

THE WINHAM PAPERS

Commentaries on Politics, Sex, and Science

2017-2024

THE JJ WINHAM PAPERS

1. The Real Reasons People Oppose Abortion (2017)

J.J. Winham

The pro-life movement claims that it is their respect for all human life that leads them to oppose abortion. However, many of these people are adamant supporters of the death penalty and even more support gun "carry" laws that have significantly increased the rates of murder and accidental death by gun wounds. No, there are really 3 other reasons for all the opposition to abortion, although they have become tightly entangled over millennia. Taking each separately for the moment:

1) **Promote A Religion:** The world's religions constitute an "ecosystem" in which each competes with the others for a limited resource: members. The larger the membership, the more that religion has power, influence, and funds. If you doubt this competition, just go to an underdeveloped country and watch the opposing missionaries fighting, not always ethically, to recruit the most new converts. Given this fact, it is not surprising that most large and successful religions ban contraception, masturbation, homosexuality, and abortion. All of these, at least historically, threaten the addition of new members by current member reproduction. This is why the same people who oppose abortion typically want to ban the other three threats to competitive procreation. The only alternative strategy is to ban or exterminate the competition. There is, of course, ample historical evidence of even this latter approach.

Once a religion starts focusing on members' reproduction, it is an easy next step to insist on its control of the two main pleasures in life: food and sex. Imposing various restrictions on each of these guarantees that members cannot let a day go by without having to remember what religion they belong to. This helps to keep membership up by constantly reminding members of their fealty and duties to the religion. To be effective, these restrictions on sexual practices and eating have to be different from those of competing religions. This takes advantage of a natural human tendency to engage in tribalism to reinforce a religion's power and integration.

2) **Promote Paternity:** It is clear from thousands of studies of organisms with two sexes, one producing expensive eggs and the other cheap sperm, that the latter sex is invariably selected by evolution to spread its genes by inseminating as many of the former as possible, and the former to spread its genes most effectively by being careful who it accepts as a sperm donor. This process is seen throughout plants and animals, and humans appear to be no different. In culture after culture, men seek opportunities to copulate, and women tend to resist mating with just anyone. Some societies allow multiple wives, but only a few rare ones support multiple husbands. While many men likely only focus on the pleasure of sex, this pleasure was selected to encourage them to have sex often. These men are not consciously trying to increase their paternities, but that is what they are effectively doing. In some cultures, men do consciously and aggressively try to maximize the number of children they produce.

Allowing women access to contraception and abortion clearly undercuts men's freedom to maximize their paternities. This is why men often oppose these options. I was in a Latin country when birth control first became available. Most of the men, even non-religious ones, opposed it, and so the women had to sneak into the new clinics providing the services.

3) **Promote Family Inheritance:** Evolution appears to have recognized that inbreeding has negative genetic consequences in most organisms. Studies of animals and plants have repeatedly shown various mechanisms to prevent mating among close relatives. In animals in which some sort of physical wealth such as a territory, food cache, or in humans, money can be passed on to the next generation, the problem of who should inherit the wealth is complicated by the need for inbreeding avoidance. In most animals faced with this problem, and in humans, the solution has been for one sex to inherit the wealth, and the other to leave the family to find a mate elsewhere. This rule is widespread in birds where males tend to inherit their father's territory or one nearby. And once humans settle down to farm or live in cities, they also tended to adopt inheritance by one sex and dispersal to marry elsewhere by the other. Presumably because protection of the wealth has often involved fighting, most human societies let sons inherit the wealth and married their daughters outside of the family. Since wealth also confers power, this makes males generally dominant in human societies to females. Unmarried females could often be traded for alliances or sold for more wealth and since males were dominant the females had no choice but to except their lot. Since those marrying these females would have no interest in raising children that they did not father, the dominant males in the family often insisted on strict chastity and virginity for the females they were trading off. This set up traditions in which males controlled and regulated the sexual behavior of their daughters and sisters, a tradition that persists today. While having an abortion rids an unmarried daughter of a child a future husband would not want, the very fact that she got pregnant on her own is a strong challenge to the traditions of male dominance of her sexual behavior. Not only does this affront the males who dominate her, but it threatens the opportunities for other females in the group to benefit by her being sold or traded as a virgin. So both sexes of their family are likely to oppose any effort by her to control her own sex life.

4) **All of the above:** As with other organisms, human traits rarely evolve independently of each other. A religion that builds its sexual prohibitions around the gene spreading and dominance biases of men will have a much more powerful influence than one that does not. Male dominance and male gene spreading naturally go hand in hand. None of the three factors have to be coordinated, but the social forces are strongest when they do.

Maybe I have a unique view from studying behavior in different animals, but even without that, any thinking person has to ask themselves whether masturbation is really an evil in this day and age. Similarly, the newest forms of birth control are so benign physiologically and so helpful to women trying to plan their lives that it is hard to see any real objection. Abortion is perhaps harder to accept emotionally, but if a woman is neither religious nor inclined to indulge the selfish interests of the men around her, is it really fair to force her to bring an unwanted child into this world? Of course, the abortion debate is not about fairness: it is about trying to perpetuate existing power by subsets in our society in spite of the growing pressures to undermine that power.

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2. The Real Reason So Many Men are Lousy Lovers (2018)

JJ Winham

The cynic's answer to this question is that men are just selfish: they only care about maximizing their own sexual pleasure. This answer ignores an underlying issue: if men and women were sufficiently similar in their sexual responsiveness, then a man seeking his own pleasure would generate similar pleasure for his partner. But this often fails to happen, and the reason is that the genital anatomy and sexual physiology of women are different from those of men. Since few sex education courses explain these differences, men just do not know any better.

Women have multiple zones of erogenous tissues scattered around their genital area. By erogenous, I mean tissues that can become engorged with blood and provide pleasurable sexual sensations when stimulated. Two of these zones are the vestibular bulbs, one of which lies under each of the two major labia of the vulva. They wrap around the urethra and are joined just in front of it. A slim spur extends from the point of juncture into the underside of the clitoris. The whole ensemble is called the "corpus spongiosum". Each of the corpus spongiosum zones can fill with blood when the woman is aroused, although it lacks an inflexible outside coating. This allows it to expand but not get stiff from pressure build-up (e.g., it acts like a sponge). In contrast, two parallel tubes lying above the bulbs, called the "corpus cavernosa", do have a tough surrounding tunic and when they become engorged, they get quite stiff. These two tubes lie adjacent to each other inside the top of the clitoral shaft, but make an abrupt right angle at the base of the shaft, and then divide into separate "clitoral legs" that extend back, just above the bulbs, until they reach opposite sides of the vagina. In addition to these two complexes, a perineal sponge lies just inside the body wall between the vaginal opening and the anus. It is not clear whether this is a separate structure or just the ends of the two vestibular bulbs as they wrap around the vagina. Finally, although it does not consist of vascular tissue, the cervix of some women can serve as a source of arousal when stimulated.

Because of the wide distribution of these structures, stimulation of one zone does not necessarily stimulate other zones. Thus, the two vestibular bulbs and the two legs of the clitoris are each independently stimulatable, and all four are mechanically independent of stimulation of the clitoral shaft and its "glans" tip, the junction of the bulbs, the cervix, and the perineal sponge. The junction of the two bulbs, which can be stimulated by pressing on the lower front wall of the vagina, is the most likely candidate for the now well-known "G-spot". It can thus be stimulated independently of the vestibular bulbs. Not only are these zones mechanically independent, recent brain studies have shown that stimulation of different genital zones activates adjacent but separate areas in the woman's brain.

In men, most of the accessible erogenous zones are aggregated into one compact organ: the penis. As in the clitoris shaft, the adjacent tubes of the corpus cavernosa lie above a single spur of the corpus spongiosum. Unlike the situation in women, the urethra passes through the corpus spongiosum and opens on the glans tip of the penis. The rest of the corpus spongiosum extends

back into the pelvic cavity where it ends in a robust single bulb. As in women, the two corpus cavernosa divide at the base of the penis and each flanks one side of the corpus spongiosum until they reach the bulb where they flare out as anchors for the penis. When a man has an erection, the two corpus cavernosa tubes provide the stiffness, and the engorged corpus spongiosum prevents the swelling of the corpus cavernosa tubes from compressing the urethra. Because of this aggregate structure, stimulation of the external penis affects the corpus spongiosum and two corpus cavernosa tubes simultaneously. While stroking of the scrotum, pressing on the perineum to stimulate the internal penis bulb, or using a finger inserted in the anus to stimulate the prostate can add to the pleasure, most men focus only on stimulation of the external penis during intercourse or masturbation. It is interesting that in a 8-10 week old human fetus, both sexes have a similar structure with all future erogenous zones concentrated as they are in adult males. But as the female fetus develops a vagina, this inserts itself in the middle of the various complexes and spreads them all out.

In addition to these anatomical differences, men and women differ in one important physiological aspect. In most men, ejaculation and orgasm occur together. Ejaculation causes a man's brain to release hormones that soon undermine his erection and initiate a refractory period where further stimulation is neither pleasurable nor arousing. Women do not ejaculate during orgasm, (although some women emit fluids from their Skene's glands and bladders), and they do not suffer the same type of refractory process. When appropriately aroused, a woman can have multiple orgasms, right after the other, or have a long single orgasm with multiple waves of pleasure. Because separate nerves control ejaculation and orgasm in men, it is possible for a man to train himself to stifle ejaculation and then have multiple orgasms or waves of pleasure like a woman. However, this takes extensive effort and practice, and most men do not even know it is possible.

These gender differences in anatomy and physiology have profound consequences for how each sex can maximize sexual pleasure. When a man strokes his penis during masturbation or intercourse, he simultaneously stimulates the corpus spongiosum and corpus cavernosa tubes. He can thus bring himself to orgasm quickly, and if he ejaculates, he soon loses his erection and urge for further stimulation. As noted above, because the erogenous zones of women are spatially scattered and only loosely connected mechanically, stimulation of any one zone may have no effect on others. Women can learn to reach orgasm with continued stimulation of a single zone or combination of a few zones. Not surprisingly which zones are favored by particular women, and the nature of their orgasms can be highly diverse. The two zones most widely linked to orgasm are the accessible parts of the clitoris and the G-spot. College women in a recent survey seemed to agree that clitoral stimulation alone tended to produce a rapid rise to a peak of arousal, a strong but local orgasm, and a rapid fading in sensation, whereas G-spot stimulation showed a much more gradual rise in arousal, a whole-body orgasm that could include multiple waves of pleasure, and a very slow fade out of arousal and responsiveness to additional stimulation. Many women's magazines argue that simultaneous stimulation of both the clitoris and G-spot, after a slow G-spot buildup of arousal, yields the most powerful and long-lasting women's orgasms. In the popular literature, this type of orgasm is known as "the big O".

Clearly, these gender differences pose several problems for men. First, many men know little about female anatomy and physiology. At worst, all they know about sex is what they learned masturbating themselves; the simplest assumption when they first have sex with a woman is that

she has a similar pattern to the man's own pleasuring. Second, women take longer to arouse than men. Many men do not know this nor how to tell when stimulation of a given erogenous zone is sufficient. Third, the average penis is not a well-designed tool for simultaneous stimulation of multiple women's zones, or even stimulation of a single zone with finesse. Notably, it is very difficult for an average penis to stimulate a clitoris and G-spot at the same time.

Practitioners of Tantra have their own protocols for solving the gender differences. These can be quite complicated and claim a need for manipulating "energy fields", but the simplest elements of the routines can be adopted by anyone. After joint bathing and a few minutes of quiet meditation, the woman gives the man a full body massage ending with a slow and sensuous "lingam massage" to give him an orgasm. The man then gives his partner a full body massage ending with a "yoni massage" that ends with her having a combined clitoral and G-spot orgasm. A proper Yoni massage works from the "outside-in," and uses the man's hands, not his penis. The recommended sequence begins with massage of the outer labia (including the underlying vestibular bulbs), and progresses through stimulation of the lining between outer and inner labia, underside and shaft (including the base) of the clitoris, and then alternates between the clitoris and the opening of the vagina, the perineal sponge, and the cervix. The final stage involves steady stimulation of the G-spot and finally the clitoris and G-spot to trigger orgasm. Once orgasm begins, both the clitoris and G-spot receive continued stimulation until the woman indicates this is enough. If the man has an erection, this is a great time for normal intercourse as the woman is still in the long tail of her orgasm and can often have additional ones with penile stimulation. Tantric men often can separate ejaculation from orgasm and hence the earlier orgasm during Lingam massage has not left him refractory. However, if a man does not know how to do this, he can skip the Lingam Massage step and just begin with Yoni Massage. Note that this protocol only works well if the man knows his partner's anatomy and physiology well and is willing to patiently stimulate each erogenous zone in turn.

There are of course as many permutations of the protocol above as there are ingenious and amorous people. Some women can achieve advanced levels of erogenous arousal psychologically. The ears, lips, breasts, and toes can act as erogenous zones in early stages of arousal. Many women have learned to have clitoral orgasms without G-spot stimulation and not having ever had "the big O" do not know what they are missing. Men in other couples use their hands or mouths to complete the early stages and then use their penis to stimulate the woman's G-spot while she uses her fingers or a vibrator to stimulate her clitoris. A few talented and long-lasting men can use their penis to accomplish many of the steps without hands. But most men cannot do this and do not even know why they should try. Gay women know what their partners need and lesbian pornography often shows them following the protocol listed above.

It is ironic that western cultures in the late 19th and early 20th centuries largely believed that women were incapable of orgasms. These notions were gradually discarded with pioneering research in the 1950's and 1960's, but even then, it was largely believed that only clitoral stimulation was likely to produce female orgasms. While there is still a debate about which zones account for G-spot arousal, stimulation through the lower anterior vagina after prior arousal of other erogenous zones is now widely practiced. And the first time a man watches his partner have a long-lasting and full-bodied "big O", he will be astounded and even envious of her ability to have such a powerful experience.

Did anybody teach you about vestibular bulbs? Did you even know they exist? Where do any of us learn all this stuff?! We don't! Conservatives have successfully blocked discussion of anatomical details in most sex education programs in this country. Instead of detailed education during teenage years, both boys and girls largely learn about sexual responses through masturbation or pornography. And in the absence of contrary information, each sex assumes that what they experience with their own masturbation is how a member of the opposite sex responds to mutual stimulation. Men expect women to get turned on and have an orgasm as fast as they do. Women are surprised and disappointed when their partner is done, and they have barely started. This causes lots of problems when men and women do have sex together for the first times, and many never figure out a solution.

You might think the solution is simple: just provide suitable education in schools at the right age. But there are many forces in modern society that are blocking such a step. The claim is that discussing sex in detail at early ages will just encourage sex before the kids are responsible enough to make wise decisions (like using contraceptives). There are also the religious prohibitions against any sex outside of marriage including discussing it. There are issues of threatened male self-respect and dominance in partner relationships. And most pornography, except perhaps the lesbian sex footage, fails to educate anyone. We can only hope that if enough people perceive the problem, suitable materials will get posted online where our kids can access them on their own.

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Some useful references:

Sheri Winston (2009): "Women's Anatomy of Arousal" ([Book on Amazon](#))

Tantric Sex without the Mysticism: A Blog by Shakti Amarantha: ["Extraordinary Passion"](#)

OMG Yes!: A website designed by women to enhance sexual pleasure in women:
<https://www.omgyes.com/>

A good summary of current research on orgasms:

Pfaus, J.G., G.R. Quintana, C.M. Cionnaith, and M. Parada. (2016). "The whole versus the sum of some of the parts: toward resolving the apparent controversy of clitoral versus vaginal orgasms. *Socioaffective Neuroscience and Psychology* (access by entering this DOI into your browser: DOI: 10.3402/snp.v6.32578

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3. The Real Reason Our Society Is Polarized (2018)

J.J. Winham

Types of Societies: Imagine two alternative societies. In the selfish society, there are no regulations, few laws, little if any communal infrastructure, and minimal government. At the other extreme is the cooperative society in which selfish behaviors are largely restrained, there is much communal investment in infrastructure, and significant government to enforce laws and oversee communal efforts. While many societies currently fall between these extremes, why does such variation exist? Why doesn't one or the other become the dominant economic paradigm?

It turns out that biologists find the same range of social systems in animals: some show nearly total selfish behavior while others are as cooperative as the extreme human systems. While economists have tried to explain various human systems by assuming rational agents, the finding that the same diversity of economic systems exists in largely irrational animals suggests that something else is going on. And since people turn out not to be that rational either, perhaps the rules governing society type are common to animals and humans. Both theorists and experimentalists have thus tried to identify the evolutionary forces that determine social systems in both humans and animals.

One explanation advanced for highly cooperative societies of close genetic relatives is called "kin selection": in such contexts, evolution favors helping kin produce offspring instead of trying to produce your own. This factor may explain some animal societies, but there are far more in which cooperation is seen without strong kin effects. This has led to an effort to provide evolutionary models in which cooperation is the expected outcome even without kin effects. To my knowledge, no one has identified such a model, at least using realistic prior assumptions. Instead, the best that one can come up with is a dual outcome system in which an evolving society can end up either cooperative or selfish depending on where it started. Rather than bog you down with a lot of math and evolutionary theory, let's look at some simple examples to see why this outcome occurs.

A tale of Bridges: Jim and his family own a farm. Each spring, they make weekly trips to a market where they sell their fresh vegetables for \$100 per trip. Because they have to ford a river to get to the market, the delay going and returning means they can make about 10 round trips per spring season for a net income of \$1000. There is a local company that will install a portable bridge over the river for them for a seasonal rental of \$1500. The bridge would cut the roundtrip time in half, allowing them to make 20 trips per season for a seasonal income of \$2000. However, since they would have to pay the \$1500 bridge rental, their net profit would only be \$500. Clearly, they would be better off not to rent the bridge.

However, the neighboring farm owned by Sam and his family faces identical economic conditions as Jim's family does. Were the two families to split the cost of renting the bridge, \$750 for each, then both families could make 20 trips a season and each family would reap a net profit of $\$2000 - \$750 = \$1250$, which is better than the \$1000 each would gain without the bridge. So, should they do it?

Probably not. Since they are poor farmers, suppose the rental company lets them wait until the end of the season to pay the fee. If they agree to rent the bridge, they each earn a seasonal benefit (before paying the rent fees) of \$2,000. If one family then defaults on paying their share of the fee, the other family would be stuck paying the entire rent leading to a seasonal income of \$500, again worse than if they had not agreed to rent the bridge. Unless both families have 100% confidence that the other partner will pay their share, it is better not to enter the agreement and avoid renting the bridge. And the higher the cost of the bridge rental, the greater the temptation for one of the families to agree to the rental and then default on payment. This is called "The Prisoners' Dilemma" game: even though cooperation by both parties has a higher payoff than if both do not cooperate, it always pays to default regardless of what your partner elects to do. Here is the payoff table to "you" (one of the parties) given rental fee payment at the end of the season. The person on the left is the focal decider of what to do. The table then shows the payoffs of their choice of action and what the other party chose to do. In each column, we put a dot in the cell that is the maximum for the player on the left:

		Opponent Plays	
You Play		Cooperate	Default
Cooperate		\$1250	\$500
Default		\$2000 ●	\$1000 ●

The upper left cell in the table gives the "Co-Cooperator's Payoff", the lower right cell shows the "All-Default Payoff", the lower left cell shows the "Temptation to Cheat Payoff", and the upper right cell gives the "Sucker's Payoff".

Waiting until the end of the season to pay the rent may tempt one or both of the parties to default. What if the bridge renters know this or there is a local law that bans either family from using the bridge further if they have not paid their share of the rent by the time they have completed 5 round trips? A family that has not paid their rent after 5 trips on the bridge will have to use the slower way to market for the rest of the season. The family that does not default still has to pay the full rent and thus have a season profit of \$500. But now the defaulting family will only have a net profit of \$1200 which is less than the \$1250 they would have earned had they not defaulted. We now have a game with two optimal strategies: if your partner cooperates, you should also; if your partner is likely to default, then you should not enter into the deal. How confident should you be before you agree to sign the rental agreement? In fact, this can be calculated and for these payoffs, you need to be 91% sure your partner will pay their share before signing any agreements.

		Opponent Plays	
You Play		Cooperate	Default
Cooperate		\$1250 ●	\$500
Default		\$1200	\$1000 ●

If the law says a renter is banned if they fail to pay after 2 round trips, then the seasonal profit for a defaulter drops to \$1,000, a less tempting sum, and an honest renter only needs to be 67% sure their partner will not default before signing the agreement. Their payoff table becomes:

Opponent Plays

You Play	Cooperate	Default
Cooperate	\$1250 ●	\$500
Default	\$1000	\$1000 ●

The point is that even with this kind of rule, a potential partner will do as well or better by signing the agreement and then later being the only one to default. If the second party then also defaults, they are both likely to be sent to jail. The second party will not want this and is thus likely to pay the whole rent. By signing the agreement, the potential defaulter is thus tricking the second party into adopting the cooperate option where he later can be exploited. The issue then boils down to **trust**: how accurately can each party evaluate the honesty of the other.

Clearly, one solution is to require payment up front before anybody uses the bridge. Now there is no way to default, so everything is OK. Right? Wrong. Humans and animals are terribly adept at finding some way to cheat. Suppose both Jim and Sam sign the agreement and pay the fee for the 40 round trips they need. Unbeknown to Jim, Sam has 2 trucks and his family has stockpiled vegetables. As the season progresses, Sam makes 30 trips in the time Jim makes 10. With their quota up, Jim either has to pay more fees or use the slow route for the remaining half of the season. Sam ends up with a seasonal profit of \$2,250 and Jim gets only \$750, worse than if he had not agreed to the deal. Without another law, we are back to the Prisoners Dilemma.

Opponent Plays

You Play	Cooperate	Default
Cooperate	\$1250	\$750
Default	\$2250 ●	\$1000 ●

The moral is that cooperation is invariably not favored at all (a Prisoners' Dilemma) or at best a dual optimum game where the best strategy is to do what your potential partner is most likely to do. And of course, that is at best a guess. This type of game only favors joint cooperation if there is a sufficient level of trust between the two parties.

Note that there is always a grey area between intended default and error. For example, if Sam made 21 bridge trips, limiting Jim to 19, should he be punished? Maybe he just loss count. This is why systems of laws and punishments designed to ensure fairness need a parallel court system to decide whether a default was an accident or intentional, trivial or egregious.

One way to improve the estimate of the other person's trustworthiness is to extend this to an iterated game. If a potential partner defaults early in a sequence of times the game is played, the estimate of their reliability should be decreased; if they cooperate several times in a row, then the estimate

can be increased. Economic models of reciprocity are based on such iterated games. Interestingly, none of them using reasonable assumptions can shift the dual optimum game to one in which cooperation is the sole optimum strategy.

Population Games: The above two-party games can be generalized to populations. The math is a bit more complicated, but the basic conclusions are the same. Cooperation in a society is often hindered by a Prisoners' Dilemma situation, where it is usually called a "Tragedy of the Commons". And like the 2-party examples, one can institute rules and regulations that convert it to a dual-optimum game. As with the two-party examples, a "tipping point" can be computed based on the payoffs in the table, above which the average person should cooperate and below which they should default. In a population game, the tipping point is the likely fraction of the population who would prefer to cooperate versus those who would not. Choosing a strategy is the same: if you think the fraction of cooperators in the population is above the tipping point threshold, then it is usually in your best interests to cooperate. If not, then you should not cooperate. A population that initially is mostly cooperative might suffer some economic shock, spread of an anti-government religion, discover some unknown graft, or whatever might undermine the mutual trust needed for cooperation. Once the fraction of those committed to cooperation drifts below the tipping point, there will be an accelerating pressure to drive the entire society to the default uncooperative state. Similarly, a society that is mostly selfish and uncooperative that through various events drifts above the tipping point will experience an accelerating pressure to become more cooperative. Which state is most likely by chance is the one that is least abundant at the tipping point.

Do such shifts really occur? Absolutely! History is full of examples of societies switching back and forth between cooperative states and selfish exploitative ones. It is interesting that very young children also show an alternation between being generous and cooperative and then selfish and manipulative. This is probably an adaptive trait since no child can know at that age whether they were born into a cooperative or selfish society. By being able to act in either mode, they can then abandon one or the other strategy as they figure out where they have landed. It may also pay for adults to periodically switch just to test the waters and see whether the society is changing. However, adults can more safely judge where a society sits relative to its tipping point by observing the behavior of others. If you see most other people running stop signs in their cars, you would fairly surmise that defaulting was on the rise.

The examples above all focus on discrete alternative strategies. In real societies and even in many 2-party games, the options fall along some continuum. The corresponding payoffs for adopting different combinations of strategies usually vary continuously as well. One still sees the use of laws and punishments to turn Tragedy of the Commons situations into dual-optimum games with tipping points. Where a society falls along the continuum for one kind of transaction (say, renting properties), need not be the same place where it falls along the continuum for another kind of transaction (say providing insurance services). Thus, the level of default that is tolerated without punishment or additional laws may differ among types of transactions. However, there is most often "spill-over" between transaction types leading to a common expectation of reliability and thus trust. Shifts in one class of transactions can easily put pressure on others to follow suit. What is considered "fair" behavior" can converge on a society-wide standard.

There are two important differences between 2-party and population games. These involve how the per-person payoffs of cooperating in a largely cooperative society, and of defaulting in a largely default society depend on the numbers of individuals playing the dominant strategy. Cooperative societies often exhibit "synergism" in which the result of a team effort is greater than the sum of the individual team members' efforts. Ten workers can often build a bridge that is more than ten times larger than what a single worker can build, or perhaps build a given bridge in less than 1/10 the time it would take a single worker to build it. Adding more cooperative workers to a project can thus increase the average per-person payoff (thus increasing the upper left cell in our game tables). Where synergism is prominent in a cooperative society, a dual-optimum game is more likely, and the threshold tipping point is lower, making it harder for a society to drift across it and become a default society.

Synergism is unlikely in an all-default society. If anything, the increased opportunities for gouging customers, bribery and corruption, and outright theft as population size increases can cause a decrease in per-person average payoffs. What typically does increase with population size is the variance in per-person payoffs. Where laws, regulations, and taxes in cooperative societies constrain the upper and lower payoffs that are likely, their lack in a default society allows for a very great range of payoffs. A clever or lucky individual in a default society thus might obtain a much higher payoff than they would as either a cooperator or defaulter in a cooperative society. This of course would be achieved at the expense of other defaulters who would then obtain less than the average payoff.

Current Contexts: Modern democratic governments were designed, at least initially, as mechanisms to create and preserve cooperative societies. They thus had two main functions: promote and oversee synergistic projects, and guarantee "fairness" in social and economic transactions. To keep the fraction of cooperators above the inevitable tipping point, they need to use whatever tactics they can to maximize trust among member citizens. This is usually achieved by having some sort of parliament, in which liberal and conservative representatives engage in a push poll negotiation to define what fairness is in that society. These definitions of fairness are then made into the laws that regulate behavior.

Historically, the two biggest threats to cooperative societies are tribalism and greed. Tribalism, whether based on religion, race, political party affiliation, kinship, education level, or actual ethnic origins, tends to generate distrust between members of the same society but different tribes. An effective government either plays down the tribal differences or plays up the advantages of diversity in achieving solutions to shared problems and enriching cultural life. Tribal conflict and mistrust often increase during periods of significant immigration. They can also arise during periods of economic or environmental stress when citizens most hurt by the crisis blame their problems on another tribe.

Greed is more ubiquitous and insidious. Greed is usually defined as "excessive desire for wealth". In all the games we have discussed above, we assumed each player would and should try to select the strategy that maximizes their own payoffs. We consider this desire as natural and not excessive. However, if a cooperative society establishes laws that turn a Prisoners' Dilemma or Tragedy of the Commons game into a dual-optimum one, a player that seeks to get around these laws and default is being greedy.

There are several ways a greedy player might try to default. The first is to accept that they live in a largely cooperative society and try to lobby, bribe, or manipulate the government to repeal some law or regulation they oppose. This is the approach taken by most conservatives who claim that these laws or regulations are "bad for business". This is surely true if the "business" entails gouging customers for goods or services, polluting or exploiting protected public lands, randomly denying health insurance claims, selling poisonous or infected products, letting banks make risky gambles with your savings, etc. Repealing the relevant laws permits such cheating and moves the tipping point required to maintain cooperation to a higher value. A more egregious approach is simply to ignore the law or regulation and hope you get away with it. Despite all our laws, crime never goes away. As long as there is a temptation to cheat, somebody will try to do so. One is most likely to get away with a crime when crime is rare, since people will not be looking for it. Once crime gets going though, it spreads and usually brings on a backlash of new laws or better policing.

The alternative to accepting life in a cooperative society is to somehow manipulate the society so it drifts past the tipping point. It will then move increasingly rapidly towards an all-default society. Why would anyone try to do this and how would they do it? Wealth disparity is usually limited in cooperative societies by progressive taxes and the laws and regulations that limit how one might get richer. Someone who managed to reach the upper brackets in a cooperative society might covet the greater variation possible in an all-default society since, being already somewhat rich, they could leverage that wealth in the all-default society to even higher levels. And if wealthy enough, they could buy media access and use this to shift public attitudes.

This may seem far-fetched, but funded by a coterie of very wealthy plutocrats, legalized by the Supreme Court decision called "Citizens United", and spread by media such as Fox News, the Republican Party in the United States began more than a decade ago denouncing its government and undermining trust in government institutions. They also incited tribal conflicts between the races, between well and poorly educated citizens, between religions, and between residents and recent immigrants. They have now ensured that many of their supporters own firearms. The election of 2016 suggests that the United States has finally passed the tipping point and ushered in an administration and Congress that immediately began repealing laws and regulations that had kept a cooperative society from degenerating into a Tragedy of the Commons. It is not clear where the current tipping point is and thus how much effort would be required to restore the former cooperative society. The payoffs have changed and that can change the tipping point. However, the fact that almost half of the US population voted for Republicans in the 2020 election suggests that the dynamics have already moved past the tipping point.

The Answer to the Question: This has been a long-winded story. But the basic answer to the question is that social cooperation is at best a dual-optimum game, and that means there will always be a temptation to cheat, and pressures from various quarters to relax all the rules and regulations that keep the society from shifting to an all-default Tragedy of the Commons. Young children will always be born with both cooperative and selfish proclivities. There will always be crime. And there will always be progressives and conservatives. We are stuck with the polarity and likely shifts between cooperative and selfish governments as time goes on. But maybe understanding the likely dynamics will encourage the design of a cooperative government that is not so easily undermined.

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4. The Real Problem with the Republican Party (2020)

J.J. Winham

Review: I argued in the prior essay (#3) that the primary functions of democratic governments are: 1) to coordinate cooperative tasks like building bridges or protecting borders, and 2) to define and police fairness in that society. Since fairness can vary depending upon environments, we suggested that having two parties in the government that engaged in recurrent "push-pull" negotiations to define the boundaries of fairness was an effective way to ensure trust in the government. I also noted that cooperative societies are potentially unstable and when a fraction of the population greater than a "tipping point" value loses trust in that government, the best strategy for everyone is to start being selfish and not cooperative. Finally, I suggested that the two biggest threats historically to trust and the stability of cooperation have been tribalism and greed.

Regulated Capitalism: The United States has always been a capitalistic democracy. Capitalism is defined as an economic system in which the means of production are owned privately and are operated to ensure the owner's profit. One alternative is socialism in which the means of production are owned by the government and operated according to principles other than the maximization of any one individual's profit. By its very definition, capitalism results in competition within markets, and therefore establishes the potential for selfish behavior that the society may not consider fair. To ensure fairness, a democracy needs to regulate its capitalism. In most democracies, it is considered unfair to steal from someone else. Such societies have regulations against stealing. The push-pull negotiations of opposing parties in a democratic government often focus on how much and in what ways capitalism should be regulated.

Our history is full of adjustments in the definition of fairness. The Civil War was fought over the widespread practice of exploiting one race of people by another to maximize the latter's profit. This was finally recognized as terribly unfair. During the early 20th century, it was decided that the efforts of large fiscal monopolies to stifle competition were unfair, and the government was charged with breaking up many of these organizations. During the great depression, Franklin Roosevelt oversaw the creation of welfare systems paid for with progressive taxes that helped ameliorate what was perceived as the unfairness of financial inequalities. The logic was that while merit and effort certainly played big roles in capitalistic success, so did chance. To offset the bad luck of some, the more successful and wealthy individuals were asked to help their fellow citizens get through difficult periods. In these and many other cases, our democratic government has periodically re-defined what is fair by regulating capitalism. And in every case, the new regulations caused someone to lose profits they had previously enjoyed, whereas others gained some kind of profit that they had previously lacked. While the latter were generally happy, the former were not, and this has resulted in persistent pressure to roll back any kind of capitalistic regulation. Maintaining fairness will thus always elicit social tension in capitalistic democracies.

Freedom versus Regulation: The American Revolution was fought to achieve freedom from domination by Great Britain. Despite slogans used at the time such as "Freedom or Death!", our founders never intended to replace the existing social order with an anarchy in which nobody had

any constraints on their behavior. On the contrary, they spent a lot of time constructing a set of rules and regulations that limited possible behaviors. This starts with our Constitution and extends on to the laws which are passed by Congress and signed by the president. In most societies, there is also a body of customs that are not written into law but which citizens are expected to honor. This includes common courtesy and respect.

There is thus a trade-off between freedom and regulation. We can think of it as a slider control: moving the slider to favor more regulations will reduce individual freedoms: moving the slider to fewer regulations will increase individual freedoms. Is there an optimal location for the slider? At one extreme are theocracies and dictatorships where nearly everything is regulated, there are few remaining individual freedoms, and the criterion for the rules has little to do with fairness. At the other extreme are the libertarians who seek to minimize any regulations or customs that limit individual behaviors. I can think of only two reasons why someone would argue for this system. The first is that they trust that everyone will be fair to each other and no one will unfairly exploit someone else. This is dangerously naïve: anyone familiar with human history, and even their own experience, will realize that this is a false hope. The second reason is that the libertarian does not want to be constrained in the opportunities to unfairly exploit someone else. Given the potential unfairness at each of the extremes, it seems clear that the optimal location for the slider in a democratic society is somewhere between them. Negotiations over whether the slider should be moved a little higher or a little lower is what politics should be all about. United States currently has two major parties: the Democrats and the Republicans, who are supposed to, and usually have, undertaken the critical negotiations.

One other factor needs to be mentioned. If trust cannot be counted on to ensure adherence to current regulations and customs, some other enforcement is needed. Most societies therefore invoke punishments when rules and customs are violated. Violators of laws and regulations are usually punished with fines and jail time, and violators of current customs are punished with social approbation and isolation.

Republican Party Philosophy. Although the Republican Party once supported small farms and businesses, promoted higher education through land grants, and pioneered retirement programs with pensions for Union soldiers in the late 19th century, it gradually turned its major attention to the promotion of big business as key to the United States' prosperity. By the 1920s, big business was doing fine, but many were rife with corruption and the lower strata of society were not doing well at all. It could hardly be called fair. The Depression and the takeover by the Democrats led to a shift in the slider to more regulations, less freedom by big businesses to exploit their staff and customers, and the initiation of a taxation system that hit the rich hardest and use the funds to support people who needed help or medical support.

Republicans have continued to oppose most of these New Deal changes. They argue that successful capitalism requires "free markets", that regulations "hurt" business, and that welfare programs undermine the motivation by workers to succeed by merit instead of handouts. They resent the taxes which take some of the money they have earned and re-distribute it to those in need. They believe that privately owned services are more effective and economical than government sponsored ones. In support of their positions, they have advanced theories such as supply-side economics, which claims that low taxes on the rich encourage the rich to invest in productivity and

the resulting profits trickle down to the poor.

The alternation between Republican and Democratic administrations and Congresses during the last 100 years provides some tests of the Republican positions. In fact, as can be seen by reading many reviews on these issues, most of the Republican positions are unsupported. The higher taxes during the Clinton presidency resulted in a much higher prosperity than the low taxes of the George W. Bush presidency. The same periods confirmed the advantages of having reasonable regulations that keep business owners from gouging customers, exploiting their workers, causing threats to health by pollution, and in some cases actually selling fraudulent products. It is no coincidence that the administrations of Hoover, Regan, and George W Bush, all of whom relaxed regulations on investors and banks, each suffered a major stock market crash toward the end of their tenure. In each case, the unregulated environments allowed parties to build up unsupported debt and take risky chances, often with other people's money. Trusting a "free market" to do the right thing does not have a very good record. Next, the general consensus among economists is that supply-side economics does not work. The rich do not take the money that they would have lost to taxes and invested in productivity or their workers. Finally, comparisons between countries make clear that government sponsored welfare programs can be much cheaper and more efficient than privately owned ones.

Still, for four decades after World War II, the push-pull negotiations between the conservative Republicans and the liberal Democrats to adjust the slider seemed to stay within reasonable bounds. In part, this was due to a shared commitment by both parties to protect the integrity of the country as a whole despite any differences. Both could be fiercely nationalistic when the country was threatened, and invariably teamed up to deal with any danger. But then things changed....

It's the money, Stupid! There were two major periods when changes became clear: the first was the presidency of Ronald Reagan, and the second was the presidency of Donald Trump. In both cases, a lot of subtle shifts occurred in the decades before their presidencies and it was only when they became Presidents that the cumulative shifts coalesced and became obvious. Regan was the first president to try to impose the Republican agenda listed above on the US economy. He severely cut taxes on the rich and slashed government welfare efforts for the poor involving housing, unemployment, unions, and the minimum wage. He was a strong proponent of supply-side economics, and of the notion that the poor had only themselves to blame for the messes they were in. While his support for business did help pull the United States out of the severe recession that he inherited, the unemployment rate basically went back to what it had been before the recession, the middle class did not gain in mean income, and national productivity did not really recover until 15 years later. Overall, the only lasting effects of Reaganomics were a significant increase in the discrepancy between the rich and the poor, and a more widespread acceptance of the belief that anyone, (but particularly white men), has the inalienable right to make as much money as they could get away with. And the biggest hurdles to achieving that goal were regulations.

As we noted in our prior essay, **greed** is one of the two key threats to the stability of a cooperative democracy. It is particularly dangerous because increases in greed have a built-in feedback factor: as more people around you get away with greed, you may be tempted to do the same because you want to get rich too, or if enough people are being greedy, you may feel you have to do the same just to keep up. Once a cooperative society has a high enough fraction of greedy citizens to pass

the tipping point, it becomes very difficult to stop the subsequent slide to an all-selfish society. Once Reagan sanctified greed, hordes of selfish people began working to undermine or eliminate as many regulations and limiting customs as possible. Big companies saw their opportunity and began pouring millions of dollars into the lobbyists in Washington and into the campaigns of sympathetic Republican candidates. Rich financiers like the Koch brothers invested large amounts of personal money in promoting conservative candidates at state and local levels to start a grassroots attack on regulation. The newspaper mogul Rupert Murdoch created Fox News to brainwash the public into believing regulations on businesses were immoral and a barrier to their also getting rich.

With the promotion of greed and the demands for deregulation already well underway, the Republican Party then began employing the second critical threat to cooperative democracies, tribalism. They probably did not do this in an attempt to destroy our nation, but they did do it in an attempt to attract new voters who traditionally voted Democratic. Tribalism, like greed, is a recurrent if not inherent tendency in human beings. It probably had a useful function when human populations were sparse and broken up into small "tribes" that competed for territories or limited resources. History is full of tribal conflicts whether the tribes were ethnically defined or based on religions or nationalities. And like greed, tribalism begets more tribalism: people harassed because of their affiliations or ancestry will typically fight back against the aggressor tribe, generating another feedback loop.

Several circumstances allowed the Republicans to leverage extant tribalism to attract former Democratic voters. The federal government, particularly Democratic administrations, undertook major efforts during the second half of the 20th century to eliminate Jim Crow and promote integration in the American South. A liberal Supreme Court also contributed. Southern whites who oppose these changes easily found common cause with the minimal government /no regulations stance of the Republican party, which welcomed them with open arms. As noted earlier, the discrepancy in wealth between rich and poor had continued to grow steadily throughout the end of the 20th century and into the 21st. To a large degree, these changes were due to successful implementation of Republican policies. But it also had to do with outsourcing of labor to foreign countries and rapid changes in technology. While the rich were relatively happy, the poor were increasingly unhappy and even angry. The Republican Party appealed to their tribalism by suggesting possible scapegoats for their misery. These included any kind of immigrant who could be accused of competing for jobs with the poor. Muslims, Latin Americans, and Asians were all sufficiently different from poor whites to trigger tribalistic feelings. Poor whites who had lost jobs due to outsourcing and technological change also resented well educated people who had mastered the technologies and still had jobs. This allowed the Republican Party to blame the "elites" thus creating another tribal friction. Finally, given the spread of secular culture in the United States in recent decades, evangelicals and many Catholics felt threatened. The Republican Party without affiliating with any particular religion took a supportive stand against abortion thus encouraging certain religious groups to affiliate with the Republican tribe. Since many of these groups felt constrained by regulations that honored religious diversity and would not let them promote their particular religion as aggressively as they had in the past, they also found common ground with Republicans in the desire to roll back constraining regulations and customs. Financial and religious Republicans could thus commiserate with each other in longing for the past when both had a greater influence in society.

Building on the prior efforts by the Party, Donald Trump ran for President, playing both the greed and tribal cards in explicit and aggressive ways. In addition to exploiting the strong feelings that were already widespread, he concentrated on building a cult of personality using his skills learned on television. Whereas prior Republican candidates only skirted the laws and regulations while adhering to customs of civility, Trump derided many of the limiting customs as well as all the regulations. He thus pushed the nation as close to an all-selfish society as has ever happened in our history.

What has happened to the Republican Congress members who were once willing to pursue push-pull negotiations with Democrats to keep the country united? The majority have been replaced or have themselves shifted away from cooperation to pursuing political power at whatever cost. Although both parties have engaged in gerrymandering, Republicans have recently taken this to a new extreme. They have also pursued a variety of mechanisms to limit or deny enfranchisement of opposition voters, contested any election that went against them, and flooded the media with falsehoods. Some may actually believe their policies are correct and the others are wrong. But when you peel back the verbiage, the only policies they are really pursuing are the elimination of regulations and the maximization of profits. Economic growth is seen as the ultimate goal of all their policies, but unregulated growth invariably benefits the rich at the expense of the poor, leads to pollution and corruption, and in many cases causes the economic system to be unstable and crash. As has been said before, power is money, and money is power. When you cannot figure out why some current Republican politician proposes some new action, look to who will benefit financially. Particularly in the US Senate, most members are very well off financially and are affiliated with outside businesses. And in the Trump administration, there was a steady rotation of individuals between the government and the pool of lobbyists working in Washington. Trump even favored those lobbyists and business leaders who had the clearest conflicts of interest with their jobs. There could not be a more glaring indication of the pervasiveness of greed as a driving force. In short, by introducing greed and tribalism to gain power, the Republican Party has broken the social contract that made them a part of a cooperative democratic society.

A Return to Regulated Capitalism.? We hope this has made the case clear why the optimum position for the slider is somewhere between libertarian anarchy, which always enables dangerous cheating, and strict authoritarianism, where nobody gets to choose what they do. Despite critics claims to the contrary, regulated capitalism is not the same as socialism. Regulated capitalism is based on private ownership and the accumulation of profits. However, the search for profits must be fair to other people without gouging, cheating, taking risks that could undermine the entire economy, causing pollution that poisons the rest of society, or introducing tribalistic biases. It can also be argued that since chance will always play an important part in financial success, it is most fair to everyone to have some sort of buffer in which the unsuccessful get a second chance through help from the successful. The position of the slider with respect to welfare will always be contested, at least by those who pay more into the system. However, that is precisely the kind of issue that is best decided by push-pull negotiations, and not by one party taking over all power. The Republican Party has lost sight of where it really belongs in a democratic society. Perhaps the best solution is to replace it with a new conservative party that values cooperation and continued integrity of the nation.

This still leaves the problem that there is a large fraction of the American population that no longer trusts government and has been persuaded that greedy and tribal behaviors are not bad things. Pushing the fraction of greedy people back past the tipping point will not be easy. However, the fact that more than half of the voters favored the more cooperative stance of the Democrats in the 2020 election suggests that there is a good starting point. Cooperation has evolved out of relative anarchy in the past. Let us hope that it can be done again.

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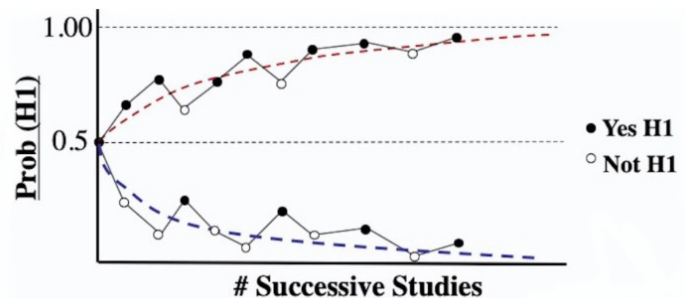
5. The Three Prongs of Science (2021)

J.J. Winham

This essay is primarily for fellow scientists, or for young people who are thinking about becoming scientists. Despite a lifetime doing science, I have only belatedly perceived some differences in approach among my many colleagues that sometimes lead to tribalistic antagonisms and misunderstandings of each other's work. Maybe these patterns are already obvious to some, but it has been my recent experience that they are not as widely appreciated as they should be. My hope is that this essay will save the younger people coming up through the ranks some of the hassles that we older folks experienced.

Commonalities in science. Scientists are trying to build up a comprehensive and coherent understanding of the world. By comprehensive, I mean that no phenomenon can escape their attention. By coherent, I mean that a finding in Biology should be consistent with existing findings in physics or chemistry. The optimal methodology is called strong inference. Having selected a phenomenon to be understood, the scientist collates information from existing knowledge in whatever fields are relevant to create a set of alternative hypotheses that might explain that phenomenon. Ideally this list would be exhaustive so that one of them has to be true. This depends of course on whether the prior knowledge from which the hypotheses are being derived is accurate; sometimes the prior knowledge is not accurate and the actual true hypothesis isn't even one of those considered. However, most of the time a list of hypotheses that includes the true answer can be drawn up. Scientists then begin various kinds of studies including experiments to test the predictions that should be verified if a given hypothesis is true. Often there are many such predictions that can be tested, and in some cases multiple hypotheses make the same prediction. It is thus often most useful to focus on those predictions which discriminate between alternative hypotheses. The best hypothesis is the one for whom all of its predictions are met when none of the other hypotheses can meet this criterion.

It often takes many scientists and many studies to understand any particular phenomenon. Techniques and devices are not error-free and the accuracy of any given study is unlikely to be perfect. A result by one scientist that supports a given hypothesis might be challenged when replicated by another scientist and found not to be the case due to some error. The result is that the approach to the "truth" in science is always asymptotic as shown on the right. If a result appears to be close to the truth, but somehow conflicts with some other parts of science, this can cause a major re-examination of all the assumed concepts from which the hypotheses were drawn. Again, results should be coherent both within a discipline and across disciplines. If they are not, one has to re-examine where the problems are and start over.



While understanding individual cases is valuable in itself, what has made modern science so powerful is the subsequent search for general patterns among sets of many cases. Again and again, general patterns have been found in nature. Widely general patterns become known as "principles". Examples include evolution, general relativity, and the ubiquitous DNA code. So once scientists feel they have gotten close to the truth for a particular phenomenon, someone has to determine whether this outcome fits any general patterns that have been observed in other similar phenomena. Does the result provide support for a general principle? Does it challenge some previously accepted generality that needs to be re-examined and reformulated? General patterns and principles have enormous value: they constitute a large fraction of the prior knowledge used to formulate hypotheses for understanding new phenomena, and outside of science, they can provide guidance for governmental, economic, and medical policy making.

Differences in science. Scientists certainly differ in many ways, including whether they work in the field or in a laboratory, focus on fine or large-scale phenomena, rely on complicated devices, advanced statistics, or interactive networks, etc. But here, I want to draw attention to another pattern of differences which I think extends across every field of science. It has to do with the questions that are being asked about natural phenomena. Most phenomena involve some entity that undergoes some process or activity resulting in some consequence. The entity could be a single living cell, a plant, a whole biological species, an ocean, a star, or even empty space. Activities could involve how the entity got to where it is currently, or processes that it may be undertaking now or in the future. Consequences involve the impacts the process has on both the entity and its contexts. This model sets us up to ask any of three different questions about a phenomenon. "**What**" questions focus on the entity itself. "**How**" questions focus on the activities. And "**why**" questions deal with the consequences of the activities. Actually, things are a little more complicated than that, but this is a good place to start. Let us examine each question in turn.

What Questions. All science begins by characterizing a focal entity: what are its traits, when does it occur, and where does it occur? One can think of this kind of study as defining the "natural history" of that entity. But description of a particular case is only the first step in good science. The next step is to see where this particular case fits or doesn't fit into existing general patterns. The general patterns relevant to people asking What questions are classification schemes or "taxonomies". This requires comparing the traits of this new entity to those of other previously studied ones. In what ways is it similar and in what ways is it different? Knowing which traits are shared by a large number of entities and which by only a few allows one to build a hierarchical taxonomy. Examples of such taxonomies include the classification of living organisms, the periodic table of elements in chemistry, the classification of stars in astronomy, and the standard model of subatomic particles in physics.

Note that the building of a hierarchical taxonomy is often recursive: the criteria used to create a taxonomic scheme may no longer work when a new entity is added. It may be necessary to reorder the criteria and restructure the taxonomy to accommodate the new entity. In addition, advances in technology allow previously hidden traits to be evaluated and compared and may drastically change an existing taxonomy. An example is the addition of genetic information to biological classification schemes based only on anatomical traits. Different taxonomists may disagree about how to weight the relative importance of different traits. So, while What questions may seem simple descriptions at first, properly placing an entity in its taxonomic position can be quite complicated. Every scientific field relies on those members who are good at answering the What

questions and classifying new entities. This is where nearly every scientific field began historically, and even today it plays a critical role when new entities are discovered or better classification schemes are envisioned.

How Questions. How question scientists seek to characterize specific processes or activities exhibited by a focal entity. If it can be assumed that similar entities are likely to exhibit similar processes, one can look to other already studied entities to build a list of hypotheses for how a current focal entity does what it does. In other words, scientist pursuing How questions often rely on results of prior taxonomic work by What scientists. In biology, the use of model organisms to help understand other species is a good example. How scientists are often considered "reductionists" because they dismantle the process into its component parts. But reduction is only part of explaining the system as one must also identify how those various parts work together to produce the observed results.

The majority of modern scientists are concerned with How questions. This is in part because understanding the mechanism of a phenomenon's processes will often give us some way to control it or at least anticipate its occurrences. And the assembling of many such results into general patterns has enabled scientists to deal with phenomena that have not yet been studied. Our understanding of how viruses take over the replication processes in host cells allows us to develop mRNA vaccines that mimic a new virus just enough to stimulate immunity. Our understanding of how various forces work together to make an object orbit the earth allows us to put stationary or moving satellites right where we want them. Our understanding of plate tectonics helps us anticipate where and when there next may be earthquakes or volcanic activity. Our understanding of how heat is gained or lost at the earth's surface and in the atmosphere allows us to predict the trajectory of global warming and come up with ways to prevent it.

Both the large number of scientists asking How questions and their practical relevance have encouraged an explosive development of new technologies to test the predictions of alternative hypotheses. It is now possible to insert genetically modified proteins into living nerve cells in the brain that light up with different colors when they are active. Two-photon microscopes can see into living cells without hurting them. Massively powerful computers make extremely powerful predictions possible and crunch large data sets to get results. Atomic physics, astronomy, earth sciences, polymer chemistry, and most other fields now rely on similarly sophisticated technologies. All of this takes a lot of money, but both governments and commercial enterprises have been willing to provide it.

What about classifying How questions? Once the processes for a number of entities have been characterized, is it possible to use similarities or differences to generate a taxonomy of processes? It is, but there are different ways to do this depending upon one's goals. Most entities are capable of multiple processes. If the main focus is on a given type of process, then classifying entities according to similarities or differences in how they accomplish this process will clarify which components in the process are most conserved and which most variable. Note that the classification of the entities by a single process may be quite different from that based on other traits of the entity. Alternatively, one might include processes with other entity traits during classification. Most often as noted above, scientists use the taxonomy based on traits other than processes to

classify the entities, and then examine the degree to which a given process varies across this taxonomy. We take up this approach further in the next section.

Why Questions. Why questions are best framed as comparative ones: why does a focal phenomenon have the properties it does instead of one of the likely alternatives? It is useful to divide this question into Why/What and Why/How categories. In the first case, one wants to know why a particular entity exhibits particular traits (other than processes instead of one of the alternatives. In the second case, one wants to know why a particular entity exhibits a particular process instead of an alternative. In both cases, there are several possible answers:

- **History:** Entities rarely are created from nothing. They usually have a history and antecedents. Two different entities might exhibit similar traits and perform similar activities simply because they came from a common source. Thus most species of birds are born with wings and can fly because these adaptations evolved in a common ancestor. On the other hand, rocks that undergo a similar metamorphic process may end up with quite different properties depending on whether they started as sedimentary, igneous, or other types of metamorphic rock. Many subatomic particles can only have certain properties if the particles from which they are derived had those properties.
- **Context:** In many cases, the context in which an entity exists can play an important role in which traits exhibit and what processes it undertakes. For example, we can ask why the planets in our solar system closest to the sun are rocky and small, whereas those farther away are giant balls of gases. The answer is the proximity to the sun. When the planets were forming out of the solar nebula, only the heavier elements with a higher melting point could become solid and coalesce. Only further from the sun could gaseous components solidify and coalesce, and since these were present in larger amounts than the heavier elements, they formed larger planets. In evolutionary biology, many Why questions are answered by considering the economics. One wants to know which alternative is likely to appear produces the highest fitness. Birds living in very patchy environments are more likely to have polygynous mating systems, whereas others in less patchy environments are more likely to be monogamous. The difference has to do with how easily males can defend large patches of resources and therefore attract multiple females. The biochemical systems that run our bodies form complicated networks. There is often a trade-off in such networks between the system being highly efficient on one hand, or robust to breakdowns and perturbations on the other. Where the trade-off has been set by evolution depends on how critical that system is to the organism's fitness, and can often vary depending upon the organism's environment. The relative positions of the earth's tectonic plates and their supported continents have played critical roles in shaping the current climate of the earth, and therefore which organisms could survive on it. Pangea was a fairly hostile place to live!
- **Random Events:** A third reason Why phenomena have the properties and processes they exhibit may be a prior random event. Search events can be random in when they occur, where they occur, or both at the same time. Mammals have replaced dinosaurs on the earth, (except for the birds), because of a random collision of a large meteor and the earth, perhaps aggravated by the concurrent irruptions of a chain of volcanoes in India. Again turning to biology, mutations are largely random in living thing's genetic material. These provide the diversity on which evolutionary selection can then operate. Species that had a common

ancestor, and have retained similar ecologies, may end up looking quite different if geographically separated due to the random accumulation of mutations.

- **Structure:** Given that an entity has a particular structure, which could be due to its history, context, or even random events, it may only be able to perform certain processes. For example, stable atoms require equal numbers of nuclear protons and orbital electrons. As more protons and neutrons are added to a nucleus, additional electrons must be added. Given the repulsive properties of electrons with each other, only a certain number of electrons can be packed into a given orbital shell around the nucleus. The reason that the different elements in chemistry that differ in the number of protons and neutrons in the nucleus can be ordered into a "periodic table" in which elements in the same column have similar chemical properties is because all of those elements in that column have the same degree of filling of their outer most electron shell. Whales swim because they have all the anatomical structures necessary and cannot move on land. Why their ancestors moved into the water from the land is another question.
- **Some combination of the above:** The properties and processes of most phenomena are likely due to a mixture of the three factors listed above. In sum, the history and antecedent characteristics of an entity are more important than context or random process. In other cases, context appears able to trump history. And a major random event such as a collision between earth and another body can totally disrupt both history and context.

Can you ever answer a Why question? Just because one can imagine a plausible explanation for something does not mean that this is the correct answer. Nobody was around when the planets congealed out of the solar nebula or when the meteor strike killed off the dinosaurs. What kind of experiment could one possibly perform? And how does one sort out the relative importance of each of the three factors listed above?

As noted earlier, the answers to Why questions are best found by comparing known or likely alternative forms of the phenomenon under study. Given that a set of alternatives can be identified, there are a number of tools that can be used to sort out the most likely among them. Because there is more confusion about how to deal with Why questions than the other two, it is worth taking a few minutes to spell these out.

- **Traces of history:** Although events affecting prior states of a phenomenon may have occurred long before humans developed science, many of these events leave traces that can be detected and used to discriminate between alternative reasons for why an entity has the properties and processes that it currently does. Biological fossils can show which properties of a current organism were also present in its ancestors, and the surrounding strata of the fossil can usually indicate something about the context in which the organism lived. Early developmental stages in modern organisms can exhibit traits of the ancestors which are then lost in the adult. Gill slits in the human fetus are a case in point. Traces of elements that are more common in meteors than on earth in the geological strata concurrent with the extinction of the dinosaurs provided key evidence for why this large group of animals disappeared. The presence of cosmic microwave radiation in space today provides evidence for the big bang theory of the universe.
- **Correlation with context:** Correlations between the presence or absence of specific traits and the ambient context of a group of entities can also be a useful tool. The number of entities being compared needs to be larger than the number of contexts to achieve any

statistical significance. Since two entities might exhibit the same properties or processes because they were derived from a common ancestor or source, some method to separate out the effects of history and context is required. The "Comparative Method" of evolutionary biology provides tools that allow for the quantitative estimation of the relative effects of history and context on particular traits. Even with quantitative methods, correlation is not necessarily associated with causation, and this method is best used in conjunction with one or more of the others.

- **Models and Simulations:** Often one can model or simulate the alternative ways that an entity might have acquired the properties it has, or alternative processes that the entity could've used in the same context. Once one has a general model, one can vary the values of critical parameters in the model to see which ones have the greatest effect on the outcome, and which values of those parameters are most likely to produce the observed results. One can then exclude those alternatives that can only be achieved with parameter values that are unlikely to exist. For those models that are possible with realistic parameter values, the simulation can make predictions that can then be tested. In addition to proximity to the sun, the generation of small rocky planets close to the sun and large gaseous ones further away might have been generated by the different rotational velocities of successively more distant bands around the sun or the differences in area traversed and thus densities of condensing materials. We know enough about physics in space, the melting points of different elements and compounds, and other parameters to model the system and discriminate between the alternative hypotheses. The powerful computer systems available today make creating and exploring such simulations feasible in ways that were never possible before. The main constraint on models is that they are always simplifications of reality. Some components or factors are invariably left out. The decisions on what to leave out depend on prior knowledge and the judgment of the modeler. Models can be wrong in that they leave out the wrong things, or they make assumptions that are incorrect. As with other parts of science, alternative models need to be tested and compared to find the ones that best explains what we observed in nature.
- **Economics:** Economic approaches focus on the consequences of alternative entity properties or processes. If some optimization principle can be applied to the consequences of alternatives, this can often provide insight into why a particular alternative is the one that is found. In evolutionarily biology, the optimization criterion is the maximization of fitness. The fitness of any realizable alternative depends on its costs and benefits, and these depend on the context. In physics and chemistry, the optimization criterion might be minimal energy state or stability. In some cases, one knows enough about the alternative entities that one can generate an economic model, input contextual parameters, and identify which alternative best meets the optimization criterion. Where several alternatives actually exist in the same context, one can measure the consequences and see if this predicts which is the most common. Economic analyses are widely used in all the sciences.
- **Experimental Manipulation:** By experiment, I mean direct manipulation of something as opposed to just measuring a parameter. If studying an entity who's traits or processes are more affected by context than history, manipulation of contextual variables in a systematic way may induce changes in the entity that confirm or disapprove hypotheses about why it is the way it is. If using an economic model, changing contextual variables may affect the consequences of an entity's properties or processes, and these changes in the consequences can be compared to predictions from alternative hypotheses. If one can alter the traits of

the entity or its processes, resultant changes in the consequences can also be informative. Where a process such as the formation of planets around a star is not directly manipulatable, a good simulation can allow one to manipulate properties, processes, and contacts in the model to compare alternative scenarios. While experimentation is usually associated with research on How questions, it is increasingly possible through technology and other forms of manipulation do you use it to test alternatives for Why questions.

Tribalism vs Complementarity: it has been my experience that most scientists tend to favor one of these questions in their own research over others. Some people seem to be particularly good at providing meticulous descriptions and sorting entities into clearly defined taxonomies. Others seem drawn to the challenges of designing discriminating experiments and recruiting new technologies to sort out just how something works. Scientist who are attracted to Why questions are often those who are also most interested in big picture science. Charles Darwin and Albert Einstein would be classic examples.

It is not surprising that there might be competition and rivalry within the group of scientists pursuing the same kind of question. Taxonomists are often very strict about the rules that can be used to classify entities and there is often strong disagreement about which sets of traits are most reliable in producing a classification scheme. How question scientists have frequently competed to be the first ones to finally solve a particular process. The race to understand how genes and DNA work is a case in point. Why questions can also lead to polarized views and debates such as that over Lamarckian versus Darwinian evolution.

There will probably always be competition within disciplines, not only over competitive views, but also over limited funds for research. Most of this is healthy and advances the science. There is, however, another form of conflict which is not so healthy, and that is antagonistic tribalism by scientists pursuing one kind of question against those pursuing one of the other kinds of questions. During the rise of molecular biology in the 1950s and 1960s, numerous authors at the time promoted the reductionist approach of molecular biology as intellectually superior to the descriptive methods of natural history. This was despite the fact that molecular biologists pursuing How questions invariably started with and relied on prior descriptive and taxonomic results from work by What question scientists. A similar conflict occurred in the 1980s when evolutionarily biologist began asking Why questions about animal and human social structure. The critics claimed that the Why scientists were only coming up with "just so" stories, ignoring the many techniques that Why scientist developed to discriminate between alternative hypotheses. These arguments might seem like just rhetoric, but in fact they often caused major shifts in funding allocations and staff hiring. The tendency for each scientist to favor one type of question for their own research and the zero-sum game that characterizes scientific funding have both contributed to continuing tribal animosities across many fields of science.

It should be obvious by now that the three types of questions in science should be complementary and not competitors. As we noted earlier, Why scientists might seek the reasons an entity has the traits it does instead of alternatives (Why/What) or why it exhibits a particular process instead of an alternative (Why/How). But the interactions can actually go further than this. Knowing why a particular consequence is favored by evolution or energetics or other reasons may help explain why the entity does it the way it does. Knowing how an entity performs a process instead of an alternative may help explain why it does it. Longer

chains of question interactions are possible. A bird of paradise may have a long tail because its diet (context) precludes it from defending a big enough territory to attract a co-resident female, so it must display competitively with other males to attract females for copulation (a particular process). Over time, this selects for longer tails in males (an entity trait). This sequence is: Why→How→What. An element undertakes particular chemical reactions (process) determined by its electron configuration (trait) which is determined by the number of protons and the rules of electron shell packing (context). This can be envisioned as a Why→What→How chain.

The point is that we are better scientists if we not only acknowledge but pay attention to the work done by our colleagues asking different kinds of questions. In addition, it doesn't hurt to consider whether asking one of the other questions of our own study system might not shed some new perspectives or approaches that we would not think of otherwise. For young scientists just starting out, it can be very useful to apprentice oneself to a senior scientist pursuing a What question, then one pursuing a How question, and then one pursuing a Why question. Not only does this help young scientists decide which approach fits them best, it also gives them the tools and the experience needed to incorporate information and approaches of those pursuing the other two questions. In short, it does not help anybody to be tribalistic in science. We do best if we work together, respect each other's work, and share perspectives to stimulate new ideas.

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THE WINHAM PAPERS

6. The Real Original Sin (2021)

J.J. Winham

In case you hadn't noticed, the Bible often takes considerable liberties with time scales. Did any human really live for 900 years? So, it may not come as a surprise to learn that the Original Sin as outlined in Genesis actually occurred 56,000 years ago. It *did* occur in what is now northwestern Israel. Unfortunately, the passing down of the story through the millennia has resulted in considerable changes from what really happened. Here, I provide the true story.

At that point in history, most of Europe and parts of western Asia were inhabited by humanity's cousins, the Neanderthals. There were no modern humans in these regions. One population of Neanderthals extended down into just the northern parts of Israel. The Middle East then had a wetter climate and an interesting mixture of fauna and flora from the Mediterranean coastal area, northern Africa, and the nearby Asian steppes. Modern humans had just begun to move out of Africa, with some populations moving up the Mediterranean coast and others moving east towards the Red Sea and eventually India.

Our story begins with a dozen modern human men who had left their cave settlements in southern Israel and were moving north along the coastal plain. They were looking for suitable areas for a future habitation that contained abundant game, local vegetable foods, water, and caves in which to live. Caves were not abundant along the coastal plain, so this group explored some of the valleys extending to the east from the plains as they move northwards.

The group was led by the tribal shaman Gor-Li. While none of the men had been in this area before, Gor-Li had heard from other explorers that if you went far enough north you might encounter small populations of Shagorum. This word meant “animal-people” in their language. While these looked a bit like humans, they were thought to be the offspring of humans mating with animals. Such matings were considered a hideous crime, and both the perpetrators and their offspring were to be killed whenever possible. Gor-Li explained all of this to his group before they set off but, so far, they had not encountered any of these “monsters”. Of course, we now know that the Shagorum were Neanderthals and were not the result of any kind of bestiality. They were just a different species related to humans.

Gor-Li led the group off the coastal plain and into a promising looking valley. They soon encountered abundant game and a number of fairly steep cliffs that ought to have habitable caves. After coming out of a particularly dense patch of woodland, the human spotted a group of what they first thought were other humans standing at the base of a steep hill. The group included several adults of both sexes and lots of offspring of different sizes. There were about fifteen of them. When they turned towards the intruding humans, it became obvious that they were not human beings. They were Shagorum! The humans hesitated long enough for the Shagorum to takeoff running as fast as they could to the east and up the valley. They clearly knew their way and seemed to have trails to follow. The humans ran after them brandishing their spears and shouting. When he first reached the place where the Shagorum had been standing,

Gor-Li noticed an extensive series of trails going up the hill and expanding across the valley in all directions. He halted and glanced up the hill and saw what looked like the entrance to a cave. He decided to check it out and the group moved up the path to the cave. It was clearly the Shagorum residence. The humans peered inside and saw a large fire smoldering in the middle of the main chamber. Scattered around the fire were tanned skins arranged as if for beds. There were racks of dried meat, large stacks of tubers and other edible plants, hide buckets full of water, and other evidence that a sizable group lived here full-time. Two of the men briefly explored the back of the large chamber and poke their heads into a few of the side chambers. They returned to say they had found no evidence of any more Shagorum. The whole group had evidently been gathered outside the cave when they were forced to flee.

Gor-Li decided to leave one member of the group to keep scavengers and other animals from occupying the cave, while the rest of the group tracked down the Shagorum and made sure that they never returned alive to this place. He asked his son Adm to stay and guard the cave until the group came back. He said it might be several days as he did not know how far they would have to track the Shagorum to catch them, and he also wanted to check out the availability of game further up the valley. Adm was 17 and already one of the best hunters in the group. He was extremely agile with his spear and had an uncanny knack for sneaking up on game. Adm agreed to stay and guard the cave until the group came back. There was clearly plenty of food and water and he was curious to see what else the Shagorum had collected in the cave. He watched while the group went back down the hill and headed up the valley at a quick trot. They soon disappeared from sight.

There was a stack of partially burned palm stems by the side of the cave that were obviously used for torches. Adm lit one in the fire and, holding his spear in one hand and the torch in the other, began to explore the cavity. It was very well organized and clearly quite comfortable. He was a bit surprised that “animals” would live like this. As he moved to the back of the cave he saw several side chambers and began to explore them. One of them had a large stack of tanned skins that were not currently being used. At the very back of the main cave was a small passage leading to another chamber. As he walked into it he suddenly saw a gigantic snake lying on the floor in front of a huge pile of what appeared to be dried fruit. He froze so as not to arouse the snake. It was jet black with shiny scales and longer than a man is tall. He recognized it as a species that could be very vicious and kill you if it bit you. It was not uncommon, and the human approach was always to kill them when they were encountered.

The snake lifted its head off the floor and considered Adm. He did not move but stayed stock still watching. Then, one of the rats which were so common in his own cave came out of a crevice and advanced warily on the pile of dried fruit. When it got close enough, the snake struck like lightning, grabbed the squealing rat, gave it a few chews and then swallowed it. Adm watched in fascination as the rat became a lump in the snake, gradually moving down toward the center of its body. At that point he noticed there were several other lumps further down along the snake, and a few of its scats to one side of where it was lying.

He watched the snake return to its earlier position and wondered why the Shagorum had allowed such a dangerous snake to live in their cave. But then it occurred to him that if the snake had arrived there by chance, keeping it guaranteed protection of the fruit pile from rats. That

would be very clever and not something you would expect animals like Shagorum to realize. Or even more unlikely, might the Shagorum have brought the snake when it was small to live near the fruit pile to protect it? That would be even more clever. Everything his father had told him made him doubt that they were this clever, but he was already wondering whether this might not be true given the order in which the Shagorum lived in this cave.

As Adm turned to go back to the main part of the cave, he heard another noise behind the fruit pile. He whirled around holding up his torch and brandishing his spear. To his shock, a round light-skinned face with giant eyes poked over the fruit pile and stared at him. When he did not immediately attack it, it rose to its full height and he could see that it was a young but adult Shagorum. And it was clearly a female. He knew he was supposed to slay it immediately, but the way it held his gaze made him hesitate. After what seemed an eternity, the young Shagorum edged from behind the fruit pile, calmly stepped over the snake, and reached out to take a small handful of dried fruit from the pile. Then holding his gaze steady she moved forward towards Adm. He anticipated some kind of trick and adjusted his spear for maximum attack angle. She stopped opposite him and held out her hand with the fruit like some sort of peace offering. He looked from her face to the fruit and back and held his position. Never stopping to watch him, she took her other hand and slowly placed one of the fruits in her mouth and ate it. Then she looked at him again and smiled! She smiled! So, the fruit wasn't poisonous, but even if he wanted to try it, both of his hands were occupied and needed to stay that way. Finally, a look of comprehension came over her face and she moved closer to him holding out one of the fruits in her fingers. Very slowly and keeping her eyes on his, she leaned in and place the fruit on his lips. Adm had eaten nothing since before dawn this morning, and as the sweet sugary fruit invaded his lips and tongue, he compulsively chewed it and swallowed it. She lowered her arm to her side and again giving him a gentle smile, she slowly slipped past him and into the main cavity of the cave. Adm was flabbergasted by this whole performance and by her. He lowered his spear and warily followed her back into the cave's main chamber.

She poked at the fire and added some additional wood from a nearby pile. Then she bent down and began arranging the firs that were assembled in little piles around the fire. They had been somewhat disrupted when Adm's group members did their cursory check of the cave. She stood up and walked slowly to the entrance of the cave where she stood for several minutes looking down into the valley in all directions. She must have seen that there was no one else out there, either Shagorum or human. She turned around with a sigh and went back into the cave and sat down next to a small stack of stone knives. She picked up one and Adam immediately grew wary again, but then she reached over and grabbed a skin and began scraping the fat and other tissues from its interior side. While she worked she made small humming sounds and occasionally looked up and smiled at him again. That smile was getting to him. He had never seen an animal smile like that! Adm sat with his spear across his knees and a sharp knife that he always carried handy at his belt. In this way, they spent most of the remaining morning.

Toward mid-day, she got up and walked slowly towards the entrance of the cave where she paused and looked over her shoulder, clearly inviting him to come. He rose and, holding his spear at the ready, followed her to the entrance. She left the cave and took a small trail along the side of the hill to a place where she stopped, looked over her shoulder for a minute, and then squatted to do her business. She stood up and turned to him with a questioning glance while

pointing with her hand at the same area. She was clearly giving him permission to do his business as well. Holding his spear at the ready, he did. She honored him with another of those warm smiles and he followed her back to the cave. She then put some water in a leather pouch and added some strips of meat, a few of the tubers cut in sections, some seeds of some kind, and some of the dried fruit. She set it by the fire so that it was stable and dropped a couple of very hot rocks from the fire into it. The water immediately began to bubble and boil, and she sat down next to the leather pot and occasionally stirred it with a stick.

After a few minutes she raised her face to look at Adm and began to speak. Yes! Speak! It was not a language he knew and it was full of weird clicking and guttural sounds. But it was clearly meant as words. He then tried to tell her in his own language that he did not understand her. She looked puzzled so he shook his head hoping this would indicate he did not understand. She was quiet for a few minutes. Then she pointed to herself and looking at Adm emitted a weird short sound. He again shook his head in consternation, and she pointed at herself again and this time slowly sounded out the utterance “EEEE-VO-click”. He was initially perplexed, but she did it again and this time he figured it out: she was telling him her name! Since what she had sounded out was like “Ivo”, a girl's name in his language, he pointed back at her and said “Ivo!”. She smiled from ear to ear and then pointed at him with a questioning look. He pointed to himself and said “Adm”. She tried to repeat his name at first incoherently but with a little practice it actually came out pretty close to his own version. She pointed to herself again, said “Ivo”, then pointed at him and said “Adm”. They exchanged smiles with each other and she turned back to stir her pot.

Adm took her preoccupation with the cooking to give her the first serious look since she had appeared. Her face was a lot like a human one, but she had a broader flatter nose, big lips, and those giant eyes. Her body was like a human body, perhaps a bit shorter in legs and arms, and clearly strong. She had young conical breasts not unlike those he had seen on the girls in his clan. She was very agile when she moved and always seem to have a clear idea of what she wanted to do next. Adm knew he was supposed to feel hostility toward her, but instead, he had already developed some kind of affinity. It was totally strange.

She divided the cooked meat, vegetables, fruit, and grains into two smaller leather bowls and they ate. It was delicious and Adm had not realized given all that had happened how hungry he was. When he was finished, he set the bowl down and watched her as she tidied up and did some other minor chores. He marveled at how efficient she was and could not imagine how someone, especially an animal, could deal with what had happened today the way she had. Did she realize that the rest of her family might be dead? Why had she been so willing to accept him the way she had? He wondered if some of the Shagorum were more people than animal despite their parentage. If so, maybe she had been one of the lucky ones. She was definitely more like a person than an animal. And he was now convinced that though he had threatened her multiple times, she had no desire to harm him or leave.

As the sun set behind the hill, Adm went to the cave entrance and looked both up and down the valley for any sign of either humans or Shagorum. Nothing. He noticed a nice little herd of antelope grazing just down the hill in an open grassy area. For the first time he noticed a small stream running down the hillside to one side of the cave. The Shagorum had built a small dam on

it that formed a pool, making it easy to collect water. Ivo came out and stood beside him holding a large leather container. She then moved down to the pool and filled it with water to take back to the cave. Adm went down with her and after it was full, he reached out for it and carried it back to the cave himself. This certainly earned him another one of those smiles.

As it got dark, Ivo stoked the fire and pulled one large group of skins into position where the person who slept there could easily see the cave entrance. Then turning to him she patted the skins and said “Adm”. He went to where she indicated and lay down on the warm skin, putting his spear nearby in case he needed it. She went to an adjacent pile of skins and said “Ivo” and lay down on her pile and covered herself with the fuzzy ones. They both went to sleep to the sounds of the crackling of the fire, the distant calls of hyenas, and the flapping of a few bats that flew in and out of the cave.

Adm woke up well before dawn. He was sleeping on his side, and something was pressing against his back. He raised his free arm and reached behind himself and felt Ivo's soft warm thigh. She must have moved her sleeping furs next to his during the night and was now fully snuggled up to his back. It was nice in the morning chill, and he drifted back to sleep. When he woke at dawn, he turned on his back and extended out the arm nearest to her. She lifted her head and snuggling closer, laid her head and a palm on his chest. He pulled his arm in to enclose her and hug her tight. It felt good. And despite all his father's warnings, it felt right, so very right.

After they got up, Ivo made them a breakfast of boiled grass seeds and dried fruit. Then she got up and filled a small leather bowl with water from the big water container near the cave entrance. She then took a torch and lit it in the fire and turning to Adm with an invitation on her face started to walk to the back of the cave. He followed as they entered the chamber with the snake and the dried fruit. She stuck the base of the torch in a crack in the side of the cave wall and bending down scooped the water out of a small depression in the floor of the cave. Then she poured the water she had in the bowl into the depression. She next picked up the scats that the snake had left at various places on the cave floor and put them in the bowl. As Adm watched, he realized that Ivo was probably the official caretaker of the snake and had likely been doing her duties when the rest of the group had been at the foot of the hill preparing for some other activity and the humans had encountered them. That was why she had been here when they arrived.

Her tasks completed, Ivo pointed at the big snake, which was totally ignoring them, and uttered a guttural clicking sound. Adm was at first not sure what she was up to, but she repeated it and he then realized she was saying the name of the snake in her language. She then pointed at the snake and said “Adm?”. He saw what she was up to and said the word for snake in his language. She immediately tried to say the word in his language. It came out all wrong, so he said it again. She tried again three times and finally uttered a pretty good rendition of the word. Adm nodded and she showed her brilliant smile. On a roll, she bent down and stirring the water she had just put in the depression with a finger said a word in her language. Then she turned to Adm and waited for him to say the word for water in his language. Again she repeated it several times but this time she got it sooner than she had gotten the word for snake. When he nodded she gave him another of those intoxicating smiles. Then she pointed at the scats in the bowl and said a word in her language. Adm laughed and said the word for poop (feces) in his language and again she repeated it until she got it pretty close to the way he said it. She had an amazing memory for

sounds and while he was trying to memorize even one of her words, she had already nailed three of his.

Back in the main part of the cave, Ivo went about various housekeeping chores, while Adm examined a corner of the cave near the entrance where someone had been making stone tools. There were lots of chips laying around, and a number of carefully selected rocks for starting points. A few of these rocks were very dark and almost transparent (what we now know as obsidian). Where they had been chipped already, they had razor sharp edges making them very attractive for knives and spearheads. Adm had become quite adept at making his own stone tools in recent years and sat down to experiment with this new material. One piece showed great potential for a new knife that he could carry on hunts.

In early afternoon, Ivo pulled out a very large rolled skin with leather straps hanging from all sides. She pointed to the dwindling stack of firewood at the side of the cave and said the word for firewood in her language. Then she turned to Adm with that same questioning look she had used in the snake chamber. He now knew the game and immediately said firewood in his language. This was a somewhat complicated word, and it took her a while to master it, but she again did so.

She then picked up the rolled leather affair and led him out of the cave and up a trail to the woods just over the top of the hill. The entire way she kept practicing the words for snake, water, firewood, and poop in Adm's language. When they reached a spot she found suitable, she unrolled the large skin on the ground and began collecting dry firewood from around the forest. She was good at stacking it and interweaving it into as tight a mass as possible. When it pretty much filled the space available on the leather rectangle, she rolled up the sides and tied them tight. The package was clearly much heavier than one person could carry, so she handed Adm the remaining straps on one end and picked up the straps on the other herself. Together they carried the heavy load back to the cave, while the entire time Ivo practiced the new words she had learned.

Later, after finishing their main afternoon meal, they were both sitting by the fire. Ivo turned to Adm and holding out one hand, moved her first two fingers as if walking away from herself. She then said the word in her language for what she had just done and waited for Adm to tell her the word in his language. He was a little puzzled at first but then figured she must want the word for “go”. He said it very carefully and she repeated it until she had it down. Then holding her fingers away from herself she walked them back to her and said a word. Adm said the word for “come” in his language. She then practiced that until she had it down. Although she often had problems making some of the sounds that were key to his language, she always managed to invent some version that he could understand.

Shortly before the sun went down, she stood up and turning to Adm said very clearly, “Ivo go poop”. Adm laughed and nodded and she turned around and left the cave briefly. Adm had noticed that when she was housekeeping the cave, she had left her sleeping skins next to his. He got up and went to his skins and lay down. When she came back in and looked at him, he reached over and patted her skins next to his and said, “Ivo come”. With that gigantic smile she did.

Adm awoke from a very pleasant dream in the middle of the night. He slowly realized that something was feeling pretty good down in his groin area. He opened his eyes and saw that Ivo was bent over that area of his body doing something with her hands. He did not want her to stop so he just lay back and closed his eyes. Soon she gave a grunt of approval and climbed up on top of him. She used her hand to guide part of him into her and began some rapid and very energetic movements. He did not want her to stop and put his hands on her shoulders as she worked away. She gave out a lot of moans and sighs as she sped up and suddenly a wave of pleasure swept over Adm. Soon after, Ivo squealed and shuddered and then collapsed on top of Adm. As they lay like that for some time, Adm felt a peace and contentment with the world that he had never felt before. Soon both of them were asleep.

Adm again woke before dawn with Ivo sound asleep and curled up against him. He realized that what they had done last night was mate. Although he had never done it himself before, Adm had often seen other humans including his parents do this. However, they did it differently with the woman on her hands and knees and the man behind her entering from the rear. He had never seen anybody do it with the man on his back and the woman on top. But still, he knew what they had done. In his tribe, a human who mated with an animal was committing the worst crime imaginable. As noted earlier, it was punishable by death. But Adm could no longer think of Ivo as some sort of animal. She was a person, just kind of different, with all the feelings, cleverness, ability to communicate, and skills that people had. And she was a lot easier to be around than many of the young girls that he had known.

The next morning after their meal of seeds and fruit, Ivo was energetically husking some large tubers that she had taken from one of the storage piles. She looked up at him and said “Adm go snake?”. He paused to think of himself being near that giant monster alone, but he picked up a bowl and filled it with water. Grabbing a torch, he went off to do the task. When he entered the chamber alone, the snake raised his head and clearly looked at him. He put the torch in the crack in the wall and slowly bent down to scoop the now dirty water out of the depression. He poured in the fresh water and stood up. The snake had lowered its head and it was now waiting for rats. He moved around slowly picking up the scats and putting them in the bowl and then feeling very proud of himself, picked up the torch and went back to the cave entrance to toss them outside.

They spent most of the day inside. Ivo was making something with small bones and a sinew. Adm did not see what it was but was preoccupied trying to make the new knife he had envisioned from the black glossy rock. It was trickier to chip than flint, but he soon got the hang of it and the knife began to take shape. Throughout the day Ivo continued building her vocabulary by pointing to things or making motions, saying the word in her language, and waiting for Adm to say it in his. Amazingly, she mastered the words for food, knife, fire, meat, roots, hand, foot, eat, and sleep. Adm was waiting for her to ask the name of the word for what they did last night, but she did not ask. Adm did learn a few words in her language: “egan-click” (dried fruit), “gosha-grunt” (spear), and “ska” (knife).

After they had eaten that evening, Ivo led Adm over to their joint pile of sleeping furs. She squatted down on her haunches and patted the spot in front of her for Adam to do likewise. She then just sat there scanning every inch of his face and upper torso with those giant eyes of hers, a gentle smile on her face. Then she raised her hands and put one on each side of his forehead. She

slowly slid her hands down to his chin. Then closing her eyes, she made the same movements on her own head. She repeated this sampling of his nose, lips, chin, and ears with her fingers followed by an identical sampling of her own face. Adm had seen reflections of his own face in containers of water and knew that he looked a lot like the other men in his group. He guessed that Ivo had never seen her reflection or understood that it was her face, but knew that Adm looked different from her father and brothers so suspected she also was different from him. Finally satisfied with her analysis, a big smile graced her face, and she leaned forward to push Adm gently onto his back. She then used her fingertips to trace his body as he closed his eyes and just gave in to the sensual pleasure. She gradually moved on to what she had done the prior evening, and after they had both reach that ecstasy that was so new to him, they lay in each others' arms. Stimulated by her comparisons earlier of their bodies, he used his own hands to trace out the dimensions of her arms, legs, and torso. She was definitely shaped differently from the young girls he knew in his own clan. But somehow, she seems to fit perfectly against his body, and enjoying the warmth they shared, they both fell into a deep sleep.

The next morning Ivo came running back into the cave after making her early lavatory stop. She waved her arms and said "Adm come! Meat!". He grabbed his spear and went to the cave entrance and quickly saw that the small herd of antelope he had seen earlier had returned to the grassy sward at the foot of the hill. He snuck through the hillside vegetation until he was downwind of the animals. Then very cautiously he approached using his extensive skills in stealth. When he was right at the edge of the grassy sward, he picked a female who had her head down and was grazing close by. He rose and hurled his spear directly at her flank and caught her right behind her front leg. She went down immediately. He ran in while the other antelope scattered and slit her throat with his knife. Ivo appeared magically out of the forest behind him and together they dragged the antelope up the hill to a place she indicated was used by her group to butcher their prey. They work together as an efficient team to butcher the animal, saving the skin, some of the entrails, and a large amount of meat that they sliced up and prepared for drying in the cave. They then went to the stream and washed off all the accumulated blood and gore. As they turn to walk back to the cave, Adm held out his hand and Ivo took it in hers. Together they walked back to the cave.

They spent the rest of the day doing their respective handicrafts. Adm had found a good shaft for a new spear and soon had an obsidian spearhead that was as sharp as anything he had ever used. It seemed to have a good balance and would throw well. He started work on a second obsidian knife. Ivo was bent over whatever she was making for an hour or so when she finally stood up and came up to Adm. She held up what she had been creating for him to see. It was a necklace decorated with alternating small bones, claws from some large animal, and a very unusual kind of seed. In the very center was a curly black seed that looked just like a snake! Adm had never seen anything quite like it. She reached out to tip his head down and then around his neck to tie the sinew thread in the back. Then she stepped back to admire him and his new necklace. And that night they mated again. This time Adm knew more about what to expect and was able to time his own ecstasy to shortly after hers.

The next morning Ivo bustled around the main part of the cave cleaning out some sections and re-organizing various food piles. At one point she picked up the water bucket and said, "Ivo go water". Adm looked up briefly and smiled at her and she turned and went out the cave entrance.

A short time later Adm heard Ivo scream “Adm! Adm!” He jumped up, grabbed his two spears and ran out to the waterhole. There he saw Ivo high up on a boulder that had fallen from the cliff next to the stream. All around her, snarling and snapping, were six hyenas. Adm ran at the hyenas, carefully looking for the biggest and likely most dominant female. Female hyenas had an unusually large fake penis that identified their sex at a distance. The most likely candidate was the one closest to Ivo and looked ready to try and spring up the boulder. Adam threw his new spear with all his force at the female hyena. It hit her in the side just below her shoulder blades and she screamed and fell to the side, blood spurting in all directions. He then took his other spear and began stabbing at the rear ends of the rest of the hyena group. They turned around and started to snarl at him but he kept them at bay by jabbing at them and hitting several in the face and throat. From the corner of his eye, he saw Ivo jump down from her boulder. She pulled his first spear out of the dying hyena and began stabbing at the rest of the group from behind. Suddenly attacked from both sides, the smallest hyena in the pack turned and fled. The others soon followed suit and ran down the hill.

Adm and Ivo dragged the bodies of the two hyenas they had killed over to a nearby cliff and threw them off. They tumble down the steep side and ended up almost at the bottom of the hill. They did not want rotting bodies near their water source. Ivo refilled the water container, which had been tipped over in the commotion, and they went back to the cave. As they walked Adm realized that without the normal traffic of multiple Shagorum to scare them off, the smell of drying meat would have been irresistible to the hyenas. Knowing how well they could smell, it was surprising that hyenas had not tried to investigate sooner.

Back in the cave, Ivo went to work scraping the skin of the antelope they had killed the other day. Adm sat down at his tool making site, but he was too distracted to start a new knife or spearhead. Instead, he faced up to some things he had been putting off thinking about. He had just risked his life to save hers, and he knew he would do it again. While they had only been together a few days, it seemed like years now. Things had changed so much! When they were together, they worked as a team so comfortably. Being with her made him happy in a way he had never experienced before. And he thought that he made her happy too. Somehow a bond had been formed between them, a very strong bond, one that he did not think would ever break. He swallowed hard as he thought about the eventual confrontation with his father and other tribal members. He could not see any way to resolve what was sure to happen. That night they mated as soon as they were under the furs. It seemed like they both were desperate for physical contact, a confirmation that the other was still alive and there, and somehow an expression of appreciation that they had found each other. They did not have words to share about all this, but then they didn't need any.

The next morning after they had eaten, Adm stood at the entrance of the cave and did his daily scan for the return of his father and other humans. And this morning he saw them coming down the valley from the east. He felt dread rising in his throat as he tried to figure out what he could say. He noticed that the small herd of antelope had just come out onto the grassy sward below the hill. His father's group was coming down from a high point and also spotted them. They immediately spread out and moved into the adjacent vegetation. Three of them stayed behind watching. The rest of the group quietly encircled the small herd and then suddenly broke out of the forest and began spearing one after another. The three who had stayed behind continued on their way and started coming up the hill to the cave. Adm could see it was his father and two of

the young men he had known all his life. Ivo came up behind him and quickly saw the advancing men. Adm pushed her back into the cave and indicated with his hand that she should stay there out of sight. He grabbed his new spear and went back to the cave entrance.

As his father got closer he saw Adm watching their approach and waved at him. Adm waved back. When they were close enough to shout, his father asked, "Everything good?" Adm said "Yes, Father". His father stopped a short distance below Adm and turned to see what was happening with the hunt. Adm held his breath. Soon the other two humans coming up the hill reached his father, who turned around to close the distance between them and Adm. Now quite close, Adm's father suddenly spotted the necklace on Adm. "What is that?!" he demanded angrily. At the angry words Ivo stepped out behind Adm and clutched his arm. One of his father's companions shouted "A Shagorum!" and raised his spear. Adm stepped in front of Ivo, raised his own spear and said "No! I will kill anyone who tries to hurt her!". His father and the others looked stunned, but his father recovered quickly and ordered the other two humans to go inside the cave and kill any other Shagorum they found there. Adm and his father stared at each other for several minutes, his father shifting his glance towards and away from the female Shagorum standing behind Adm. Suddenly there was a commotion in the back of the cave. One of the men shouted "Aiee! Kill it! Kill it!". There was the loud sound of a large rock crashing on the cave floor and then a violent thrashing. Adm knew they had found the snake. He was not sure whether Ivo understood what had happened, but she gripped his arm even tighter. The other two men came back and one said "No more Shagorum, but we killed a big cobra they seemed to be keeping in the back of the cave!".

His father turned his attention back to Adm. "What is this?! Why are you with a Shagorum? Why did you not kill it?" Adm swallowed and said, "She is my mate." His father turned red in the face, which was always a bad sign as he had a terrible temper. He shouted "What? How can you have an animal for a mate?" Adm gave his father a steady gaze and said, "We have mated many times already." The look of disgust that crossed his father's face said it all. After a long minute of silence, his father said in a harsh voice, "That is the worst crime a human can commit. By our customs, we should kill you both right here and now." The ensuing silence seemed to last forever. Finally, his father said, "Because you were once my son, I will give you and your animal time to collect a few things and leave. You must be gone and out of sight before the rest of the men get up here with the antelopes they have killed. You are banished from our people forever. If any of us ever see you again we will kill you, your animal and any offspring you produce. Go! I never want to see you again!".

Adm turned, and pulling Ivo with him, rushed back into the main part of the cave. He pulled down two of the skin bags that the Shagorum used to collect fruit and tubers. He said to Ivo, "Ivo Adm go! Ivo Adm go!". Comprehension came quickly and she joined him in putting dried meat, tubers and fruit, their best knives, and a water bag into the carriers. She rolled up several of the sleeping skins and after tying them tight, latched them onto one of the bags. Adm grabbed his two spears and new knife, and the two of them rushed out of the cave with what little they had collected. Adm could hear the rest of the human group coming up the main trail, so led them both down a back route to the more heavily forested part of the hill. When they reach the bottom of the valley, he turned them west toward the coastal plain. They walked as fast as they could, stopping only once to fill their water bag.

And so began an epic and difficult journey. Adm hunted small game like rabbits and birds, they only slept in safe places where lions could not sneak up on them, and they only stopped to build fires a few times. Once they reached the coastal plain, they turned north using the distant Mediterranean coast as a guide. When the coastal plain ended with mountain ridges that came all the way to the sea, they turned east along those mountains. Eventually, they came to a giant valley running north and south with a steep escarpment on the west side. They again turned north, staying close to the escarpment on the west side of the valley. Weeks later, they came to a nice side valley that clearly hosted caves, game, water, and plants that Ivo new how to prepare. Adm hoped they had gone far enough north that the wave of modern humans moving up towards them would not arrive in their lifetimes. They had encountered no other humans, but they twice saw Shagorum. Once they were walking on the crest of a hill and down in the valley saw a group of male Shagorum who had encircled a large buffalo and were trying to kill it. The group was so intent on its activity it never noticed them passing. The second time they were in the valley and they spotted a group of female Shagorum spread out on the side of the hill collecting tubers. The Shagorum stopped what they were doing and watched Adm and Ivo as they hurried past. None of them shouted and no one seemed to follow them later. They soon found a very nice cave that was larger than the one they had just left and had a stream running into an out of it. They decided to make this their new home.

About a year after they had settled here, Ivo gave birth to their first son. They named him Cian. As he grew up, it was clear he would look a lot more like Adm than his mother. Like his father, he was clever and agile, but unlike his father he grew up to be very selfish and manipulating. Their second son, Ebel, was just the opposite: he looked like his mother and was a sweet and friendly soul. This made him particularly vulnerable to exploitation by his older brother, who always tried to get the larger share or the only sample of something they both wanted. As the boys grew older, they often fought physically, and by the time they were adults, they largely stopped interacting. Ebel never returned from a solitary hunting trip he took as an adult. They never figured out what had happened to him.

Adm and Ivo's third child was a girl they named Awano. She was a beautiful combination of both of their physical features as well as their temperaments and personalities. She and her mother were very close and spent much time together out in the field collecting foods and preparing them in the cave. While there were some sparse Shagorum groups in the area, when she became adult she mated with her brother Cian. The fourth child was a son named Set. Like his sister, he combined the best features of both of his parents, being clever and good-natured. Both he and his sister and their brother Cian could have passed for pure humans to someone not looking carefully. When Set was an adult, he decided he wanted a human mate, and knowing from his parents' stories that there were modern humans further south, he left to explore those regions. As it turned out, he eventually settled in what is now northern Israel, found a human mate, and had lots of children.

Adm and Ivo had a number of additional children whose names have been lost. Infant mortality was very high in these populations so some of those certainly died before they grew up. Their sons tended to have difficulty fathering children for reasons that we now know are genetic incompatibilities between the two species. But the daughters did pretty well even though some of them had to interbreed with their brothers. Although Adm and Ivo both died before the northward wave of modern humans reach their area, their grandchildren were absorbed by that

wave as it passed them by and many of their descendants went on to be early settlers in Eurasia, gradually replacing all the Neanderthals.

While Adm and Ivo were alive, they often told their descendants the story of how they had met and ended up where they were. It became a family legend. Because they felt that the snake had played a key role in preventing Ivo from being murdered with the rest of her family and had been the agent that brought Adm and Ivo together, it featured significantly in the story they told. They referred to the snake as the Guardian of Egan (“egan” being the Neanderthal word for the dried fruit). So as the tale was passed from generation to generation, it became known as The Story of Adm, Ivo, and the Guardian of Egan.

So how did this story ever turn into the biblical tale of Genesis? The names of Adm and Ivo have largely been retained. Not so the “Guardian of Egan.” Even the most ancient of Hebrew scribes would not have known that “egan” was the Neanderthal word for dried fruit. The closest Hebrew word was obviously “Eden”, which referred to God. The transmogrification of guardian into garden seems obvious in English, but is not so clear for ancient Hebrew. Later Latin scribes might have confused the words “custos” (guard) and “campus” (plain or field). In any case, none of these early cultures of humans would have ever imagined that someone in their right mind would husband such a poisonous snake to eat the rats that attacked their piles of dried fruit. So the word “guardian” would make no sense to them. A substitution needed to be made and somehow it became “garden”.

In Adm and Ivo's telling, the snake was a benevolent agent who brought them together. Since most people do not like snakes, it is not surprising that the legend gradually made the snake a sinister agent, even a representation of the devil. Given the widespread misogyny of many Middle Eastern cultures, it is also not surprising that the revised version retained Ivo's close association with the (now evil) snake and painted her seduction of Adm as a bad thing. His participation was of course a violation of the customs of Adm's tribe and thus a "sin". A very *original* sin and one that from the tribe's point of view justified his banishment by his father. And it was easy to substitute Adm's Father in Heaven for his biological father. What about the apple? Once the legend was being copied by cultures outside of the Middle East, the relevant scribes would know nothing about dried dates and figs. So they substituted a fruit that they knew: apples. You see, it all makes sense!

What? You don't believe this story? Yes, I know that tens, maybe hundreds of millions of people believe the Genesis version. But then, think how many people used to believe that the world was flat! I guess you need some proof. OK: I suggest you go get your DNA analyzed and then get back to me....

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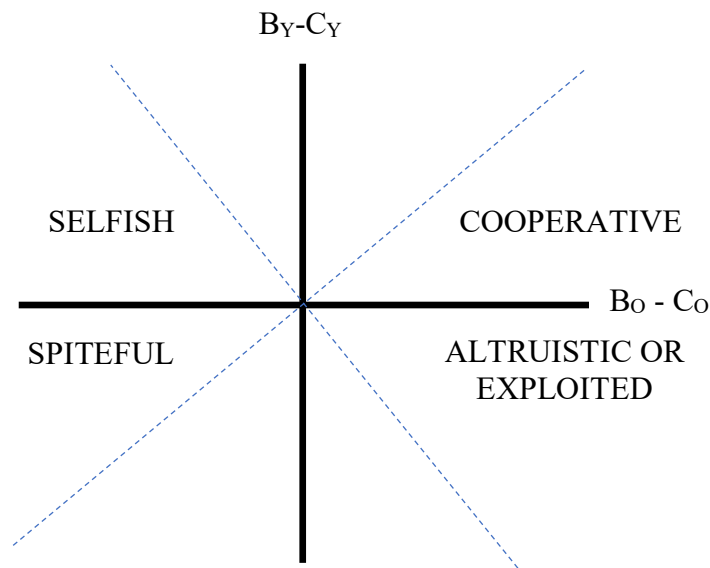
7. The Problem of Fairness (2021)

J.J. Winham

In earlier essays, we pointed out that *fairness* is a key ingredient in maintaining cooperative societies. We argued that it was the function of opposing parties in a cooperative society to engage in push-pull discussions to find the right level of fairness. But what is fairness? Is it only a property of cooperative societies? While it may be necessary to maintain a cooperative society, is it sufficient? In this essay, we examine various contexts in which fairness may be an issue.

A Graph: Let us start with a very simplified way to classify contexts. Suppose you are considering performing an action that on average will benefit you an amount B_Y , but will also cost you an amount in the same units of C_Y . The net effect on you of performing this action is then $B_Y - C_Y$. Suppose also that your action may benefit the average person in your sphere of influence by an amount B_O , but also may inflict a cost on the average person of C_O . The net effect of you performing the action on the average person in your sphere of influence is $B_O - C_O$. We could of course make this description much more complicated with different effects on different people in the sphere of influence, but let us go with this simple approach for now.

All possible combinations of effects can be represented as a point on the graph below:



We assume that both axes have the value of zero where they cross. This point is known as the origin of a graph. The values of the x-axis to the right of the origin are positive and those to the left of the origin are negative. Similarly values of the Y axis above the origin are positive, and those below the origin are negative.

Your action can have four different consequences corresponding to the four quadrants in this

graph. In the upper left quadrant, your action provides you with a positive net effect and an overall cost to others. Actions in this quadrant will be termed *selfish*. In the upper right-hand quadrant, your action leads to a positive net effect for both you and others. We call this a *cooperative* action. In the lower left quadrant, your action leads to a net cost to you but also a net cost to others. This is typically called *spite*. Finally in the right lower quadrant, your action creates a net cost to you, but it provides a net benefit to others. This could be due to you being *altruistic*, or possibly you're being manipulated and *exploited* by the others. The dashed line running from the lower left quadrant to the upper right defines combinations of effects that are equal for you and the average other person. The dash line running from upper left to lower right is the line defining zero sum games in which the benefit of one party is equal to the number of units lost by the other party.

So, what is a fair action? Keeping this graph in mind, which actions should be considered fair? Taking each quadrant in turn:

Upper Right Quadrant: Let us start with the upper right quadrant in which people are presumed to be cooperative. The dash line indicates transactions in which both you and the average other person around you benefit equally. This must certainly be the ultimate in fairness. But is it the only form of fairness that we should aspire to? In most societies, sellers and buyers barter over the amount that is to be paid for some asset. Sometimes, a clever buyer can gain a valuable asset without paying as much as they should. Similarly, a clever seller can talk a vulnerable buyer into paying more than the asset is worth. In many capitalistic societies, whoever is fiscally most clever is admired and given credit for their achievement. However, as the net effects of transactions get further and further from the dash line, there is more and more pressure to limit such unequal exchanges. There is thus a narrow zone above and below the dash line within which some inequality is allowed; it is the width of this zone that is often the subject of differences between conservatives and progressives in politics. Where should one draw the line? One can think of many relevant examples. At what point do drug companies make the cost of their products so high that it is considered gouging? How low a wage should employers be allowed to pay their employees or cut their time to avoid paying benefits? When does clever bookkeeping to minimize taxes become cheating? All of these are contentious issues for which the width of the zone around the dashed line must be negotiated. And note that the width of the allowed zone may need to be adjusted the further the transaction is from the origin on the graph.

Upper Left Quadrant: The upper left quadrant which characterizes fully selfish behavior might seem automatically to violate any sense of fairness. However, there are societies in which small amounts of theft are tolerated, and even more where certain levels of sexual harassment are ignored. There is thus a circle around the origin within which some degree of unfairness is tolerated. However, most societies enforce laws and penalties for actions in this quadrant outside that circle. This enforcement imposes an additional cost on both you and others in the form of the taxes you must pay to support the police and courts. And if you get caught violating the laws, your cost of the action can go up way above the benefit. Again, there is often disagreement between conservatives and progressives about where to draw the boundary of that circle. Should mining and lumbering companies be allowed to exploit public lands that others use for recreation? Should commercial enterprises be allowed to pollute the environment around us? These questions of fairness routinely pit the personal interests of some individuals against the common good. Many conservatives hate regulations because they constrain the opportunities to

make more money at the cost of the public.

Lower Left Quadrant: The lower left quadrant may seem like an unlikely circumstance. However, as with most possible behaviors, some humans definitely perform it. An example is suicide. While some people commit suicide to avoid an imminent worse demise, the majority of people who commit it do so to hurt the feelings of surviving people who care about them. This is clearly spite. Hate is an emotion that is often inflamed by acute tribalism and polarization. Individuals with a sufficient level of hate may perform acts that both kill themselves and as many of those of the hated faction as possible. While many terrorists believe that their actions will benefit the faction from which they came, there are other terrorists who simply destroy an opposing group of people out of hate. While the perpetrators of terrorism may believe that what they are doing is "fair" because it is a punishment for what the opposing faction has done or is doing, it is only if the action has some later-term benefits that one could say the action was justified.

Lower Right Quadrant: Finally, the lower right quadrant represents situations in which you pay a net cost and the recipient of your action receives a net benefit. If you do this willingly, it is considered altruistic. An obvious example is charitable giving. This is one case where it is important to consider the unit in which the benefits and costs are measured. A gift of \$100 to a starving person may save a person's life, but are unlikely to have any impact on the life of a very wealthy donor. We may then need to scale the benefits and costs according to some baseline for each individual. In the case of charitable giving, the actions may indeed plot in this lower right quadrant, but the coordinate for the giver maybe just under the X axis in the graph, even though the coordinate for the receiver may be far to the right of the origin. It is also possible that a charitable giver will receive social benefits or even just feel good and that this may compensate even further for the cost of their gift.

At the other extreme of altruism are firemen, policemen, and soldiers who are prepared to give their lives to preserve the society from which they came. Their actions can have both big benefits for others and costs to themselves. Are such actions fair? Again, we may need to adjust the units of costs and benefits to reflect compensating factors. The critical factor here is the probability that the fireman, policeman or soldier will be the one killed or injured while acting. If the probability is low enough, it can be used to discount the computation of costs, whereas the fact that these individuals are all paid by the society for this task is a continuous benefit as long as they live. In many cases, these individuals also have some sort of insurance that will provide for their families in case they do die. If the probability of dying is low enough, the actions of these individuals could actually plot in the upper right-hand quadrant.

Although there are individuals who risk their lives to save someone else's, they are few and far between, and it is not a common option for most people. In general, true altruism is rather rare in both animal and human societies. There is quite an extensive literature on why this is true, and how many apparent examples of altruism can actually be explained by other economics such as reciprocity, kin selection, or rather more complicated pay off schedules. We just do not expect to find very many points in this quadrant when the actor performs an altruistic act willingly.

On the other hand, history has filled up this quadrant with points based on exploitation. Slavery was once common on all the continents in a variety of cultures. Slaves are obliged to perform

many expensive actions at no net benefit to them, except to avoid being killed by their owners. Although the slave owners in the southeastern United States had all kinds of arguments to the contrary, most modern people do not consider slavery a fair practice. Many Native American tribes, African tribes, the Romans, and Asian cultures took captives during warfare and treated them as slaves for the rest of their lives. While they would often argue that these slaves were the spoils of war lucky to be kept alive, most of us would not countenance this behavior as fair in this day and age. Finally, many autocratic societies force their citizens to behave in ways that impose a net cost on them to the benefit of select others in the society. Again, most people in democracies would not consider this fair.

Examples: It may be useful at this point to examine a number of specific cases where the issue of fairness is frequently raised even within presumably cooperative societies:

Taxes: One of the advantages of cooperative societies is the ability to undertake tasks in which group action is more efficient and effective than the sum of individual actions. Most of these tasks, however, can be expensive. The society asks every citizen to contribute to those costs. These contributions are usually required in the form of taxes. While it might initially seem fair to ask the same amount from all citizens, the considerations we made above for charity also apply here: the actual cost to a citizen depends upon the fraction of the citizen's current wealth that the tax represents. The same tax may have little effect on a wealthy citizen whereas it may be a severe deprivation for a poor one. This is the logic behind progressive taxes in which wealthy individuals pay more than poor ones.

If taxes were only used to build bridges, many conservatives might grudgingly at least feel they are fair. But in many societies, taxes are used to pay for social welfare programs such as unemployment support, guaranteed retirement funds, and universal medical care. Conservatives often balk at progressive taxes used for such programs, as the wealthy who are paying the most rarely need such support. They see these programs as "enforced" charity and not *fair* to the wealthy. A frequent justification for this attitude is the belief that the poor failed to become wealthy because of their own stupid mistakes, whereas the wealthy were more clever and therefore earned their wealth. This reveals a fundamental difference between conservatives and most progressives. Most progressives believe that success in life is due to a mixture of individual decisions and chance. Cleverness has little to do with whether one is born into a poor family from which it is hard to escape or into a rich one where the children inherit lots of money they didn't personally earn. Progressives thus feel it is *fairer* to share some of the benefits enjoyed by the lucky with the unlucky. There are other moral arguments which can be invoked to support progressive taxes, but this underlying economic reason is a key component.

There is of course plenty of room for a push-pull negotiation by conservatives and progressives over how heavily the wealthy should be taxed to support the common good including the poor. The last half century has seen major shifts in the tax burden imposed on the wealthy from low to high and back again. This is a healthy process as long as the two parties have fairly equal representation in the government that makes these decisions.

Employer versus employee compensation: Consider an entrepreneur who has a creative idea about how to write some new software program or build some new device. They cannot realize this idea as a new business without hiring four employees. Suppose the company gets going and

makes a profit. How should the profit be divided? Should it be divided equally with 1/5 going to the employer and also each employee? The employees would not even have a job if the employer had not come up with the idea and recruited them. Therefore, most people would think it more fair if the employer takes a bigger fraction of the profit than the average employee. The question is how much more the employer should take. A selfish employer might be tempted to take more than most people would think reasonable. What can the employees then do? There are of course two options. If there are other companies doing similar kinds of business, the employees can simply leave this company and go to one that treats them better. Certainly, this option is being adopted by the many migrants in poor countries around the world who are moving to wealthier countries hoping they have a better chance to earn a living. However, if there are no easy alternatives, the employees are stuck staying with this company. The second option is for all the employees to form a group, known as a union, and refused to do any work for the company unless the employer pays them a *fair* wage. Conservatives traditionally oppose unions and have done everything they can to prevent their being formed or succeeding. Progressives, naturally, support the opportunity to form a union. Again, the options for unions have shifted back and forth depending upon which political groups are in power.

Tribalism: the history of our species is replete with tribalistic conflict. Whether or not this is some atavistic trait that evolved in early times, it reoccurs again and again in almost every society once the numbers get large enough to accommodate multiple factions. The criteria for forming factions vary all over the place: religion, geographical origin, color of skin, fiscal status, political bias, you name it. Members of a faction essentially act as a cooperative group towards each other but see other factions as threats and opponents. In terms of our current discussion, members of a faction will act in ways they see as fair to each other, but in ways that are selfish and unfair to members of other factions.

Tribal conflicts can range from the mild, such as teenage girls in one clique excluding girls in another from joining them for lunch, to the bloody religious wars of Europe and the Crusades. In more recent times, southern whites in America succeeded during the late 1800s and early 1900s in largely disenfranchising the newly freed black people in their populations. And as we write this, the Republican party in the United States is engaged in a massive program to disenfranchise the opposition Democratic party. Some tribalism arises simply from economic differences. For example, most school districts in the United States are at least partly funded by local property taxes. Since most parents want their children to attend the best schools, there is competition to acquire housing near such schools. This raises the price of housing in that area and eventually residents around the better schools are largely wealthy, and those around the less attractive schools are poor. This process generates a feedback since the more expensive homes in the wealthy district provide more money making their school even better, and those near the poor schools contribute less funds and this makes their schools even less effective. This process thus leads to serious inequities in housing and schools and is one reason many Progressives argue that education should be supported only by state and federal taxes. Other incidental tribalisms are known and can similarly be criticized because they are based on some rule that could be changed.

As noted in a prior essay, tribalism and greed pose the two greatest threats to the stability of a cooperative society. That stability hinges on the perception in at least the majority of the population that the cooperative strategy is fair. The whole point of tribalism is that it benefits one

faction over, and often at the expense, of others. Ideally, there would be no factions in the society, and this is often approximately the case in small hunter gatherer groups. But the larger a society, and the more diverse it is in identifiable differences, the more likely tribalism will arise. The antidote is for the society to establish laws, regulations, and expected customs that curtail the rise and influence of tribalism. A related necessary condition is that a large enough fraction of the society adheres to these rules. If this fraction becomes too small, the society goes past the tipping point that then favors increasing selfishness and unfair behavior.

Gender rights: In an ideal fair world, men and women would have identical rights, privileges, and net payoffs for any transaction. But as history shows us, this has proved to be nearly an impossible dream. Some of the issues are strictly biological. Men do not get pregnant or lactate; these tasks fall entirely to women. Women are limited in the number of children they can have given these duties, whereas men can have many more offspring by mating with many women. A woman might prefer that a man donate all of his effort and resources to helping raise her children, whereas the man may prefer to divide his resources among multiple women. This creates an immediate conflict.

There are other complications. Where both survival and reproduction benefit by control of a local territory (animals) or property (humans), it makes sense to pass this on to one's descendants. This creates a new problem because if both sexes of offspring stay in this location, they are likely to engage in inbreeding which can have very negative genetic consequences. In both animals and humans, this problem is solved by having one sex of offspring stay to control the resource, while the other leaves the family to breed elsewhere. Whether men or women control the family resource has varied over history and continues to vary with culture today. Whichever sex gets to stay, the situation produces an asymmetry in the expectations, privileges, rights and duties of the two sexes. This invariably has many cultural repercussions, some of which certainly do not seem fair to one or the other sex. For example, where males inherit the resource, they want to ensure that their sons are in fact theirs. They may thus impose all kinds of constraints on their wives such as reducing their ability to move around in the society, wear particular clothing, or even suffer some sort of genital mutilation to make copulation difficult. These women may not feel that these constraints are fair to them.

Many of the roots of gender asymmetry have changed in the last 150 years. Family wealth is less often rooted in a specific property and more in movable assets. There is no reason for one sex to stay where they grew up, and in fact both sexes often settle away from where they grew up with no risk of inbreeding. Now, either sex can inherit the family wealth, or even have it divided between them. Fathers still worry about whether their children are their own or not, and in some cultures, women are still highly cloistered. Childcare is now available, allowing many women to undertake the same kinds of professions as men. Some societies even allow time off from work to have the children and expect the fathers to take some role here as well. Women in the United States got the vote in the early 1900s and have continued a steady trajectory of emancipation from male dominance since then. Still, gender asymmetries have a stubborn inertia and continue to this day. Many males are reluctant to give up their dominance over females, and certain religions continue to drag their heels about change. As with the other topics above, some societies have established laws and regulations to create greater gender equality. The situation is definitely more fair now, but there is still a ways to go.

Some Common Threads

The list of examples of unfairness in cooperative societies above is clearly not exhaustive, and it may seem that defining fairness is too complicated. However, there are really only two main ways in which transactions and cooperative societies can be unfair. Let us take a simple example in which a seller offers a product or service to a buyer. Most societies do not require that the payoffs to the two parties be identical. Instead, there is a zone of tolerance on either side of the dashed line in the upper right-hand quadrant of our graph within which most people would consider the transaction fair. It is when the transaction is plotted outside that zone that people begin to consider it unfair. Let us call this "Fair Trade Unfairness". The dispute between how much profit should go to an employer and how much to employees has to do with this type of fairness.

The second type of unfairness occurs when the payoff to either the buyer or the seller depends on some irrelevant criterion such as tribal faction membership or gender. We can call this "Identity Unfairness". Suppose a local community is mostly composed of people of Irish and Italian descent. If Irish salesmen always seem to reap higher profits than Italian salesmen for selling the same item, this may be deemed unfair. If Irish buyers always get a better deal than Italian ones as well, people will suspect some sort of ethnic bias. There are lots of other combinations depending upon the identity of both buyers and sellers, but the point is still the same. Whether a particular combination is considered fair or not may depend in part on whether the society believes the criterion irrelevant. If most Irish salesmen obtained government sponsored business training before they immigrated to the current society, whereas Italians did not, this may be considered a mitigating factor. As with the zone of tolerance for Fair Trade Fairness, there may be a similar zone of tolerance for Identity Fairness depending on whether the society considers the criteria relevant or irrelevant. This is again an area where push-pull negotiations are required.

Note that differences in payoffs depending upon the Identity criterion may be large enough to plot a particular transaction outside of the zone of tolerance for Fair Trade Fairness. Thus, some situations may violate both types of fairness at the same time. Our examples above involving taxation, tribal favoritism, and gender bias all begin as issues of Identity Fairness. But historically, it has often only resulted in major legislation or civil action when they also became Fair Trade violations. However, it is important to remember that Fair Trade Unfairness does not have to begin with Identity Unfairness: individual sellers are perfectly capable of gouging individual buyers without it requiring any identity criteria at all. For this reason, it is important to keep in mind both types of unfairness when analyzing particular situation.

Summary: Returning to our graph, we argued that most transactions that plot in the left hand and lower right quadrants will typically be considered unfair by most societies. In the two left-hand quadrants, there may be a small zone around the origin of the graph within which some unfairness is tolerated. In the lower right-hand quadrant, there is a small zone just beneath the horizontal axis which is also often tolerated. In the upper right cooperative society quadrant, there is usually a zone of tolerance surrounding the dashed line of equal payoffs for actors and recipients. We have called this the Fair Trade zone. A certain degree of Identity Unfairness is often tolerated in many societies as long as transactions do not plot outside the Fair Trade zone. This is probably not because of some basic principle, but more likely due to the difficulty of enforcing strict Identity Fairness, and ambiguities about whether criteria are relevant or not.

THE WINHAM PAPERS

8. Trust and the Social Contract (2022)

J.J. Winham

As discussed in prior essays, citizens in a cooperative society agree to limit their own selfish interests and pay certain costs in exchange for access to a common good that is otherwise inaccessible. This agreement is known as the *social contract*. The constraints on individual behavior in this contract take the form of laws, regulations, customs, and courtesies. In observing these constraints, the citizen *trusts* that the society, often through its government, will in fact provide access to a common good that is a *fair* compensation for the costs and constraints. Fairness requires that the benefits of cooperation generally exceed the costs, and that the costs and benefits are roughly identical for equivalent citizens. In every human society, there will be some individuals who try to pay lower costs or gain more benefits than is fair. For this reason, most societies have penalties and sanctions for those who violate the expectations of the social contract.

The unraveling of cooperation: Trust is the glue that holds a cooperative society together. If a citizen perceives that enough other people are under-paying the costs of the social contract or reaping an unfair fraction of the common good and getting away with it, they may be tempted to also abandon the social contract. As we have discussed in prior essays, if enough people abandon the contract there is a built-in feedback loop that will gradually push the society out of the cooperative mode and into an all-selfish one. Most reasonable models of social evolution posit a tipping point above which there are still enough cooperating citizens for the penalties and social pressure to constrain the feedback loop, but below which enough citizens have abandoned the social contract that it now favors other citizens doing the same.

Could this unraveling be happening now in our society? How would we know? Below are some symptoms that could indicate various stages in this unraveling and evidence for their current presence or absence:

- *Discourtesy:* Manners lubricate social interactions, eliminating or at least reducing potential friction. Their use communicates respect, and in a subtle way, a statement that the performer of the manners trusts that the recipient will reciprocate. Discourtesy communicates disrespect and the likelihood of subsequent social friction. There is no question that the usage of manners has greatly declined during the lifetime of this author. Many parents do not feel motivated to teach their children classical manners, and political discourse, even in legislative negotiations, is often totally lacking in basic courtesies.
- *Lying:* Trust relies heavily on access to the truth. When a person discovers that another has lied to them, it erodes their trust in that person. Multiple lies by the same person can completely undermine trust. Similarly, if a person believes that the government has been lying to them, this erodes trust in the government and even the whole system. There have always been charlatans selling fake goods, and politicians promising achievements they know will never occur. As long as they are uncommon and it is revealed that they are lying, they can be discounted, and it does not undermine trust in the social contract.

However, if enough people believe that the government is lying to them, the failure of trust can be quite widespread with the consequent undermining of the social fabric discussed above. As with discourtesy, lying has become more frequent at all levels of society in recent decades. There are even news organizations that routinely spew out falsehoods to millions of people. Different political factions in the United States currently disagree over what is the truth that should be taught to children in schools. Dictators in other countries often restrict access to information to keep their populaces from knowing the truth. None of this is good for the survival of cooperative societies.

- *Tribalism*: Tribalism has long been a divisive force in the United States. Slavery based on race has been banned, but the bad feelings between races continues to this day. Religious factions have often evolved and led to major conflicts both in the United States and in other countries. As we have discussed in prior essays, tribalism is one of the most common and dangerous threats to the stability of cooperative societies. Together with greed, it usually leads to one faction exploiting and taking advantage over resources to the detriment of another faction. Despite efforts to reduce or even eliminate tribalism, it continues to be a divisive force in the United States and worldwide.
- *Sexual Misconduct*: For both biological and cultural reasons, men and women usually have somewhat disparate sexual interests. Different cultures have dealt with this conflict in different ways. In some, the interests of women have been completely subjugated to those of men in the same society. Many modern societies make some effort to balance the two interests so they both feel they are being treated fairly. In the United States today, this process is still being undertaken. Men have routinely taken liberties with women including rape and this is now being dealt with through various levels of government. However, there remain men in this country who do not see why they should be limited in pursuing their interests as they wish. It is thus a continuing source of conflict.
- *Cheating*: There have always been people who have cheated on the laws, regulations, and customs in their society. Some people cheat by ignoring stop signs or speed limits, others by falsifying tax returns, and still others by having sexual intercourse with people outside their marriage. Almost any law, regulation or custom will be violated by at least a few people some of the time. Just establishing a law, regulation or custom is thus not sufficient. Each of these will be tested on occasion by people seeing if they can get away with violating them without being caught or punished. Have cheating levels increased? Surveys show that the fraction of students who cheat in school has increased significantly in the last 50 years, and currently more people glide through stop signs than perform a full stop. Other possibilities such as petty theft, infidelity, and tax evasion appear to wax and wane and it is often difficult to obtain suitable statistics. Overall, cheating has not declined in recent decades and if anything has increased in a number of areas.
- *Detrimental Alliances*: Cooperative societies can often deal with small pockets of people who have given up the social contract. However, the challenge becomes greater when these pockets form alliances and become a larger fraction of the society. Gangs undertaking illegal activities such as drug cartels and the Mafia can become large enough that they are serious threats to the society. Often such alliances are not restricted to

groups within the same society, but involve many different groups in other countries. These are especially difficult for a given country to eliminate or control. Drug trafficking has definitely expanded both nationally and internationally in the last 50 years. In addition, dictators in authoritarian states are increasingly collaborating to undermine cooperative societies that oppose them.

- *Interactions:* Note that many of the deviant behaviors above are contagious: if citizen see enough other people running stop signs or cheating on their taxes, and getting away with it, they may be inclined to follow suit. Also an increase in any of the above issues can provide license for people to test the water in others. If enough of the above symptoms are obvious, a person is likely to question whether the entire social contract is worth it. This generates the negative feedback that we have discussed earlier.

Roots of the problem: There seem to be many indications that the cooperative society known as the United States is starting to unravel. What is the likely cause? Every pundit has their favorite explanation at the moment. Evangelicals are convinced that it is the turn away from religion that has led to this problem. However, social scientists have shown that religious people are no less likely to break laws or violate customs on average than non-religious people. In fact, atheists are statistically less likely to break laws than religious people in the same society. Everyone knows about the sexual abuse scandals currently raging in the Catholic Church. And how often have we heard about the leader of some well-funded religious congregation being caught engaging in financial or sexual misconduct?!

Others point to the potential for online media to undermine a general respect and agreement about the truth. The country is rampant with conspiracy scenarios, some of which are totally unbelievable by many but deeply believed by others. Another explanation is that the large parties that used to dominate politics not only in the United States but in Europe have fractionated into many small and competing factions, making a majority consensus impossible. But that leaves open the question of what caused the fractionation. Another popular notion is that a backlash by white Christian men against the recent erosion of their political and financial hegemony is the major cause of distrust and intergroup friction.

If any one or two of the warning symptoms listed earlier stood out, we might be able to focus on reducing those problems specifically. But in fact, as argued, all of the symptoms seem to be present and growing. This suggests that there may be a widespread rejection of the social contract per se. When this is true, the same people who run stop signs are also likely to be rude and cheat on their taxes. If you have rejected the social contract in general, then there are no constraints on your behavior at all. One could argue that the only policy advocated by Donald Trump when running for office was the rejection of the social contract. He was a candidate who was always overtly discourteous, whose recorded lies reached epic levels, whose tirades against minorities and migrants were shockingly blatant, who was recorded in a video bragging about his sexual misconduct, who has cheated on every wife he has had including the current one and is accused of cheating on taxes and avoiding the draft, and who has actively recruited alliances with dictators in other countries who have also rejected a democratic social contract. Despite these overt violations of the social contract, millions of people have voted for this person and continue to support him. There has to be a reason why so many people suddenly have no respect

or at least trust in the social contract.

As noted at the outset of this essay, faith in the social contract requires that citizens perceive that the benefits they are getting from it exceed the costs. While modern society provides many benefits, the daily concern of most people is economic viability. One of the most striking findings of recent global research is the decades-long increase in economic disparity between the rich and the poor. The latter are increasingly unhappy that they cannot make ends meet, while the high end of the spectrum continues to increase wealth at an exponential rate. Whereas a chief executive in 1965 paid himself \$21 for every dollar he paid to the average worker, current chief executives pay themselves \$350 for every dollar they pay a worker. Unions and other mechanisms to ensure a living wage have gradually been phased out of our current society, and corporations have found multiple ways to hide funds and avoid taxes to the benefit of the chief executives. When many corporations moved factories out of the United States to employ cheap foreign labor, the workforce they abandoned found few alternatives for equivalent employment. The cumulative result is that many low and medium income people do not feel the benefits of the social contract make up for the costs. So, they lose trust in it.

The situation is exacerbated by current politics. Following the lead of former President Ronald Reagan, the Republican Party has abandoned all policies except the belief that each person has the right to make as much money as they can in any way they can get away with. They call this "free-market economics". They oppose taxes particularly on the rich, regulations that constrain their ability to make money even if they cause pollution or health issues, and having to contribute to any kind of social safety net. Their approach typically focuses on short-term profits even at the cost of long-term repercussions on health, the economic system, or even the viability of the planet. Because their wealth, and that of the lobbyists who fund their campaigns, is at stake, they are increasingly aggressive about controlling elections and punishing party members who do not toe the line. To further undermine the effective functioning of the cooperative society, they have incited tribalism in our society at multiple levels: racial, economic, and religious. In many ways, this party has not only abandoned the social contract, but is actively working to destroy it.

Why might other citizens buy into this Republican point of view? Being released from the constraints of the social contract clearly has some appeal: one no longer has to worry about the rights of others but can focus solely on improving one's own situation. Wealthy people benefit if they do not have to pay taxes or be regulated in how they can acquire more funds. On the other end of the economic spectrum, people who are currently having trouble making ends meet may feel that they have a better chance by ignoring all the constraints. As more people are tempted to reject the social contract, they may feel emboldened to challenge those who still adhere to it. This can quickly lead to a competitive tribalism in which defending one's economic model is both a duty and a matter of self-interest. And once such tribalism becomes established, even those who do not immediately improve their condition can now blame some other group such as blacks or Jews for their misery.

While capitalism is often blamed for fiscal inequality, corruption and greed are just as common in communist China and other economic systems. The issue is whether the economic system includes regulations that ensure fairness as reasonably defined in that society. The bottom line is that once enough people abandon any social contract based on fairness, the economic system

will gradually move to the all-selfish mode.

Solutions? Social movements often have large amounts of momentum. History is full of examples where it was difficult or impossible for a movement to change direction even when there were good reasons to do so. In the case of the unraveling of a cooperative society, the dynamics depend a lot on whether the society is still above or has fallen below the tipping point where the feedback loop becomes dominant.

It is not clear whether the United States has passed the tipping point or not. A recent opinion piece in the New York Times provided conflicting opinions about this issue. In a society as complex as this one, it is impossible to calculate the tipping point on theoretical grounds. And while polls give some indication where various citizens stand, it is not necessarily the case that any given fraction, such as 50% of citizens, can predict which way the society will go. In fact, given some compromises written into the United States Constitution, it is entirely possible for a selfish minority to take over the government and then stay in power indefinitely.

If we have not yet passed the tipping point, the kinds of policies that the Democrats are currently proposing would all work towards reducing fiscal inequity and pushing us back to a mostly cooperative society. These policies include restoring unions, setting a higher minimum wage, providing a broader social safety net including better healthcare, taxing the rich and corporations more heavily, setting constraints on corporations operating overseas unfairly, and reinstating environmental regulations scrapped by the prior administration. The current efforts by the Republican party to block voting rights of people who might vote against them need to be opposed at every level. It would also be useful if Donald Trump and similar figures were caught and punished for violating the constraints expected by the social contract. The fact that he can continue to get away with all his clear and overt transgressions just encourages other people to do the same.

If the United States has passed the tipping point, restoring the social contract society would be much more difficult. Republicans, who oppose all of the changes desired by the Democrats, would likely win the next election. They would then proceed to eliminate all remnants of the social contract that existed before and try to set up some sort of plutocracy. Given the strong political tribalism current in the United States and the widespread availability of guns, this could easily lead to a civil war and a partitioning of the country into pieces. It is alternatively possible that the Republicans' continued opposition to necessary disease and environmental controls could lead to a complete collapse of the society well before any civil strife broke out. Whichever trajectory occurred, the United States would then join the long list of sophisticated civilizations and empires that rose to great heights for a while, and then collapsed and disappeared. There are several very important lessons in this historical record, but for some reason Republicans are not interested.

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9. Cooperation and Risk (2022)

J.J. Winham

In prior essays, we bemoaned the unraveling of cooperative societies as greed and tribalism eroded the social contract. But it is fair to ask whether we really need cooperative societies anyway. If, as history shows us, people can survive the unraveling of their prior cooperative societies, are such transitions really so bad? Are there any reasons why we should prefer a cooperative society over a selfish one? This essay argues that there is at least one very big reason. However, to make the case we need some background. First, an animal example.

Vampire Bats. Vampire bats (*Desmodus rotundus*) are a common inhabitant of the New World tropics. They spend the day in large colonies in caves and hollow trees. At night, they radiate out over the countryside looking for large mammals as prey. When they find a suitable subject like a horse or a cow, but also pigs, tapirs or even people, they land gently on the surface of the animal and after a few minutes begin to gently lick the nearest patch of prey skin. This provides a slightly numbing effect, after which the bats use razor-like teeth to open a small wound. They then begin to lick up the blood, their saliva acting as an anticoagulant. They fill their stomachs until they are swollen like a tick. The minute they start drinking blood, their guts and kidneys begin extracting the water from the blood and urinating it out. They need to reduce their weight if they want to fly back to the roost. Note that at any time, the prey animal may detect some irritation or the movement of the bat on its back or neck and shake or buck it off. The prey animal is more likely to detect harassment if more than one bat is attacking it at the same time.

The advantage of this diet is that blood is a highly nutritious food. It can provide a lot of energy and other nutrients in a very short time. The disadvantage is that it provides little energy storage, and if the vampire bat misses two nights in a row without feeding, it is likely to die. Since finding a suitable prey item every night and managing to get through the full sequence without interruption is challenging, this is a very risky food source. Vampire bats have dealt with this problem by evolving a cooperative society. Each bat has several buddies and when one of them fails to feed on a given night, it begs from a successful returning buddy who regurgitates blood and feeds it. This guaranteed reciprocity makes surviving on such a risky food source feasible. See Carter (2021) for more details.

Early Humans. To see what vampire bats have to do with human societies, we need to take a look at our own evolutionary history. We and our ancestors, collectively called "hominins", evolved in eastern and southern Africa during the last 4.8 million years. During this period, the region experienced major climatic changes. Overall, starting about 3 million years ago, the region gradually became more arid and the initial extensive woodlands were replaced by grasslands. Superimposed on this long-term trend were alternating periods of high variability in rainfall separated by periods of much lower variability. Researchers have noted that most of the major originations and extinctions of hominin species occurred during one of the longer periods of climate variability. These were also the periods when the existing hominins first used new adaptations such as major changes in diet, invention or improvement in tools, or the mastering of fire. The implication is that these periods of high variability imposed strong selective forces on

existing species, and only those that acquired mechanisms for greater resistance to variability survived.

It will be useful to note a few of these major transitions. The earliest accepted hominin was *Ardipithecus* with two species occurring between 5 and 4.5 million years ago. These species were partially bipedal, but also clearly spent a fair amount of time in trees. They apparently ate soft foods like fruits and buds collected in the forest. They had small brains, 300-350 cc in volume, which is just slightly smaller than that of modern chimpanzees of similar body size.

Their descendants, the Australopithecines, which first appeared during a major period of climatic variability 4.2 million years ago, essentially put the hominin line on the trajectory that eventually led to us. They responded to the climatic variability by significantly expanding their diets by adding some components from the incipient grasslands such as seeds and tubers, and also increasing amounts of meat. The latter was likely based on small prey such as lizards, or partially decomposed meat scavenged from predator kills. Later species were the first to use stone tools to process foods, making them more quickly digestible. Although they could still climb trees they also first developed the energy-storing foot that made long distance walking economical. This facilitated larger home ranges and the ability to be more selective in what was collected for eating. Finally, learning how to find and utilize a variety of foods favored larger brains, and typical brain sizes increased to 459-500 cc. Most species were sexually dimorphic with males being considerably larger than females. In other primates, sexual dimorphism is associated with polygamous mating systems.

The Australopithecines, once established, enjoyed over 1 million years of fairly stable climate. They eventually produced a half dozen species spread throughout eastern and southern Africa. The next million years, starting about 3.2 million years ago, hosted four successive periods of major climatic variability separated by shorter periods of climatic stability. The second and third bouts of variability were both long and severe, and most of the Australopithecine species went extinct. This was also when the replacement of forest by grassland really accelerated. Because of differences in topography and local rainfall, the result was a patchwork of islands of forest often varying in composition and height, small lakes and river margins, and intervening zones of grassland. Thus on top of the temporal unpredictability of the local climate, there was significant spatial heterogeneity in habitats.

Two new genera emerged between the second and third bouts. The first, *Homo*, simply invoked the standard Australopithecine strategy for dealing with greater unpredictability by increasing body size to access a larger range of habitat patches, changing the diet to include more meat, and enlarging the brain to provide the memory and cognition needed to exploit these more diverse and scattered resources. Three species are known from the fossil record with brain volumes ranging from 510-680 cc. Stone tools were standardized and passed on to successive generations. Unlike its ancestors, this genus had much reduced sexual dimorphism and was probably monogamous. The second genus, *Paranthropus*, abandoned the Australopithecine playbook, and became a specialist eating sedges and grasses.

When the fourth episode of climatic instability hit, roughly 2 million years ago, one of the early *Homo* species went extinct, a second that might have been more arboreal survived for a bit

longer, and the third invoked the standard Australopithecine gambit by further increasing both body size and brain size, the latter to an average of 1000 cc. This new species is known as *Homo erectus*. There were two problems with simply scaling up these features. The first is that large brains and home ranges are expensive energetically. Trying to collect food in small portions over a large area was no longer sufficient. The alternative was to focus on high-profit foods such as large mammals. These were reasonably abundant both in woodlands and grasslands, but achieving a successful hunt was tricky and dangerous. Still, like vampire bats, this was the solution adopted by early *Homo erectus*. And like the bats, successful hunters brought meat back to share with the rest of the group, including those who had failed to hunt successfully. Unlike the bats, it was feasible for multiple individuals to work together on a hunt.

The second problem was also generated by having a larger brain. In great apes, and likely in early hominins, each mother is obligated to take care of her own child until it is independent. They therefore cannot get pregnant again until this occurs. Larger brains require longer periods of dependent childhood. The longer the interval between a mother's successive births, the lower the reproductive rate of the species. For a mammal about the size of early *Homo*, 700 cc is the largest adult brain size at which the parents can replace themselves in the population if the mother must wait for her current child to mature. *Homo erectus* clearly crossed this line and would have gone extinct had they not evolved some sort of shared childcare. This allowed a mother to get pregnant again after a much shorter interval than without such help. The fact that food was also being brought back to recent mothers also insured that she and her offspring would be fed even if she could not go foraging on her own.

The adoption of team hunting, food sharing, and cooperative childcare made *Homo erectus* an extremely resilient species despite unpredictable variations in climate and landscape structure. Their collective approach facilitated the accumulation of cultural strategies, including a redesign of stone tools to better fit their needs, the ability to use fire to cook foods, making them more digestible and storable, and eventually the use of caves and constructed shelters as central places for true hunter-gatherer economies. It is not surprising that they were the first species of hominin to move out of Africa, eventually getting as far east as Indonesia and the Philippines.

Populations of *Homo erectus* that remained in Africa continued to deal with episodes of climatic change. A major bout of instability about 1 million years ago included a long period of much wetter weather. This allowed the previously receding woodlands to reclaim large areas from the grasslands. This reduction in preferred habitat and competition with large mammal herbivores prove to be too much for *Paranthropus*, and the genus went extinct. *Homo erectus* adapted well to these changes, and subsequently to the later return of the grasslands. They went on to produce several descendent species including the Neanderthals, the Denisovans, and our own species, *Homo sapiens*, all of which continued to expand brain size while relying on cooperative food sharing and childcare. These later forms also eventually moved out of Africa and colonized the entire planet except Antarctica.

Modern Humans. You may be thinking that all of this is interesting but irrelevant: we have moved so far beyond these early species with our technologies, cultural achievements, agriculture, and social complexity. But focusing on these achievements misses the point. Our hominin ancestors were continually challenged by unpredictable crises. The forms that survived

were the ones that steadily increased flexibility and adaptability. They did this by expanding their brains to solve problems and cooperating to implement solutions. And the legacy of these adaptations remains with us. It is still the case that some of us collect or produce the food that the rest of us eat. To stay healthy, humans still need to eat a lot of high-energy food. Our brains are still large and it takes a decade and a half before an offspring can be considered independent. Without childcare and provided food, women could not have as many babies as needed to maintain our populations.

And we still live in an unpredictable and risky world. The best buffer against unexpected challenges has always been a smart and cooperative society. When such a society unravels, it is much more vulnerable to such crises. The fall of the Roman empire is a case in point. From its peak at the end of the first century CE, there was a steady erosion of cooperation due to greed and corruption, increased financial inequality, and eventually internal tribalism. In subsequent centuries, the empire faced a series of crises: disease, invasions, and climate change. It initially dealt with them, but over time as civil strife and polarization became acute, it could no longer deal with both internal and external forces ripping it apart. Other empires in China, Central America, the Middle East, and India also fell due to inadequate responses to pandemics, invasions, or climate changes.

We may like to think that we are immune from such instabilities. But does it not give you pause to consider the number of people in the United States and elsewhere who refused to cooperate by becoming vaccinated and wearing masks during the current pandemic? How about all the resistance particularly by businesses to curbing the serious climate change that the planet is facing? And while there does not currently appear to be an imminent invasion by aliens, the rising tensions between Russia, China, and the United States do not inspire optimism.

Vampire bats have flourished for 20 million years. They have surely faced their own crises, and yet survived with a fairly simple pattern of cooperation. Our species has evolved a much more complicated set of cooperative behaviors. So, can we hope to survive for as long as the bats? Given current trends, you have to wonder. And the sad irony is that if our species goes down because it failed to undo all the damage it has done to the planet, it will likely take the vampire bats with it.

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THE WINHAM PAPERS

10. The Real Problem with Religion (2024)

JJ Winham

Biologists say that every species has its Achilles heel, a trait that, if it gets out of hand, can drive the species to extinction. I worry that in humans, that trait is religion.

Just consider the millions of people who have died bickering over religious differences, not to mention the thousands currently at risk for the same reasons. For centuries, protestants and Catholics, Sunnis and Shiites, and Sikhs and Hindus have been killing each other. Decapitation, burning at the stake, disemboweling, even extracting the beating heart from a living sacrifice have all been common practices, thanks to religion.

The religious ecosystem is a zero-sum game: every new Baptist means one less Catholic. Survival of a religion in this competitive system is achieved only by maximizing relative numbers of members. There are two ways to do this. One is to expand your own reproduction, which is why most religions ban contraception, abortion, homosexuality, and masturbation. The other way is to either convert or kill off your competition.

Religions not only seek to add new members, they also need to retain the ones they have. Nearly all invoke the three "F's" to do this. The first F is to put "Flags" on their members that will continually remind them to which religion they belong, as well as advertise to others how common this religion might be. Typical flags include specified clothing, constrained diets, distinctive haircuts, and in some cases, body marking or mutilation (e.g., circumcision). They may also include conspicuous activities such as morning prayers, segregation of the two sexes at events, and special ceremonies for life's transitions.

The second F is "Faith". Members are taught that they must believe the doctrines of their religion no matter what contrary information might be provided, say by science, or other religions. To ensure members are loyal in this way, they are told that they will be punished in Hell if they let their faith waver but enjoy Heavenly rewards if they are stalwart. Faith also has a built-in positive feedback loop: keeping the faith through tough times and surviving can be argued as evidence supporting the faith.

The third F is "Force". At many times in human history, a dominant religion has used physical force to ensure that everyone within their grasp adheres to their rules and beliefs. Punishment for disloyalty can range from social isolation to dismemberment and death.

It is tempting to chalk up religious conflict as just another example of human "tribalism". History is full of examples of different groups fighting over some resource or territory. But history also shows that such conflicts can lead to eventual melding of the competing groups. Cultural practices such as agriculture have practical advantages and even a Mongol horde that favors cooking their steaks under their horse's saddles can eventually learn to raise crops.

But the clash of religions is less amenable to melding. There are certainly examples where this has occurred. But at the root of most religions is a belief in something like a god, heaven, or virgin birth, which cannot be proved, one way or the other. When two religions have conflicting core beliefs that are not provable or disprovable, it is usually impossible to meld them. Adherents of each religion will remain convinced that they are right and the other is wrong.

Ideally, two religions might agree to tolerate each other. But the world does not have many examples where this was a long-term stable solution. For its first 200 years, the United States insisted on freedom of religion, which technically meant tolerance of different religions. This principle is currently under attack by Christian evangelicals, who envision a religious theocracy for the country based on their religion, and not the others. The Taliban in Afghanistan, the current leadership in India favoring Hinduism, and the religious councils running Iran all have similar goals. Eventually, the existence of a contrary religion is seen as a threat: the two religions cannot both be right, and there is no peaceful way to settle it.

Science deals with many of the same questions that religion seeks to answer: where did we come from, where are we going, why do things happen the way they do, and so on. The difference, and it is a big one, is that scientists routinely list alternative explanations for a given phenomenon and then do experiments to either exclude or verify the alternatives. Although scientists have occasionally come to blows defending their favorite hypotheses, in the end, it is the experiment that resolves the question. Sometimes, as with Einstein's theory of relativity or the existence of the Higgs boson, it can take decades to determine whether a given hypothesis can be verified and alternatives excluded. But that is what scientists do. And if someone doubts the outcome, they can always redo the experiment or come up with a different perhaps more discriminating one.

Unfortunately, there are no parallels in religion. In fact, one might argue that the real problem with religion is that it is *not* a science! I say this despite the many "scientific" books coming out of the evangelical movement purporting to "debunk" modern geological dating, discount the relevance of the 30-some hominin fossils found to date, prove that Noah's Ark really existed, etc. Yielding to pressure by religious relatives, I have read a number of these and was astounded at their twisting of the data, misinterpretations, and outright falsehoods. I am sure there are scientists who are strongly religious, and willing to take a side, but reviewing those books on topics in which I am reasonably well versed, I was not convinced. To be fair, my evangelical relatives remain unconvinced that they are carrying genes from a long-ago ancestor's tryst with a member of another closely related hominin species. The difference: I believe in data-driven science, whereas they believe in faith-based religion.

If not science, where do most religions come from? Many religions rely on a sacred text that was reportedly dictated by God or written down after supernatural events occurred. But only in rare circumstances can one verify that those events actually happened, much less that they happened in the way that the text claims. And when someone claims that God appeared to them in an epiphany, it is a sample size of "one" and there is no way to replicate this experiment.

Other religious doctrines arise through the sanctification of pre-existing customs. For example, once humans have an economy based on a defensible resource, such as arable land or herds of domestic animals, adjacent groups will attempt to take over each other's property. Since men are

traditionally the most effective warriors, male inheritance becomes the norm in such societies. And given the uncertainty of paternity in most human populations, male inheritance often leads to serious constraints on the freedom, activities, and even bodily integrity of their women.

For example, Middle Eastern cultures, which were traditionally pastoralist, had many constraints on women long before Islam or Judaism made them scriptural law. The blaming of "original sin" on women in the Bible's Genesis surely reflects and even justifies such constraints.

Although religion has properties that go beyond tribalism, it often exploits tribalistic tendencies that are present in most people: the willingness to follow a charismatic and persuasive leader, the urge to defend members of your group when challenged by another group, and the reinforcing camaraderie and fellowship experienced when sharing similar beliefs. To be fair, sometimes the same tribalism occurs in science. We are all human and there is no doubt that human tribalism goes back a long way in our evolution. But I think you will find that in the end, most scientists, however reluctantly, will give up on a favored notion when presented with serious evidence. This does not happen often with religion, and it continues to be a major trigger for violence and bigotry throughout the world.

Let us hope it will not be our Achilles' heel.

These and related issues are discussed in far greater detail by Richard Dawkins (*The God Delusion*), Sam Harris (*Letter to a Christian Nation*), and Christopher Hitchens (*God is not Great: How Religion Poisons Everything*), among others.

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11. Have We Tipped? (2024) JJ Winham

There has been an avalanche of articles in newspapers and journals trying to explain current political polarities. Each comes up with a different cause. I would like to suggest a fairly simplistic but integrated perspective.

In his book, *American Nations*, Colin Woodard identifies 11 distinct cultures in North America. He then argues that today's differences are due to divergent and persistent biases at the time of settlement. In my reading, it seemed there were really two dominant cultures that gave rise to most of the others. These were the New England "utopians" and the South Carolina "slave-owners". Each of these cultures exported its views to new states, eventually leading to two large coalitions that fought for dominance in the Civil War.

I think this example reflects a general pattern in human history: a conflict between the same two social and economic options. These are the cooperative society and the selfish society.

There are three key conditions that typify cooperative societies:

- *Teamwork*: Allometry is an important principal in biology that says that the efficiency or effectiveness of a body depends upon its size. Larger animals find it easier to keep warm than smaller ones. I would argue that there are certain functions in social living for which cooperative groups are more efficient and effective than smaller groups or independent individual action. In modern times, these might include the building of roads and bridges, education, and fielding militaries. Cooperative societies often exploit such allometric advantages of teamwork.
- *Fairness*: No society, whether of animals or people, can escape cheaters. These will try to exploit weaknesses in the social fabric to benefit themselves at the expense of others. The reason we have laws and regulations is to limit cheating and ensure fairness. It is also the reason why most cooperative societies have manners. Manners confirm that society members respect each other and can be trusted to act fairly.
- *Charity*: Success in one's endeavors surely depends in part on one's skill and prowess. but anyone who has lived as long as I have must admit that chance plays just as big a role. In a cooperative society, those for whom chance has been kind and generous should acknowledge their luck and be willing to help those for whom chance has been less kind. In a way, charity ensures fairness in the face of chance.

None of these conditions comes free. Teamwork needs to be funded, usually via taxes. Regulations limit the options for individuals to make money doing things that might harm others. Charity means giving up some of your own profits to help somebody else. A cooperative society is stable only if the benefits of cooperation exceed these costs. This is often called the social contract.

The alternative to a cooperative society is a selfish one. Everyone is out for themselves. Private enterprise is always favored over taxation-supported cooperation. There are no laws to ensure fairness, and in fact there may be laws to guarantee inequality. Welfare and charity are absent.

Such societies invariably become highly "pyramidal" with a few wealthy dominants at the top, increasing numbers as one moves to lower economic levels, and usually slaves and beggars at the bottom. Nepotism and inherited wealth make it difficult for anyone to climb up the pyramid.

What happens if a society has opposing advocates for these two alternatives? Some insights can be gained by setting up an evolutionary game model where cooperative and selfish advocates compete to control the society. In evolutionary game theory, one looks for an evolutionarily stable strategy (ESS), which is one that when sufficiently common cannot be invaded by the other. At least in all the examples I have seen that had reasonable assumptions, this game always has two ESS's: one in which the majority of the society cooperates, and the other in which the majority of the society is selfish. Neither strategy is the only ESS. There is a tipping point between these extremes: when the fraction of cooperators in the society is higher than this tipping point, it pays for most individuals to be cooperative. There will be some cheaters, but they will not do well. If the fraction of cooperators in the society drifts below the tipping point, then it is on average better to be selfish. This drives the society over time all the way to mostly selfish. And since neither strategy is the only ESS, it is possible that a given population will bounce back-and-forth between the two extremes over time.

Do such transitions really happen in human societies? Absolutely! The historian Thucydides describes numerous shifts between democracy and oligarchy in Greek city-states. Ancient Rome shifted from a more cooperative republic to a very hierarchical empire. Both the United States and France deposed oligarchies and replaced them with democracies. Supposedly egalitarian communist societies often degenerate through graft and corruption into selfish ones.

As Heather Fox Richardson details in *Democracy Awakening*, proponents for cooperative and selfish societies have been at each other's throats throughout US history. For example, 1930s Democrats were able to forge a renewed cooperative society system with the New Deal. And not surprisingly, the Republicans have since tried to push our society back to the alternative. At least until recently, the Republican party reluctantly accepted living in a cooperative society. They defended the union and relied on legislative and judicial tools to negotiate lower taxes, reduced regulations, and minimal welfare. The push-pull between liberals and conservatives over where to draw the line is probably a healthy thing, allowing a society to adjust to changing conditions. Unfortunately, the Republican Party no longer accepts living in a cooperative society and is now advocating for a full conversion to a selfish one.

The coming election fits this model exactly. Most of the policies advocated by the Democratic Party are those required for any cooperative society: teamwork funded by taxation, regulated capitalism, good manners, and charity. And what do the Republicans advocate? They want exactly the opposite: no taxation, no rules or business regulations, and certainly no welfare. Policies endorsed by Project 2025 explicitly argue for the antithesis of a cooperative society. For example, women and racial minorities would be consigned to the lower levels of the resulting economic pyramid and white males to the top. Christianity would be the only allowed religion. Incompatible books would be banned, and only one party would be allowed political power.

So, how close are we to a tipping point? In evolutionary games where you know the payoffs, you can calculate the tipping point. Our economies are so complicated that I can't imagine anyone

trying to do so. Still, the signs are there. As Thomas Piketty showed a decade ago, unregulated capitalism has resulted in acute economic skew worldwide. Large numbers of people may now feel that the benefits of cooperation no longer compensate for the costs. Tribalism is often an intermediate stage in the breakdown of cooperative societies, and we are now seeing widespread tribal conflict based on religion, race, gender, and education levels. Manners and respect for rules are minimal: how many people did you see run stop signs last week? And there has been a widespread erosion of respect for government, education, science, and truth itself.

Is it too late? Are we doomed? Maybe. One would have to reduce the widespread economic skew to persuade unhappy citizens to buy back into the social contract. One suggested cause of the skew is the widespread relocation of many US industries abroad. In addition to leaving many US workers without a job, moving offshore allows US industries to avoid taxes (e.g., Apple in Ireland), dodge US regulations, and pay reduced worker benefits. Current efforts to "reshore" our industries are already underway, and incentives for the industries to do so themselves are increasing (<https://www.davron.net/reshoring-u-s-companies-bringing-manufacturing-home/>). This is a good sign.

But there is a big problem. In the 1950s, Congress and the Federal Communications Commission instituted a "fairness doctrine" for newspapers, radio, and television. Equal time and space were to be devoted to contrasting views on political topics. This kept wild deviations from the truth in public media to a minimum. Then in 1985, President Ronald Reagan and his appointees revoked this doctrine. Congress tried to reinstate it with a bill, but Reagan vetoed it. The result has been an increasing maelstrom of false information with no way for the average citizen to determine the truth. Entire networks pump out false information for political reasons. Even if we reduce the economic skew, the overwhelming misinformation may convince many voters that the social contract is still no longer good for them.

The problem was compounded in 2010 when a conservative Supreme Court decided to reverse prior policy and allow corporations and other outside groups to contribute money to elections (Citizens United decision). Since most voters get their political information on television, and there is no longer a fairness doctrine, whichever political group has the most money to buy TV ads can easily sway people to their side.

You might expect the wealthy and big corporations to side with Republicans pushing for conversion to a selfish society, and this is often true. But recent evidence that low- or moderate-skew cooperative societies are more stable and productive than selfish ones is presumably why a surprising number of wealthy donors and corporations are supporting the Democrats in the current election. This is also a good sign, but whether it is enough is unclear.

Other gambits include eliminating the electoral college, imposing term limits on the Supreme Court, revitalizing public education, and restoring the fairness doctrine.

So, returning to the question: if we were well past the tipping point, we would see our society rushing headlong to one of the ESS's. But we don't. The polls seem to be pretty even with small perturbations to either side and then back. If you are reading this after the 2024 election, you know what happened. But for those of us now, it's hard to get a good night's rest....

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12. Abortion Revisited (2024)

JJ Winham

Several years have passed since my first essay on abortion. I still stand by my arguments for why many people oppose this procedure. But in the ensuing years, a political twist has been added to the discussion. And since it relates to issues I discussed in my most recent essays, I thought a revisit to this topic might be timely.

One consequence of the level of consciousness in the human brain is the awareness of what death means. Especially what it means to us personally. Thinking about your own death can be very frightening and even depressing. It is not surprising then that most religions offer the balm of some sort of eternal life, even after the body is dead. What survives, called a spirit or soul, usually retains many of the personality and identity characteristics of its former embodiment. Many religions assume that each person's soul is unique. This means billions of emancipated souls have been collecting somewhere since the origins of humans. Other religions assume there are a finite number of souls, and when a person dies, their soul eventually goes into a new person or even another organism.

The Bible is ambiguous about when the soul first enters a developing human. However, the Catholic Church and several state legislatures and courts have recently declared that a human zygote acquires its soul at fertilization. Like many religious claims, this is not easily proved or disproved. What is a soul made of? Where does it reside in the zygote and later in the whole person? More pertinent, why make this claim now?

This century has seen a steady decline in religiosity worldwide. For those of us who grew up in 1950s America, the changes have been striking. Various forms of Christianity that were dominant have seen major declines in attendance and practice. This has not gone down well with religious practitioners. There are now efforts in the US to ban books the surviving religious right dislikes, require prayers and Bible reading in public schools, and strip evolution, sex education, and inclusiveness from the curriculum.

But the big one is abortion! By declaring that a zygote is a human being, meaning it has acquired a soul, the religious right feels it is also justified in declaring abortion murder. If the general public accepts this argument, it is *de facto* accepting a major premise of Christianity. And if the public accepts this, how can it then oppose the other efforts to restore religion in our society? Abortion is thus being used as a "wedge" issue to counter the recent decline in religious beliefs.

This raises the general issue of how conflicting beliefs can, or should, coexist in a cooperative society. Until recently, the criterion seemed to be that you could believe anything you wanted, as long as it did not cause physical harm to another person. By that criterion, a religious person's opposition to abortion should not be allowed to inhibit other people's decisions, whereas religious opposition to vaccines for communicable diseases may be overridden because additional infections increase everyone's risk. What about services and benefits? Should someone in a bakery be allowed to refuse a homosexual customer's wedding cake order because the baker's

religion is against homosexuality? Can a Catholic organization that hires non-Catholic staff refuse to provide birth control benefits because that offends their religion?

All of these issues have been raised recently, and both state and the Supreme Courts have increasingly sided with the religious right. There has been surprisingly little legislative pushback. Many members of Congress are not religious, (I even know some), but they dare not support abortion on the grounds that they do not believe in souls. There remains a widespread presumption that all US politicians should be religious. So, they issue some vague statement about being "a person of faith" and focus on the rights of women to decide what to do with their own bodies. The latter is certainly a valid argument, but these politicians are skirting a core theological issue.

These actions tie into my previous essays because the religious right is currently teaming up with the Republican push to replace our cooperative society with a pyramidal one. Leaders at the top of the pyramid would then grant special powers and privileges to religion, and in exchange, acquire large numbers of voters and preachers declaring religious justification for pyramidal policies. There is certainly precedent. In the US south prior to and during the Civil War, preachers of multiple denominations found ample justification in the Bible for the subjugation of Black people as slaves. And currently, many religious organizations are willing to give a complete pass to the unchristian behavior of candidate Donald Trump as long as he guarantees that if elected, he will put them back in power.

Because most humans are reticent to harm a child, abortion, even to those who do not believe in a soul, makes people uncomfortable. Most of us consider human life to be sacred, and so the question of when human life really begins can be quite important. For myself, as a biologist, I do not believe in souls and am convinced human consciousness is a result of that big computer in our heads, the brain. As is becoming increasingly obvious with the development of artificial intelligence, a sufficiently complex computer can do almost everything we do, including acquire a fear of death.

Given my point of view, I cannot see a fertilized egg, a blastula, or a gastrula (early stages of human development) as persons. They don't even have any nerves. As the fetus develops further and develops a nervous system, it replicates many of the stages of our evolution: first responding reflexively to stimuli, then adding in a bit of learning, and eventually having sufficient neural power to generalize and predict things. That is roughly where I think a fetus becomes a human, which in recent law has been about 20 weeks or so of development. And even then, I do not think advanced fetuses have enough consciousness that they should be saved if one has to choose between them and the life of the mother.

And what do I think about my own death? I think of it as somebody pulling the plug on my computer. When you pull the plug on a computer, it goes dead. No images, no language, no artificial intelligence. Does that depress me? Not really. I have tried to use this limited brain of mine as much as possible during my lifetime. I have been to places and done things that I never dreamed possible and I will not feel cheated when my body finally pulls the plug.