of being reelected, because there would be no chance of a return in the future. The cooperation of TFT exists only on the basis of the prospect of a return; without that, nothing doing. After Collor showed that he had a chance of winning in 1990, businesspeople interested in contributing to the campaign poured in; but only afterward. When an executive falls from grace, no deals are possible with his colleagues, because his power has a set date to end. Companies in a bad situation cannot negotiate terms or credit with suppliers. Couples who have already decided to separate often plunge into a sea of pettiness. They hide crumbs from each other; they even fight over napkins. When the relationship has a set date to end — when the "shadow of the future" is short — betrayal is the rational thing. The temptation to betray (not to cooperate) becomes irresistible.

Games of humans

TFT, however, has a serious problem: if it had been the preferred strategy of evolution, we humans would not have appeared as its product. Not the way we are. TFT is not able to perceive when someone errs involuntarily — it is too cold. If it happens that two TFT players get in sync, all is well, the game of reciprocity begins; but if, by accident or mistake, one of them betrays, an endless series of mutual betrayals begins, from which there is no escape. Remember that the result of mutual betrayal is the worst possible for the players.

The human animal in its social interactions is complex and subtle. It is not an inveterate traitor. On the contrary, it seeks cooperation because it somehow perceives that this is better in the long run. We tip waiters we will never see again. We vote in elections. We donate blood. We greet strangers with smiles. All these actions are perfectly irrational in the sense of game theory. We try our best to appear trustworthy, likable, understanding, as if to say: "you can play with me, I'm reliable." Why do we do this? Perhaps because we seek reciprocity by doing these things. Through them one can make the most of life in society by cooperating in the prisoner's dilemmas that arise all the time.

Games of emotion

TFT may have been the beginning, the "foot in the door," but afterward it must have evolved into something that allows the involuntary error to be distinguished from premeditated bad faith, leading us to forgive the error and retaliate only against trickery. How did evolution do this? A neat hypothesis says it did so by embedding emotion into the mental equipment of humans.

You remember TFT in the trenches of World War I. English and Germans, facing each other, tacitly maintained a cease-fire. Axelrod recounts an episode in which, by mistake, the truce was broken by shots coming from the German side. It was a clear betrayal, and as good TFT players, the English were ready to retaliate. But then came an emotional and immediate apology from a German soldier who, shouting, said: "we're very sorry, the shots are not our fault, they're from soldiers of another unit — those wretched Prussian artillerymen." This kept the truce intact. At that moment, what restored the balance in the trench was the Germans' reaffirmation of their commitment to keep playing the game as before. What led the English to believe them? It was the way in which the apology was made. The emotion made the announced commitment credible. At that moment the English were transcending TFT.

For the economist Robert Frank, of Cornell University, emotion is something that arose in the evolutionary process to enable us to play the social game, guaranteeing credibility to our commitments. Through emotions, we prove — beyond words — that we are trustworthy players: play with me, I don't cheat. Have you ever noticed how present oaths are in our lives? They are indispensable in social interactions at every level. One specialist comments that oaths exist "among all peoples and in all cultures. They are indispensable at the economic level, the legal, the private, the public, the intra-tribal, the international... No treaty, no contract, no form of administration of justice occurs without an oath. Oaths are phenomena of language; they exist precisely because language is insufficient [to guarantee credibility]. The weakness of language is the possibility — the probability — of the lie, of fraud, of dirty tricks in social games. Chimpanzees taught the language of symbols immediately try to deceive their trainers by lying. It is safe to conclude that in the earliest days of civilization, lying and language arose together and went together... But collaboration and exchange in society require trust; means to avoid cheating, to make the actions of companions predictable, to give stability to a world of shared values... The purpose of the oath was always to exclude the lie..." "telling the truth, the whole truth, and nothing but the truth."

Nice. But does swearing solve anything? If it did, witnesses would not lie in court, physicians would never betray the Hippocratic oath, priests would not break their vows of poverty, chastity, and obedience...

No. For the basic games of social life to take hold, the guarantee of commitment would have to be given in some other way. We have instinctive mechanisms in our brains — emotions — to demonstrate our sincerity, regardless of what we may say. Emotions are very hard to disguise. We end up revealing through them what we are actually feeling. The dozens of muscles in our face let show what is really going on inside. What we say is, in itself, so empty that we can even use machines — lie detectors — to catch liars.

Games of sex

Think about the erection in a male. Why did evolution choose such an elaborate mechanism to get a penis into a condition to penetrate a female? Why not a bone, instead of the complicated hydraulic process, with blood having to be pumped at high pressure? Several mammals have bones in the penis to help with the erection, including our primate "relatives." Our direct ancestors — the chimpanzees — likewise, though the bones are small. Why are we different? For living beings, utility is the propagation of their genes. Males in all biological contexts have a greater inclination to cheat in the game of sex, as a matter of economics: eggs are scarce, sperm are abundant. Males simply lose nothing — or lose very little — by being promiscuous: by copulating with as many females as possible, they maximize their chances of propagating their genes. Sperm spent is quickly replaced. Females, on the contrary, have much to lose if they hand over their precious eggs for just anyone to fertilize.

They lose time and energy (if they produce sick offspring, for instance), and they also lose the possibility of producing other offspring during the gestation period. The conflict of interest is evident in the game of sex. A story that makes sense is the following: as males learned more elaborate forms of "false advertising" — (promising and not delivering; appearing without being) — females responded by becoming progressively better at detecting these frauds, and they reacted by using their most lethal weapon: denying copulation. This forced a change in the male's behavior. To escape the deception, natural selection embedded in females an instinct that acts as if she were saying: "don't come to me with empty talk, you say that to all of them. Prove it, or you get nothing." Through the erection, the male is demonstrating: "you can copulate with me, I am healthy. I run no risk of producing sick offspring. Sick males don't get erections." Cheating, by making a flaccid penis pass for an erect one, is impossible. The hydraulic erection (hmmm...) may have been the decisive proof to guarantee females against false advertising. That is also the reason for the exhibitionism of the peacock's tail — it is giving proof of health to the female. Without it, farewell to copulation.

Fidelity, the monogamous family, the psychological attributes of the human male and female, may have originated as a consequence of this kind of game, played across the immensity of time. The pursuit of reciprocity in male-female games must have entailed much conflict, much trial and error, but, when it (reciprocity) took hold, it may have produced as a byproduct the feelings and bonds that are dearest to us.

The great game

Few are the people who manage to disguise their most sincere emotions. We blush; there's no faking it. It's common for us not to control our laughter or our crying. We say "I love you" with feeling, so as to leave no doubt about the commitment. Conflict of interest. Instinct. The temptation to cheat. Game. Emotion… We began with the mathematical speculations of a hyper-rational scientist at the start of the Cold War. Who would have imagined that we would arrive at emotion as the central element of the games humans play? If evolution had not embedded in our brains this capacity to discriminate, choosing trustworthy partners in the games we get involved in, we would not be here. Emotions are essential for validating our commitment to cooperation and for seeking reciprocity. Through them we overcome the self-destructive rationality of prisoner's dilemmas, we avoid zero-sum games, we invented our "hydraulic" way of having sex, and, perhaps, we

even invented love. And look — it's not Freud who explains it; it's game theory.

For further reading:

a - William Poudstone. Prisoner's Dilemma - John Von Neumann, Game Theory and the Puzzle of the Bomb. Anchor Books, 1992.

b - Richard Dawkins. God´s Utility Function. Scientific American, 11/1995.

c - Richard Dawkins. O rio que saía do Éden - uma visão darwiniana da vida. Rocco, 1994.

d - Richard Dawkins. The Selfish Gene. Oxford University Press, 1989.

e - Matt Ridley. As origens da virtude - um estudo biológico da solidariedade. Record, 2000.

f - Avinash K Dixit. e Barry J Nalebuff. Pensando Estrategicamente. Atlas, 1994.

g -Robert Axelrod. The Evolution of Cooperation. Basic Books, 1984.

h - Martin Nowak; Robert May; Karl Sigmund. The Arithmetics of Mutual Help. Scientific American, 06/1995.

i - Robert Wright. Non Zero -The logic of human destiny. Pantheon Books, 1999.

j - Robert Frank. Passions Within Reason - The Strategic Role of Emotions. Norton, 1988.

k - Jared Diamond. Por que o sexo é divertido. Rocco, 1999.

l - Clemente Nobrega. O Glorioso Acidente. Objetiva, 1998.