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The Question of Abortion: A Search for Answers

by Carl Sagan and Ann Druyan

For the complete text, including illustrations, introductory quote, footnotes, and commentary on the reaction to the originally published article see *Billions and Billions*.

The issue had been decided years ago. The court had chosen the middle ground. You'd think the fight was over. Instead, there are mass rallies, bombings and intimidation, murders of workers at abortion clinics, arrests, intense lobbying, legislative drama, Congressional hearings, Supreme Court decisions, major political parties almost defining themselves on the issue, and clerics threatening politicians with perdition. Partisans fling accusations of hypocrisy and murder. The intent of the Constitution and the will of God are equally invoked. Doubtful arguments are trotted out as certitudes. The contending factions call on science to bolster their positions. Families are divided, husbands and wives agree not to discuss it, old friends are no longer speaking. Politicians check the latest polls to discover the dictates of their consciences. Amid all the shouting, it is hard for the adversaries to hear one another. Opinions are polarized. Minds are closed.

Is it wrong to abort a pregnancy? Always? Sometimes? Never? How do we decide? We wrote this article to understand better what the contending views are and to see if we ourselves could find a position that would satisfy us both. Is there no middle ground? We had to weigh the arguments of both sides for consistency and to pose test cases, some of which are purely hypothetical. If in some of these tests we seem to go too far, we ask the reader to be patient with us--we're trying to stress the various positions to the breaking point to see their weaknesses and where they fail.

In contemplative moments, nearly everyone recognizes that the issue is not wholly one-sided. Many partisans of differing views, we find, feel some disquiet, some unease when confronting what's behind the opposing arguments. (This is partly why such confrontations are avoided.) And the issue surely touches on deep questions: What are our responses to one another? Should we permit the state to intrude into the most intimate and personal aspects of our lives? Where are the boundaries of freedom? What does it mean to be human?

Of the many actual points of view, it is widely held--especially in the media, which rarely have the time or the inclination to make fine distinctions--that there are only two: "pro-choice" and "pro-life." This is what the two principal warring camps like to call themselves, and that's what we'll call them here. In the simplest characterization, a pro-choicer would hold that the decision to abort a pregnancy is to be made only by the woman; the state has no right to interfere. And a pro-lifer would hold that, from the moment of conception, the embryo or fetus is alive; that this life imposes on us a moral obligation to preserve it; and that abortion is tantamount to murder. Both names--pro-choice and pro-life--were picked with an eye toward influencing those whose minds are not yet made up: Few people wish to be counted either as being against freedom of choice or as opposed to life. Indeed, freedom and life are two of our most cherished values, and here they seem to be in fundamental conflict.

Let's consider these two absolutist positions in turn. A newborn baby is surely the same being it was just before birth. There's good evidence that a late-term fetus responds to sound--including music, but especially its mother's voice. It can suck its thumb or do a somersault. Occasionally, it generates adult brain-wave patterns. Some people claim to remember being born, or even the uterine environment. Perhaps there is thought in the womb. It's hard to maintain that a

transformation to full personhood happens abruptly at the moment of birth. Why, then, should it be murder to kill an infant the day after it was born but not the day before?

As a practical matter, this isn't very important: Less than 1 percent of all tabulated abortions in the United States are listed in the last three months of pregnancy (and, on closer investigation, most such reports turn out to be due to miscarriage or miscalculation). But third-trimester abortions provide a test of the limits of the pro-choice point of view. Does a woman's "innate right to control her own body" encompass the right to kill a near-term fetus who is, for all intents and purposes, identical to a newborn child?

We believe that many supporters of reproductive freedom are troubled at least occasionally by this question. But they are reluctant to raise it because it is the beginning of a slippery slope. If it is impermissible to abort a pregnancy in the ninth month, what about the eighth, seventh, sixth ... ? Once we acknowledge that the state can interfere at *any* time in the pregnancy, doesn't it follow that the state can interfere at all times?

This conjures up the specter of predominantly male, predominantly affluent legislators telling poor women they must bear and raise alone children they cannot afford to bring up; forcing teenagers to bear children they are not emotionally prepared to deal with; saying to women who wish for a career that they must give up their dreams, stay home, and bring up babies; and, worst of all, condemning victims of rape and incest to carry and nurture the offspring of their assailants. Legislative prohibitions on abortion arouse the suspicion that their real intent is to control the independence and sexuality of women...

And yet, by consensus, all of us think it proper that there be prohibitions against, and penalties exacted for, murder. It would be a flimsy defense if the murderer pleads that this is just between him and his victim and none of the government's business. If killing a fetus is truly killing a human being, is it not the *duty* of the state to prevent it? Indeed, one of the chief functions of government is to protect the weak from the strong.

If we do not oppose abortion at *some* stage of pregnancy, is there not a danger of dismissing an entire category of human beings as unworthy of our protection and respect? And isn't that dismissal the hallmark of sexism, racism, nationalism, and religious fanaticism? Shouldn't those dedicated to fighting such injustices be scrupulously careful not to embrace another?

There is no right to life in any society on Earth today, nor has there been at any former time... : We raise farm animals for slaughter; destroy forests; pollute rivers and lakes until no fish can live there; kill deer and elk for sport, leopards for the pelts, and whales for fertilizer; entrap dolphins, gasping and writhing, in great tuna nets; club seal pups to death; and render a species extinct every day. All these beasts and vegetables are as alive as we. What is (allegedly) protected is not life, but *human* life.

And even with that protection, casual murder is an urban commonplace, and we wage "conventional" wars with tolls so terrible that we are, most of us, afraid to consider them very deeply... That protection, that right to life, eludes the 40,000 children under five who die on our planet each day from preventable starvation, dehydration, disease, and neglect.

Those who assert a "right to life" are for (at most) not just any kind of life, but for--particularly and uniquely--human life. So they too, like pro-choicers, must decide what distinguishes a human being from other animals and when, during gestation, the uniquely human qualities--whatever they are--emerge.

Despite many claims to the contrary, life does not begin at conception: It is an unbroken chain that stretches back nearly to the origin of the Earth, 4.6 billion years ago. Nor does *human* life begin at conception: It is an unbroken chain dating back to the origin of our species, hundreds of thousands of years ago. Every human sperm and egg is, beyond the shadow of a doubt, alive. They are not human beings, of course. However, it could be argued that neither is a fertilized egg.

In some animals, an egg develops into a healthy adult without benefit of a sperm cell. But not, so far as we know, among humans. A sperm and an unfertilized egg jointly comprise the full genetic blueprint for a human being. Under certain circumstances, after fertilization, they can develop into a baby. But most fertilized eggs are spontaneously miscarried. Development into a baby is by no means guaranteed. Neither a sperm and egg separately, nor a fertilized egg, is more than a *potential* baby or a *potential* adult. So if a sperm and egg are as human as the fertilized egg produced by their union, and if it is murder to destroy a fertilized egg--despite the fact that it's only *potentially* a baby--why isn't it murder to destroy a sperm or an egg?

Hundreds of millions of sperm cells (top speed with tails lashing: five inches per hour) are produced in an average human ejaculation. A healthy young man can produce in a week or two enough spermatozoa to double the human population of the Earth. So is masturbation mass murder? How about nocturnal emissions or just plain sex? When the unfertilized egg is expelled each month, has someone died? Should we mourn all those spontaneous miscarriages? Many lower animals can be grown in a laboratory from a single body cell. Human cells can be cloned... In light of such cloning technology, would we be committing mass murder by destroying any potentially clonable cells? By shedding a drop of blood?

All human sperm and eggs are genetic halves of "potential" human beings. Should heroic efforts be made to save and preserve all of them, everywhere, because of this "potential"? Is failure to do so immoral or criminal? Of course, there's a difference between taking a life and failing to save it. And there's a big difference between the probability of survival of a sperm cell and that of a fertilized egg. But the absurdity of a corps of high-minded semen-preservers moves us to wonder whether a fertilized egg's mere "potential" to become a baby really does make destroying it murder.

Opponents of abortion worry that, once abortion is permissible immediately after conception, no argument will restrict it at any later time in the pregnancy. Then, they fear, one day it will be permissible to murder a fetus that is unambiguously a human being. Both pro-choicers and pro-lifers (at least some of them) are pushed toward absolutist positions by parallel fears of the slippery slope.

Another slippery slope is reached by those pro-lifers who are willing to make an exception in the agonizing case of a pregnancy resulting from rape or incest. But why should the right to live depend on the circumstances of conception? If the same child were to result, can the state ordain life for the offspring of a lawful union but death for one conceived by force or coercion? How can this be just? And if exceptions are extended to such a fetus, why should they be withheld from any other fetus? This is part of the reason some pro-lifers adopt what many others consider the outrageous posture of opposing abortions under any and all circumstances--only excepting, perhaps, when the life of the mother is in danger.

By far the most common reason for abortion worldwide is birth control. So shouldn't opponents of abortion be handing out contraceptives and teaching school children how to use them? That would be an effective way to reduce the number of abortions. Instead, the United States is far behind other nations in the development of safe and effective methods of birth control--and, in many cases, opposition to such research (and to sex education) has come from the same people who oppose abortions.

The attempt to find an ethically sound and unambiguous judgment on when, if ever, abortion is permissible has deep historical roots. Often, especially in Christian tradition, such attempts were connected with the question of when the soul enters the body--a matter not readily amenable to scientific investigation and an issue of controversy even among learned theologians. Ensoulment has been asserted to occur in the sperm before conception, at conception, at the time of "quickenings" (when the mother is first able to feel the fetus stirring within her), and at birth. Or even later.

Different religions have different teachings. Among hunter-gatherers, there are usually no prohibitions against abortion, and it was common in ancient Greece and Rome. In contrast, the more severe Assyrians impaled women on stakes for attempting abortion. The Jewish Talmud teaches that the fetus is not a person and has no rights. The Old and New Testaments--rich in astonishingly detailed prohibitions on dress, diet, and permissible words--contain not a word specifically prohibiting abortion. The only passage that's remotely relevant (Exodus 21:22) decrees that if there's a fight and a woman bystander should accidentally be injured and made to miscarry, the assailant must pay a fine.

Neither St. Augustine nor St. Thomas Aquinas considered early-term abortion to be homicide (the latter on the grounds that the embryo doesn't *look* human). This view was embraced by the Church in the Council of Vienne in 1312, and has never been repudiated. The Catholic Church's first and long-standing collection of canon law (according to the leading historian of the Church's teaching on abortion, John Connery, S.J.) held that abortion was homicide only after the fetus was already "formed"--roughly, the end of the first trimester.

But when sperm cells were examined in the seventeenth century by the first microscopes, they were thought to show a fully formed human being. An old idea of the homunculus was resuscitated--in which within each sperm cell was a fully formed tiny human, within whose testes were innumerable other homunculi, etc., *ad infinitum*. In part through this misinterpretation of scientific data, in 1869 abortion at any time for any reason became grounds for excommunication. It is surprising to most Catholics and others to discover that the date was not much earlier.

From colonial times to the nineteenth century, the choice in the United States was the woman's until "quickenings." An abortion in the first or even second trimester was at worst a misdemeanor. Convictions were rarely sought and almost impossible to obtain, because they depended entirely on the woman's own testimony of whether she had felt quickening, and because of the jury's distaste for prosecuting a woman for exercising her right to choose. In 1800 there was not, so far as is known, a single statute in the United States concerning abortion. Advertisements for drugs to induce abortion could be found in virtually every newspaper and even in many church publications--although the language used was suitably euphemistic, if widely understood.

But by 1900, abortion had been banned at any time in pregnancy by every state in the Union, except when necessary to save the woman's life. What happened to bring about so striking a reversal? Religion had little to do with it. Drastic economic and social conversions were turning this country from an agrarian to an urban-industrial society. America was in the process of changing from having one of the highest birthrates in the world to one of the lowest. Abortion certainly played a role and stimulated forces to suppress it.

One of the most significant of these forces was the medical profession. Up to the mid-nineteenth century, medicine was an uncertified, unsupervised business. Anyone could hang up a shingle and call himself (or herself) a doctor. With the rise of a new, university-educated medical elite, anxious to enhance the status and influence of physicians, the American Medical Association was formed. In its first decade, the AMA began lobbying against abortions performed by anyone except licensed

physicians. New knowledge of embryology, the physicians said, had shown the fetus to be human even before quickening.

Their assault on abortion was motivated not by concern for the health of the woman but, they claimed, for the welfare of the fetus. You had to be a physician to know when abortion was morally justified, because the question depended on scientific and medical facts understood only by physicians. At the same time, women were effectively excluded from the medical schools, where such arcane knowledge could be acquired. So, as things worked out, women had almost nothing to say about terminating their own pregnancies. It was also up to the physician to decide if the pregnancy posed a threat to the woman, and it was entirely at his discretion to determine what was and was not a threat. For the rich woman, the threat might be a threat to her emotional tranquility or even to her lifestyle. The poor woman was often forced to resort to the back alley or the coat hanger.

This was the law until the 1960s, when a coalition of individuals and organizations, the AMA now among them, sought to overturn it and to reinstate the more traditional values that were to be embodied in *Roe v. Wade*.

If you deliberately kill a human being, it's called murder. If you deliberately kill a chimpanzee--biologically, our closest relative, sharing 99.6 percent of our active genes--whatever else it is, it's not murder. To date, murder uniquely applies to killing human beings. Therefore, the question of when personhood (or, if we like, ensoulment) arises is key to the abortion debate. When does the fetus become human? When do distinct and characteristic human qualities emerge?

We recognize that specifying a precise moment will overlook individual differences. Therefore, if we must draw a line, it ought to be drawn conservatively--that is, on the early side. There are people who object to having to set some numerical limit, and we share their disquiet; but if there is to be a law on this matter, and it is to affect some useful compromise between the two absolutist positions, it must specify, at least roughly, a time of transition to personhood.

Every one of us began from a dot. A fertilized egg is roughly the size of the period at the end of this sentence. The momentous meeting of sperm and egg generally occurs in one of the two fallopian tubes. One cell becomes two, two become four, and so on—an exponentiation of base-2 arithmetic. By the tenth day the fertilized egg has become a kind of hollow sphere wandering off to another realm: the womb. It destroys tissue in its path. It sucks blood from capillaries. It bathes itself in maternal blood, from which it extracts oxygen and nutrients. It establishes itself as a kind of parasite on the walls of the uterus.

- By the third week, around the time of the first missed menstrual period, the forming embryo is about 2 millimeters long and is developing various body parts. Only at this stage does it begin to be dependent on a rudimentary placenta. It looks a little like a segmented worm.
- By the end of the fourth week, it's about 5 millimeters (about 1/5 inch) long. It's recognizable now as a vertebrate, its tube-shaped heart is beginning to beat, something like the gill arches of a fish or an amphibian become conspicuous, and there is a pronounced tail. It looks rather like a newt or a tadpole. This is the end of the first month after conception.
- By the fifth week, the gross divisions of the brain can be distinguished. What will later develop into eyes are apparent, and little buds appear—on their way to becoming arms and legs.
- By the sixth week, the embryo is 13 millimeters (about 1/2 inch) long. The eyes are still on the side of the head, as in most animals, and the reptilian face has connected slits where the mouth and nose eventually will be.

- By the end of the seventh week, the tail is almost gone, and sexual characteristics can be discerned (although both sexes look female). The face is mammalian but somewhat pig like.
- By the end of the eighth week, the face resembles that of a primate but is still not quite human. Most of the human body parts are present in their essentials. Some lower brain anatomy is well-developed. The fetus shows some reflex response to delicate stimulation.
- By the tenth week, the face has an unmistakably human cast. It is beginning to be possible to distinguish males from females. Nails and major bone structures are not apparent until the third month.
- By the fourth month, you can tell the face of one fetus from that of another. Quickening is most commonly felt in the fifth month. The bronchioles of the lungs do not begin developing until approximately the sixth month, the alveoli still later.

So, if only a person can be murdered, when does the fetus attain personhood? When its face becomes distinctly human, near the end of the first trimester? When the fetus becomes responsive to stimuli--again, at the end of the first trimester? When it becomes active enough to be felt as quickening, typically in the middle of the second trimester? When the lungs have reached a stage of development sufficient that the fetus might, just conceivably, be able to breathe on its own in the outside air?

The trouble with these particular developmental milestones is not just that they're arbitrary. More troubling is the fact that none of them involves *uniquely human* characteristics--apart from the superficial matter of facial appearance. All animals respond to stimuli and move of their own volition. Large numbers are able to breathe. But that doesn't stop us from slaughtering them by the billions. Reflexes and motion are not what make us human.

Other animals have advantages over us--in speed, strength, endurance, climbing or burrowing skills, camouflage, sight or smell or hearing, mastery of the air or water. Our one great advantage, the secret of our success, is thought--characteristically human thought. We are able to think things through, imagine events yet to occur, figure things out. That's how we invented agriculture and civilization. Thought is our blessing and our curse, and it makes us who we are.

Thinking occurs, of course, in the brain--principally in the top layers of the convoluted "gray matter" called the cerebral cortex. The roughly 100 billion neurons in the brain constitute the material basis of thought. The neurons are connected to each other, and their linkups play a major role in what we experience as thinking. But large-scale linking up of neurons doesn't begin until the 24th to 27th week of pregnancy--the sixth month.

By placing harmless electrodes on a subject's head, scientists can measure the electrical activity produced by the network of neurons inside the skull. Different kinds of mental activity show different kinds of brain waves. But brain waves with regular patterns typical of adult human brains do not appear in the fetus until about the 30th week of pregnancy--near the beginning of the third trimester. Fetuses younger than this--however alive and active they may be--lack the necessary brain architecture. They cannot yet think.

Acquiescing in the killing of any living creature, especially one that might later become a baby, is troublesome and painful. But we've rejected the extremes of "always" and "never," and this puts us--like it or not--on the slippery slope. If we are forced to choose a developmental criterion, then this is where we draw the line: when the beginning of characteristically human thinking becomes barely possible.

It is, in fact, a very conservative definition: Regular brain waves are rarely found in fetuses. More research would help... If we wanted to make the criterion still more stringent, to allow for

occasional precocious fetal brain development, we might draw the line at six months. This, it so happens, is where the Supreme Court drew it in 1973--although for completely different reasons.

Its decision in the case of *Roe v. Wade* changed American law on abortion. It permits abortion at the request of the woman without restriction in the first trimester and, with some restrictions intended to protect her health, in the second trimester. It allows states to forbid abortion in the third trimester, except when there's a serious threat to the life or health of the woman. In the 1989 Webster decision, the Supreme Court declined explicitly to overturn *Roe v. Wade* but in effect invited the 50 state legislatures to decide for themselves.

What was the reasoning in *Roe v. Wade*? There was no legal weight given to what happens to the children once they are born, or to the family. Instead, a woman's right to reproductive freedom is protected, the court ruled, by constitutional guarantees of privacy. But that right is not unqualified. The woman's guarantee of privacy and the fetus's right to life must be weighed--and when the court did the weighing' priority was given to privacy in the first trimester and to life in the third. The transition was decided not from any of the considerations we have been dealing with so far...--not when "ensoulment" occurs, not when the fetus takes on sufficient human characteristics to be protected by laws against murder. Instead, the criterion adopted was whether the fetus could live outside the mother. This is called "viability" and depends in part on the ability to breathe. The lungs are simply not developed, and the fetus cannot breathe--no matter how advanced an artificial lung it might be placed in--until about the 24th week, near the start of the sixth month. This is why *Roe v. Wade* permits the states to prohibit abortions in the last trimester. It's a very pragmatic criterion.

If the fetus at a certain stage of gestation would be viable outside the womb, the argument goes, then the right of the fetus to life overrides the right of the woman to privacy. But just what does "viable" mean? Even a full-term newborn is not viable without a great deal of care and love. There was a time before incubators, only a few decades ago, when babies in their seventh month were unlikely to be viable. Would aborting in the seventh month have been permissible then? After the invention of incubators, did aborting pregnancies in the seventh month suddenly become immoral? What happens if, in the future, a new technology develops so that an artificial womb can sustain a fetus even before the sixth month by delivering oxygen and nutrients through the blood--as the mother does through the placenta and into the fetal blood system? We grant that this technology is unlikely to be developed soon or become available to many. But *if* it were available, does it then become immoral to abort earlier than the sixth month, when previously it was moral? A morality that depends on, and changes with, technology is a fragile morality; for some, it is also an unacceptable morality.

And why, exactly, should breathing (or kidney function, or the ability to resist disease) justify legal protection? If a fetus can be shown to think and feel but not be able to breathe, would it be all right to kill it? Do we value breathing more than thinking and feeling? Viability arguments cannot, it seems to us, coherently determine when abortions are permissible. Some other criterion is needed. Again, we offer for consideration the earliest onset of human thinking as that criterion.

Since, on average, fetal thinking occurs even later than fetal lung development, we find *Roe v. Wade* to be a good and prudent decision addressing a complex and difficult issue. With prohibitions on abortion in the last trimester--except in cases of grave medical necessity--it strikes a fair balance between the conflicting claims of freedom and life.