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With sex in mind

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Introduction

Even if human reproduction were not our profession, as adults we would have sex in mind a great deal of the time: sex pervades our art, our literature, our relations inside and outside the family—even the very words we use to describe the world around us.

When we sing a hymn in church, we use a word derived from the *hymen*, going back to the songs sung at ancient wedding ceremonies. In a Roman court of law, a witness used to place his hand on his testicles and so he *testified*. Genesis, Chapter 24, describes how when Abraham was dying he called 'his eldest servant of his house, that ruled over all that he had' and said to him, 'Put, I pray thee, thy hand under my thigh' and swear an oath'—which is merely the coyness of the Authorized Version of reporting the servant to put his hand on Abraham's testicles as a symbol of truth. Indeed, the Bible is divided into the Old and New 'I swear on my testicles.'

Sex is so powerful it continually degrades the words we use to describe it. In Chaucer's time, a common verb for intercourse was to *swive*—' Thus swived was the Carpenter's wyf.' Today, the same word lives on in the innocent *swivel*, although even as late as the seventeenth century the Scots Bible called the book of Genesis *The Book of Swiving*. The word *fuck* is derived from the Norse *to push*. Appropriately, the Reverend Malthus was among the first to use the word *intercourse*.

The early nineteenth century in America saw the highwater of verbal prudery. Instead of going to bed, people *retired*, trousers became *unmentionables*, bulls became *male cows*, a cock a *rooster*, cockroaches *roaches*, and bullfrogs were not to be mentioned at all!

Sex is magical, but it is also mysterious and we continually seek explanations of why we behave in certain ways. The most profound questions are the ones that have been asked the longest, and the story of Adam and Eve in particular has become an integral part of our culture. Today, biologists are producing exciting insights into human sexuality, but yesterday's myths persist as strongly held beliefs, sometimes in direct conflict with the explanations science supplies.

The Judeo-Christian interpretation of sex and reproduction in large part stems from the myth of Adam, Eve and the serpent[1] and from the story of Onan.[2] The early fathers of the Church, like ourselves, looked for rational explanations of the world in their struggle to understand sex and reproduction. 'A man by his very nature,' wrote Augustine, 'is ashamed of sexual desire,' and he concluded human beings cover up their genitals because an erection, or vaginal lubrication, is a 'rebellion on our members... proof and penalty of man's rebellion against God.' Original sin, argued Augustine, was transmitted as a discrete entity in the male semen. It was universal and ineradicable.

The data and insights biologists have gained about sexual behaviour must displace older, less satisfactory explanations of human behaviour. Thousands of years of religious speculation and a century of psychological searching are being overtaken by a broad-based biological understanding, which pulls together information from endocrinology, the behaviour of animals, and takes a new look at history and anthropology.[3,4]

In 1859, Darwin convinced us our bodies had evolved by natural selection from that of other primates, and twentieth century molecular biology has demonstrated we share 97.8 per cent of our DNA with chimpanzees. We test our drugs on rhesus monkeys and try to give AIDS to apes, but we have been remarkably slow to use biology to help us understand sex and love, or marriage and adultery.

This paper looks at three aspects of human reproduction through a biological lens: human mating patterns and sexually transmitted diseases, reproductive cancer and breast

function, and induced abortion. Biosociology is exciting and helpful although, like most other paradigms of human behaviour, it can be misused by individuals attempting to justify their own whims, or even to manipulate society. It must be emphasised that biology can never tell us how to behave. The speed and flexibility of human cultural change has rendered biological evolution redundant, but we can still learn from it.

Two sexual agendas

In Genesis, Chapter 38, Judah's son Er was wicked in the sight of the Lord, and the Lord slew him. Tamar, his wife, in the tradition of Judah's tribal society, was passed to her brother-in-law, who 'when he went in unto his brother's wife, he spilled it (his semen) on the ground,' lest that he should give seed to his brother . . . wherefore [God] slew him also.' Judah tells Tamar to, 'Remain a widow at [her] father's house . . . lest peradventure' his third son should also die. Twice widowed and childless, Tamar refuses to accept the status quo and, hearing her father-in-law is going to market to sell a sheep, she pulls her veil across her face and, pretending to be the village whore, waylays Judah. Before they tumble in the bushes, Tamar acquires Judah's staff and signet, as a security that he will pay her a kid from his flock (interestingly, you do not need a cash economy to practise prostitution) and scurries back home without her father-in-law discovering her identity.

Three months later a servant tells Judah, 'Tamar, thy daughter-in-law, played the harlot, and . . . behold she is with child by whoredom.' He says, 'Bring her forth and let her be burnt,' whereupon she produces his staff and his signet. Judah says, 'she hath been more righteous than I,' and Tamar goes on to deliver twins.

Humanae Vitae and the whole of the Catholic condemnation of contraception in large measure stem from exegesis on this single passage from Scripture. We live on a finite planet with a fragile biosphere that has to accommodate one million more human beings every four days and eight hours; one woman dies every minute from pregnancy, childbirth or abortion, and yet this one verse from the book of Genesis, through a long chain of learned behaviours, still retards the political response to key problems of fertility control. Whenever Pope John Paul II gets off a jumbo jet and talks to the TV cameras about contraception or abortion he has Adam and Eve, Onan and St Augustine's interpretation of sex very much in mind.

St Augustine condemned all forms of birth control including the rhythm method. As John Noonan[2] points out in his scholarly history of contraception:

> 'In the history of the thought of theologians on contraception, it is, no doubt, piquant that the first pronouncement on contraception by the most influential theologian teaching on such matters should be . . . a vigorous attack on the one method of procreation accepted by twentieth century Catholic theologians as morally lawful.'

Thomas Aquinas argued coitus interruptus in marriage was worse than rape or incest, and Pope Sixtus V made adultery a hanging matter. However, other theologians have pointed out that the supernatural execution of Onan may have been because Onan disobeyed his father and the traditions of his tribe in failing to fulfil his obligations to his dead brother, rather than because coitus interruptus was intrinsically sinful.

The modern biologist, like St Augustine or Pope John Paul II, also has sex on his or her mind and tries to explain the same sexual conundrums that faced the writers of the old 'I swear by my testicles.' Why is the dual standard of sexual behaviour so persistent throughout history? Why is the ritualised sharing of women between related men a feature of many societies? Is it right to separate intercourse from procreation?

Biosociology proposes that certain mating and reproductive strategies make evolutionary sense because they exploit energy sources available in the environment optimally.[3] The energy investments the two sexes make in reproduction are vastly different. A woman, if she is to breast-feed her children for what appear to be natural intervals, can perhaps have four or five children in a fertile lifetime. A man if he is ruthless, and evolution is ruthless, can father tens or even over a hundred offspring in a lifetime.[4] In biology, it is in the interest of the female to be coy and courted and for the male to be aggressive and opportunistic. Among the seahorses, where it is the male that has the brood pouch and the female that has the penis to insert her eggs into the partner's body, it is the male that is coy and the

female that does the courting.[5] Judah was prepared to pay for non-reproductive sex; whereas Tamar was willing to go to considerable lengths to trick her in-laws in order to conceive a child.

The female can usually find a mate just by advertising her presence, but she cannot always find the food to nurture her young. The limiting resource for the male is access to females, for whom he may have to fight. The males and females of the same species nearly always exploit the same food supply so that they are in competition with one another. The female mammal, however, cannot bear young as rapidly as a male can father them so she is the rate-limiting resource, and therefore sets the pace of evolution. Most foraging groups of animals are groups of related females, males, elephants, baboons, if you must band together for safety, better to share your food supply with children and sisters. The excess males live as isolated individuals, or possibly as 'bachelor bands.'

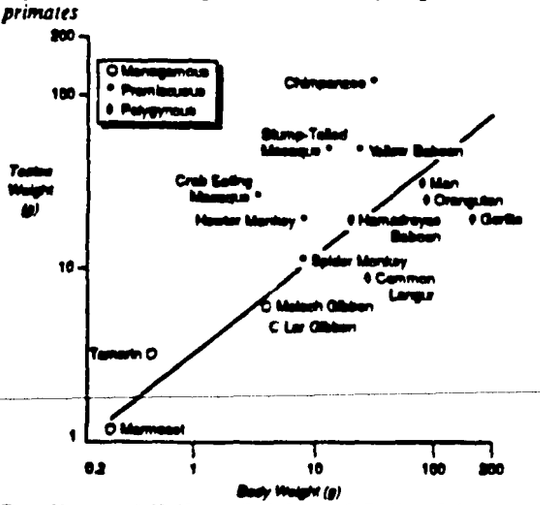
Like chimpanzees, we are a sexually dimorphic species and in our fashions and sports we may even exaggerate the anatomical differences between the sexes. Without doubt, we have a polygamous ancestry, but in recent evolution we have moved towards monogamy, albeit incompletely. The unique attributes which separate us from the higher primates are in the area of sex and reproduction, and most of them seem to be to do with the trend from polygamy to monogamy. We carry out sex in private and at times of least diurnal activity and, as St Augustine rightly pointed out, we persistently cover up our genitals. But unlike other larger apes, we sleep in the same nest as our mates at night, although interestingly the aristocracy often sleep apart, like chimpanzees. We are the only animal with a sense of humour, and most of our jokes revolve around sex.

Among animals that are genuinely polygamous, such as lions, the male is invariably larger than the female, because he has to physically compete with other males for access to the females. In animals that are genuinely monogamous, such as the beaver, the females are larger than the males because they have to carry the burdens of pregnancy and lactation while the male is little more than a vehicle to carry the testes around. Indeed, the ratio of testes to body size is a good predictor of mating patterns and, as with our sexually dimorphic bodies, *Homo sapiens* is also among the polygamous animals in testes/body size (Figure).[6]

The concealment of ovulation in the human female and the bond between the sexes that intercourse creates carries us, an originally polygamous animal, a long way on the road to monogamy. In a chimpanzee troop, the males do not know which children they have fathered and while it is in their overall interest to defend the territory of the troop and to be pleasantly tolerant of playful infants, they do not make a direct investment in bringing up the next generation. If the male is to make such an investment, he must have reasonable probability of knowing which children are his. When Tamar's behaviour suggested that paternity was uncertain, Judah was going to have her killed.

While crocodiles can manipulate the sex ratio by incubating their eggs at different temperatures, mammals seem destined to produce equal numbers of X and Y sperm, and in practically all species the ratio of males to females at birth is 1:1. Among large mammals that take a great deal of food from the environment, males and females become competitors. Gorillas are leaf eating primates and they live in male dominated groups of unrelated females and both sexes leave the troop at puberty.[7] Elephants, for example, move around in matriarchal herds of cows and juveniles. They only allow the bulls in to mate, otherwise the bulls would eat them out of house and home. Among gorillas, there is one

Figure *Testicular weight in relation to body weight in selected primates*



From Harcourt A H, Harvey P H, Larsen S G, Short R V. *Nature* 1981; 293: 55–57.

silverback male and several mature females and their offspring. Although we speak of a dominant male, it is really the female (who is the rate-limiting resource in reproductive terms) that sets the pace of evolution: females have access to more food, especially during pregnancy and lactation, if sexual behaviour is tailored by evolution to only allow one 'dominant' male among several females.

Chimpanzees have an unusual social behaviour where a number of related males violently defend a moderately large territory containing their favourite fruit trees.[7] They then mate promiscuously with the females as they come into heat. Mothers and sons stay in the same troop throughout life, but at puberty females leave their natal troop and enter new troops. Sometimes the females are attacked by the older, more mature females in the troop.

We share much of this unusual pattern of social behaviour. In most human societies the bride is 'given away' by her family and enters her husband's troop where quite often, like a young chimp, she may come into conflict with her mother-in-law. In the Genesis story, Tamar was expected to marry her deceased husband's brother, and even today in Israel some childless widows cannot remarry until they are released by their husband's brother.

Among the hunter-gatherers of the Kalahari, whose way of life is much nearer to that in which human sexual behaviour evolved than modern civilisation, the men bring home most of the protein and the woman most of the carbohydrate and the calories. This division of labour is an unusual and intriguing one. As we have seen, we are large animals to maintain a one-to-one sex ratio in the adult herd, and one of the reasons we can get by is probably because the two sexes exploit rather different food supplies and exchange food for sex. Many primates will eat meat when they can, catching tree frogs or snakes. Baboons and chimpanzees, other mammals and birds, sometimes cooperating to catch the prey and sometimes sharing it with other members of the troop. Males hunt more than females.[7]

Men and women not only differ in body size, they differ in skills. Woman appear to be better at language than men, men appear to be better at spatial orientation although, as with many 'species' exploiting different ecological niches, there is a great deal of overlap between male and female abilities. Boys, for example, have more lethal accidents than girls and in one study of bicycle accidents 86 per cent of the victims were boys. There are many more men in prison than women, but our religious tradition, going back to Eve, casts women as the transgressors, hence we use the same suffix for gangsters as spinsters, even though most gangsters are men!

Men commonly marry younger, and therefore more fertile, women. The older the man, the greater the age gap is likely to be, so in a second marriage a man commonly marries a women who is more junior in years than his first wife was. Men are opportunistic and many a wife has been bewildered to find an otherwise loving, faithful husband has spent a one night stand with somebody else. In the USA, we have just seen two television evangelists and one presidential candidate fall because they implemented this biological drive. Men do look for physical satisfaction, for which we can read reproductive potential, in women, and women do look for social status in their partners, for which we can read in biological terms security to bring children to maturity.

In biological terms, marriage is a compromise beween the conflicting reproductive agendas of the two sexes united by their complementarity in exploiting food supplies. A woman gives sex for love and a man gives love in order to obtain sex, and both give one another food. Different cultures, at different times, have promoted the sexual agenda of one sex at the expense of the other.

The royal families and aristocracy of Europe are interesting 'primates' to observe. Some monarchs, such as Edward VII, used their position to mate promiscuously, like a chimpanzee or gorilla. Edward had Alexandra the wife, Lillie Langtry, the Countess of Warwick, Alice Keppel and a host of other women, while Victoria and Albert, his parents, seem to have been strictly monogamous, like beavers.

We are the only animals where a significant proportion of adults adopt a homosexual lifestyle. Leonardo da Vinci, Michaelangelo, Eramus, James 1st, Frederick the Great, Tchaikovsky, Oscar Wilde, Proust, Krupp, Herman Melville, and E M Forster were among some of the homosexuals in history.[8]

What we see with homosexuality is each sex implementing its own biological drives without

the need for compromise with the opposite sex. The cruising homosexual chooses his partners purely on physical grounds, often not knowing their names, seeking a high degree of eroticism and often having many sexual outlets in a single evening and persisting in this way of life for many years. Lesbian lovers tend to be consistently faithful over many years, to place companionship and human relations above erotic experience and to seek relatively infrequent sexual outlets.[9]

Sodom was a city and both prostitutes and the gay lifestyle only emerged with urban living. In a hunter-gatherer band there are too few potential partners and there is too little privacy for such specialised lifestyles to exist. Today, as many people live in cities as lived in the whole world as recently as 1950. Is this why AIDS has arrived in the 1980s?

Sexually transmitted diseases

Most virologists think the HIV virus has jumped from a monkey to human beings, probably as a result of biting and scratching. This may have happened every so often in the past, but the infection petered out after afflicting a handful a people. However, the growth in the numbers of urban homosexuals and heterosexuals with many partners may have provided the dry tinder permitting the epidemic to spread to the less easily infected mass of humanity.

In 1492, Christopher Columbus' crew brought a new disease, or perhaps a new version of an old disease, from the Caribbean to Europe. Just as AIDS has been dubbed the 'gay plague', so syphilis was described as someone else's problem; the French called it 'the disease of Naples', the British the 'French pox' and the Japanese the 'Chinese infection'.

Calvin was born only 17 years after Columbus returned and it seems the puritan revolution, at least in part, was propelled by a very real fear of syphilis. The change in sexual behaviour that took place in sixteenth and seventeenth century Europe was profound; illegitimacy fell to low levels, spouses came to depend more on each other than on their kin. Sexual immorality was sternly punished. AIDS has already altered gay habits and it will probably also change contemporary heterosexual habits, although the anonymity of city life and the diversity of life styles, together with no defence of individual freedom, will stop the pendulum swinging to the degree of chastity found in high Puritan times.

AIDS makes our private lives public: we now know Rock Hudson and Liberace were gay. Catholic priests have died of AIDS in the USA. The incidence of AIDS in 5,000 individuals in Kinshasa, Zaire tells a great deal about patterns of heterosexual coitus.[10] The new born victims of viral infection die quickly in childhood. Women's peak infection is in the twenties, and probably there are often poor women driven to sell sexual favours by poverty. The peak of male infection is lower, later and broader, and these are often the richer, better educated, urban men, the entrepreneurs and technocrats who have the wealth and social leverage to use the younger women.

Reproductive cancers

In contemporary America, one in 11 women develops breast cancer and one in 18 dies of the disease. Our bodies have been tailored by evolution for optimum reproductive performance. An early menarche, the postponement of childbearing for social reasons and short intervals of breast-feeding are all deviations away from natural patterns of fertility, and all are risk factors in developing breast cancer (Table).[11] The younger a woman is when she has her first child, the less her risk of breast cancer later in life. These same factors also influence ovarian and possibly uterine cancer.

Oral contraceptive use markedly reduces the chances of getting ovarian or uterine cancer later

Table *Relative risks for breast cancer*

Risk factor	Age	Relative risk
Age at menopause	−44	1.00
	45 - 49	1.27
	50 - 54	1.47
	55+	2.03
Age at menarche	−11	1.00
	12	0.90
	13+	0.50
Age at first full-term pregnancy	−19	0.83
	20 - 24	1.00
	25 - 29	1.30
	30 - 34	1.57
	35+	2.03
	Nullips	1.67

From Diggory P, Potts M, Teper S, eds. *Natural Human Fertility: Social and Biological Determinants*. London: MacMillan, 1988.

in life.[12,13] Unlike the adverse side effects of the pill on the cardiovascular system, nearly all of which occur during use and are independent of the duration of use, the recently demonstrated protective effect of oral contraceptives against ovarian and endometrial cancer becomes more marked with duration of use and protection persists after stopping the method, and it may even be life long. Overall, the protection the pill offers agains uterine and ovarian cancers more than outweighs the adverse risk of cardiovascular disease associated with oral contraceptive use, in all but older women who also smoke.[14]

Conflicting observations exist on whether oral contraceptive use has any impact on breast cancer and sadly, after 30 years of pill use, sufficient investment has still not been made to answer this key question. What is certain is that we need to set about trying to understand the aetiology of breast cancer much more fully so that we might set about identifying risk factors so that just as a better understanding of heart disease led to changes of lifestyle that are bringing about the first measurable reductions in cardiovascular mortality, so women might take steps to reduce the risk of this dreadful malady.

One variable which reduces the risk of breast cancer is breast-feeding one's children.[15] The Kung women breast-feed, on average, every 14 minutes; they do not know one end of a condom from another yet the population of the Kalahari Kung doubles in approximately 300 years: the population of Kenya will double in 18 years. What has happened?

Lactation is as essential to the awesome processes of human reproduction as intercourse. Until recently, a child deprived of breast milk died. Like sexual intercourse, breast-feeding involves a satisfactory physical relationship between two individuals who usually love one another. And breast-feeding is nature's contraceptive. In many parts of the world, particularly sub-Saharan Africa, breast-feeding averts more births than the use of modern methods of contraception.[16]

Humanae Vitae says the 'human intellect discovers in the power of giving life biological laws which are part of the human person.' Surely that would apply to bottle feeding which, if misused, can kill? Why then is a penis with a condom more shocking than a bottle with a nipple? Both are technologies that profoundly interrupt natural patterns of human reproduction: one is a lactose *conceptive* and the other a latex *contraceptive*: each can save lives properly used and each can be improperly used.

Contraceptives save lives: infant mortality is half as high when a mother spaces her pregnancies three or four years apart instead of having a second delivery less than one year after a previous one. But it is contraceptives which shock people, which churches condemn and which politicians forbid to be advertised. The infant has no choice as to what is put in its mouth but adults can consent to contraception; artificial feeding and artificial contraception are morally symmetrical. We accept the convenience of artificial feeding, and we must accept the necessity for artificial contraception.

By happenstance, world population growth is approximately in step with the calendar year, 87 million people this year, 88 million next year. Even though the rate of global population growth is falling, the absolute numbers added to the world population will keep rising until approximately the end of the century, and that is 100 million extra people every year.

One woman a minute dies in childbirth. In the developed world, maternal mortality accounts for less than one per cent of all deaths to women in the fertile age group. In the developing world, maternal deaths cause 20 to 25 per cent of such mortality. More women die in child birth in the Indian subcontinent in one *month* than die in Europe, North America, Japan, and Australia in one *year*. These are sober statistics. They should arouse global concern.

Induced abortion

One definition of moral might be those decisions which we have to make as we move further and further from the hunter-gatherer way of life for which our biological evolution prepared us. Ancient myths and modern knowledge are closely intertwined in the decisions society makes about abortion. The only legalistic reference to abortion in the Bible is in Exodus 21:22.

> 'If men strive, and hurt a woman with child, so that her fruit depart from her, and yet no mischief follow: he shall be surely punished, according as the woman's husband will lay upon him; and he shall pay as the judges determine.'

The next verses are, 'And if any mischief follow, then thou shalt give life for life, eye for eye, tooth for tooth, hand for hand, foot for foot . . . '. It is explicit that abortion is a crime but not equivalent to the taking of a life.

Aristotle had taught that the embryo was the product of mixed semen and retained menstrual blood. The classical world did not recognise what we now call the genetic contribution of the woman to the next generation, and until the eighteenth century many intelligent, educated people believed the woman was no more than a field in which the man's seed was planted. Aristotle looked at chicken eggs during development and postulated an animal soul, which was responsible for physical development, much like a modern embryologist might talk of an inducer. He likened the effect of the animal soul to rennet on milk.[17]

Today, we know that the primitive streak is not formed until the eighteenth day of pregnancy and, as identical twins are formed at this relatively late stage, human individuality, personhood, the soul, cannot exist prior to this time.[18]

The early fathers of the Church taught the soul could only enter the embryo when the embryo was sufficiently developed to receive it. St Augustine said, 'There cannot yet be said to be a live soul in a baby that lacks sensation when it is in flesh nor formed and not yet endowed with sense.'

If the semen carried original sin, then Mary had to be a virgin and had to be immaculately conceived herself to avoid the stain of sin. Her serene freedom from the pains of childbirth was because 'she alone conceived with pleasure' and therefore escaped the curse of Eve' St Augustine, like his contemporaries, believed disease was God's punishment and he used the occurrence of congenital anomalies to buttress his belief that semen physically transmitted original sin. 'You must explain why (a baby) is sometimes born blind or deaf. If nothing deserving punishment passes from parents to infants, who could bear to see the image of God (a human being) sometimes born retarded, since this afflicts the soul itself.'

An important interchange between biology and theology took place in the seventeenth century. The first compound microscopes were not colour corrected and, although sperm could be seen, definition was poor. As is often the case when something is unclear, people imagined more than they could see. Biologists imagined they saw a homunculus, or a little man in every sperm, and theologians felt that they had a solution to the time when ensoulment occurred, if there was a homunculus in every sperm, then God could put the soul in at coitus.

Intellectually, today's Right-to-Lifers are still looking down seventeenth century microscopes to see homunculi. However, today's embryologists see the continuum of development Aristotle saw and can no more use their microscopes to say where life begins than an astronomer can scan the constellations and look for the Pearly Gates in order to tell us if Heaven does or does not exist. Daniel Callahan, A Catholic ethicist, has written,

> 'To say, for instance, that God forbids the taking of "innocent life" while conceding, as I think we must, that it is left up to men to define what an innocent life is, is to fail to see the only possible *meaning* this rule can have is the meaning human beings choose to give it.'[20]

Just as many different beliefs exist in a modern, pleuralistic nation about life after death, so society must accommodate to several interpretations of life before birth. The state cannot, and should not, impose one system of belief over another. Certainly the law seems to have little effect on the numbers of abortions taking place.

It should be no more surprising to find an abortion clinic in a city where many people are sincerely opposed to abortion than it is to find a church, a synagogue or a mosque side by side in the same city. They all advocate profoundly different beliefs about the world. The Second Vatican Council stated, 'the right to religious freedom has its formulation in the very dignity of the human person, as this dignity is known throughout the revealed world of God and by reason itself.'

Conclusions

In the Adam and Eve story, sex, sin and knowledge go together. The English words *to know* and *to penetrate* have overtones of sex. Adam and Eve were expelled from Paradise for eating of the fruit of the tree of knowledge. Scientific knowledge has the power to open the

gates of a paradise on earth, but if we are to pass through them we must let a knowledge of biology illuminate and inform our reproductive behaviour.

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