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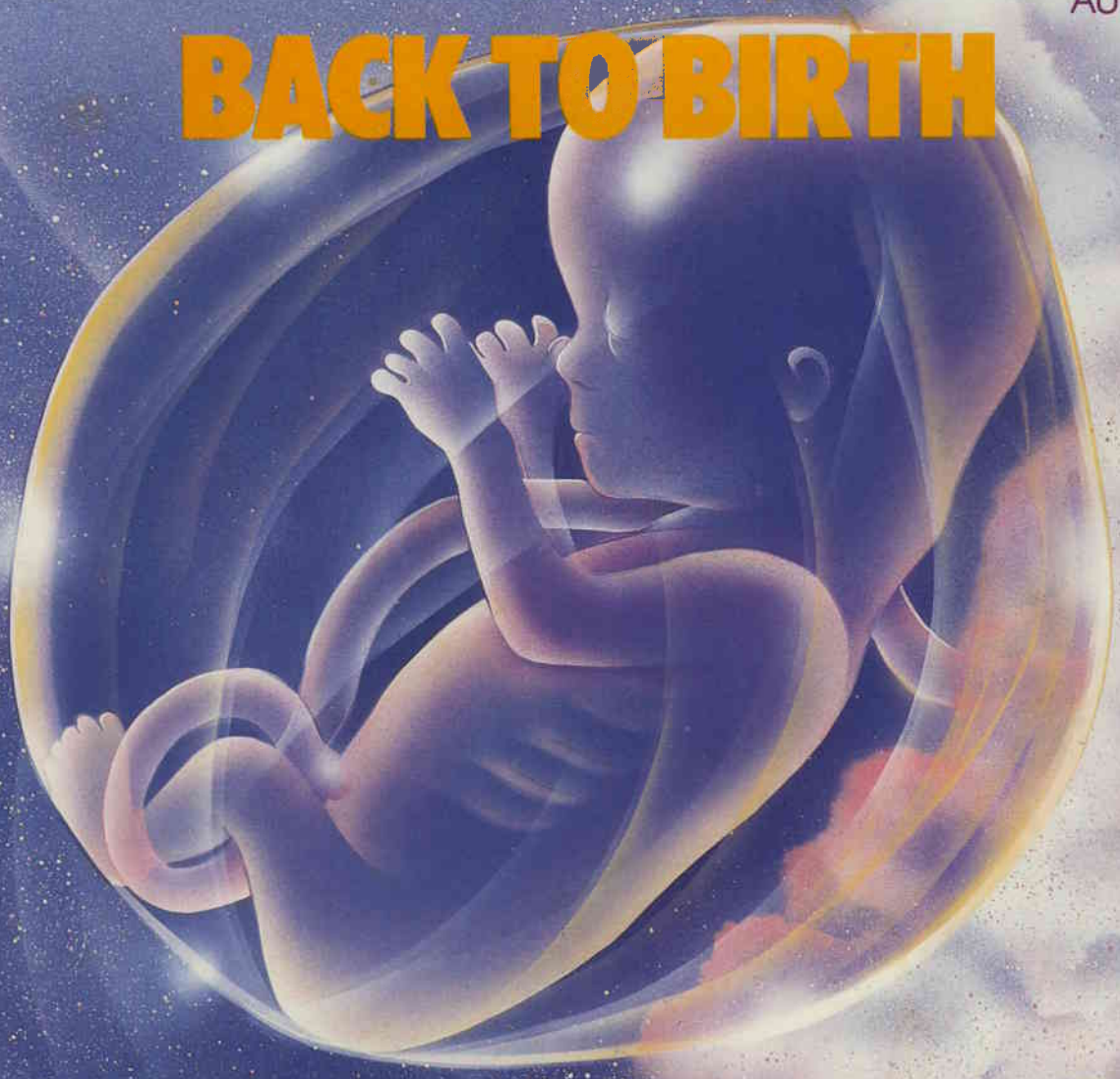
AUGUST 1989

BACK TO BIRTH



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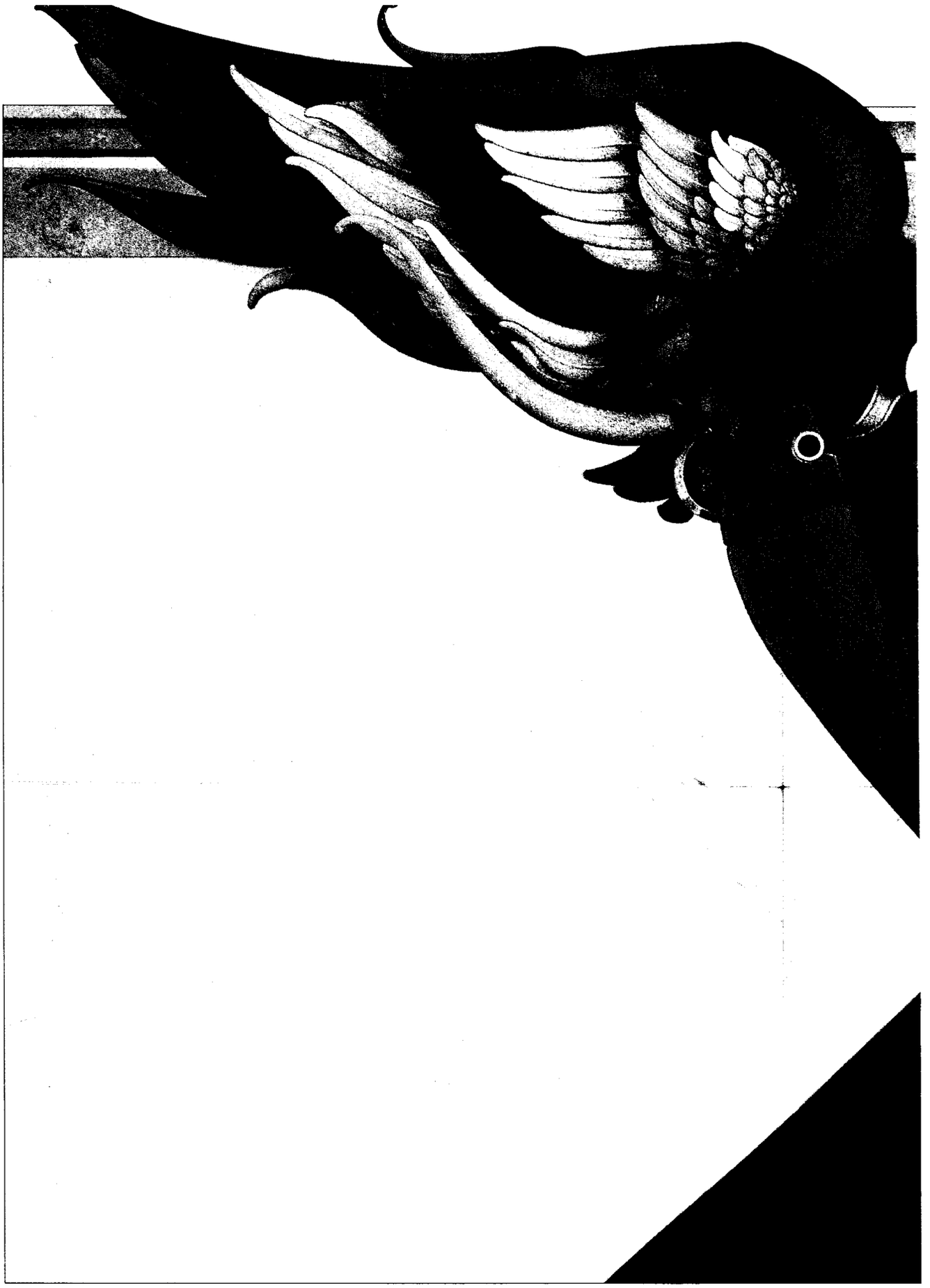

ARTICLE

Some experts believe we can make babies smarter and happier even before birth

PRESCHOOL?

BY PAMELA WEINTRAUB

The routine was always the same: Each evening after her husband had gone to bed, she performed her Lamaze breathing exercises while watching *M*A*S*H* reruns on TV. "The *M*A*S*H* theme became a signal for me to relax," explains this mother. "I forgot the tensions of the day—including the problems between my husband and myself—and felt truly happy."

As early as six months after her child was born, the mother noticed that her son would stop whatever he was doing and stare at the television whenever the *M*A*S*H* theme came on. "He is now two years old," the mother says, "and no matter where he is or what he's doing, when that song comes on he stops and stares, almost as if he's in a trance. Every time this happens, my husband and I are amazed."

This story is not as unusual as it may seem. In anecdote after anecdote, people have reported memories, personal qualities, and even aptitudes obviously acquired

PAINTINGS BY MICHAEL PARKES

before birth—not through genetics but via sounds, vibrations, even *feelings,* traveling from the external world to the womb. Another mother, for instance, recalls the day when, sitting around the dining room table, she joked about the pajamas she'd frequently worn while pregnant with her little girl. "Do you remember those pajamas?" the three-year-old girl was facetiously asked.

The child's answer floored the group: "I couldn't see what you were wearing; I could only hear what you were saying," the girl replied.

"What was it like?" the mother asked.

"It was dark and crowded, like a big bowl of water."

"What was your favorite food?"

"I didn't get any food."

"What did you think when you were born?"

"It wasn't crowded anymore," said the girl. "I could stretch."

"The amazing thing," the mother explains, "is that she described the entire experience without ever saying she had *seen* anything. She described only what she had heard and felt. She never slipped or answered a question wrong."

These stories make sense in light of new research proving that unborn children can see, hear, feel, and perhaps even form a rudimentary level of awareness in the womb. Indeed, in a startling series of studies that have been conducted over the past decade, psychologists have shown that prenatal life and the birth experience may be profound determinants of human personality and aptitude. Countless musicians, for instance, were exposed to music during gestation. And time and again psychologists have traced such qualities as self-confidence, depression, or addictive behavior to experiences in the womb.

It is every parent's dream to marshal such findings, optimizing the emotional and intellectual potential of their children. And now, thanks to the burgeoning new field of pre- and perinatal psychology—the neurological and psychological study of babies before and during birth—that dream may be fulfilled.

On the most basic level, experts such as Toronto psychiatrist Thomas R. Verny have begun to help parents establish two-way communication between the outside world and the womb. By singing and talking to the fetus, parents create a positive intrauterine environment, reducing the level of anxiety-producing hormones that lead to frenetic activity and even ulcers in the unborn. Other researchers have gone much further, constructing stimulation systems based on language, touch, and heart rhythm. When transmitted to the intrauterine environment, the researchers claim, these stimuli improve an individual's lifelong ability to learn. And in what could be the most radical aspect of prenatal psychology, some psychologists say they've proved that we sometimes remember our birth.

While pregnant mothers have touched and talked to the unborn through the barrier of the womb from time immemorial, the field of pre- and perinatal psychology got its start in the mid-Seventies when Thomas Verny was treating a twenty-six-year-old law student. In the midst of discussing a dream, Verny recalls, "this patient just started crying like a baby. He cried for about ten minutes, almost in a trance, and when he came out of this altered state of consciousness I asked him what was happening. He said he suddenly found himself in a little crib and he was crying for his mother. 'As a matter of fact,' he said, 'I even remember the crib, and it was white.' "

After considering the scenario for a while, however, the young man concluded that the vision was fantasy and nothing more. "In all my baby pictures," he said, "the crib was blue."

"Talk to your mother about it," Verny insisted, "and see what she says."

"Countless musicians were exposed to music during gestation. And psychologists have traced such qualities as self-confidence and even depression to experiences in the womb."

"This is truly amazing," said the young man the next week, when their talk resumed. "It seems that my parents were very poor when I was born, so for a few months I was sleeping in a borrowed *white* crib. After two months my grandmother gave my parents some money, and they bought a crib, and it was blue."

Verny heard other stories as well. Many went back not just to earliest infancy but literally to the womb. One mother, for instance, recalled a Peter, Paul and Mary song she had sung repeatedly during her pregnancy. After the birth of her child, that song had a magical effect on the infant: No matter how hard he was crying, whenever his mother started singing that song—and that song alone—he would quiet down.

Another woman was surprised to find her two-year-old daughter sitting on the living room floor chanting, "Breathe in, breathe out, breathe in, breathe out." The words were part of a Lamaze exercise the woman had practiced during the last weeks of her pregnancy. She had not uttered those words since.

Sitting in his soothing, antique-filled office, with a potted palm by the stained-glass window and tapestries on the wall, Verny recalls his doubt. "These things were totally anathema to me," he says. "I did not want to hear it. I went to school here in Toronto, which is very conservative. I spent a year at Harvard, where psychoanalysis was the rule. This was not something I wanted to believe."

Despite his skepticism, Verny decided to begin a literature search that would take years. When he was finally through, he had come up with a totally new picture of the unborn.

Much of the research gathered by Verny concerned the sensory capabilities of the fetus in the womb. By the fourth month after conception, Verny learned, the fetus had a well-developed sense of touch and taste. He would suck if his lips were stroked. And if a bitter substance like iodine was introduced into the amniotic fluid, the unborn child would grimace and refuse to swallow any liquid at all. At the same age, the baby could perceive a bright light shining on the mother's abdomen; if the light was particularly bright, the fetus would even lift his hands to shield his eyes.

At five months the same child would react to loud sounds by raising his hands and covering his ears. In a series of remarkable studies conducted during the early Eighties, moreover, University of North Carolina psychologist Anthony DeCasper showed that the human newborn recognizes his own mother's voice.

In one study, DeCasper asked 16 pregnant women to tape-record their reading of three different children's stories: "The King, the Mice, and the Cheese" and two different versions of "The Cat in the Hat." During the last six and a half weeks of pregnancy, a third of the women read the first story aloud three times a day; a third read the second story aloud three times a day; and a third read the last story aloud three times a day. When the babies were born, DeCasper and colleagues offered each infant a choice between the story its mother had repeatedly read and one of the two other stories.

To enable the babies to cast their votes, DeCasper invented the "suck-o-meter"—a nipple hooked up to a sound system in such a way that a baby can switch between two taped voices simply by changing the rhythm of its sucking. The findings? Shortly after birth, when the babies were tested, 13 of the 16 adjusted their sucking rhythm to hear the familiar story as opposed to the novel one. These data provided the first direct evidence that newborns remembered something about speech sounds during the last six and a half weeks of gestation. In yet another study, DeCasper showed that the newborn recognized its own mother's voice.

In addition to these sensory abilities, Verny discovered, the baby in the womb had the neurological potential for a rudi-

THE ROOTS OF PERSONALITY

Was your personality influenced by the sounds, vibrations, and chemicals that washed over you in the womb? To help researchers answer that question, we present this questionnaire. Developed for *Omni* by Toronto psychiatrist Thomas R. Verny, founder and president of the Pre- and Peri-natal Psychology Association of North America, this questionnaire is the largest such survey ever conducted.

Try to answer all applicable questions. If you do not know an answer, ask your mother. If she does not remember or is unavailable, make an educated guess.

Send your questionnaire to *Omni*-Womb, 1965 Broadway, New York, NY 10023.

1. Age____ Sex ____
2. Birth weight _____
3. Condition at birth:
   a. excellent (alert)
   b. very good c. fair
   d. poor
   e. very poor (blue and not breathing)
   f. don't know
4. Birth order: a. first
   b. second c. third
   d. fourth e. fifth
   f. sixth or later
5. Are you a twin?
   a. yes b. no
6. Were you adopted?
   a. yes b. no
7. Did your mother want to have a baby when you were conceived? a. yes b. no
8. Your mother wanted
   a. a boy b. a girl
   c. didn't matter
9. Did your father want to have a baby? a. yes b. no
10. Your father wanted
    a. a boy b. a girl
    c. didn't matter
11. Did your mother have any major calamities during pregnancy? a. yes b. no
12. During pregnancy your mother was generally
    a. happy
    b. unhappy
13. During your intrauterine life, did your mother talk or sing to you? a. yes b. no
14. Did your father?
    a. yes b. no
15. During her pregnancy, your mother was exposed to noise from
    a. machinery
    b. planes or trains
    c. loud music

16. During your intrauterine life, you felt (circle as many as apply)
    a. wanted b. loved
    c. connected to your mother
    d. to your father
    e. peaceful f. anxious
    g. fearful h. guilty
    i. happy j. bored
    k. alone l. unloved
17. While she was pregnant with you, your mother often felt (circle as many as apply)
    a. angry b. fearful
    c. anxious
    d. depressed
    e. happy f. content
18. Did you dream in the womb? a. yes b. no
19. During her pregnancy, your mother generally
    a. smoked cigarettes
    b. smoked marijuana
    c. consumed excessive amounts of alcohol
    d. drank more than one or two cups of coffee a day
    e. used drugs, such as cocaine or heroin
    f. used tranquilizers or antidepressants
20. You were born
    a. in a hospital
    b. at home
    c. elsewhere
21. During delivery your mother received
    a. painkillers
    b. local anesthesia
    c. general anesthesia
22. Your birth was
    a. vaginal, no forceps
    b. vaginal, with forceps
    c. cesarean section
    d. induced with Pitocin
    e. breech
    f. delayed (doctor not available)
23. After your birth, you were
    a. placed on your mother's breast
    b. put in a baby nursery
    c. put in an incubator
    d. taken to a neonatal intensive care unit
24. During birth, you and your mother were probably
    a. in sync b. at odds
25. You are primarily
    a. heterosexual
    b. bisexual
    c. homosexual
26. You like touching, hugging, and cuddling
    a. an inordinate amount
    b. very much
    c. an average amount
    d. very little
    e. not at all
27. With food, you tend to
    a. overeat
    b. eat until full
    c. nibble
    d. have trouble eating
28. In regard to sex, you (circle as many as apply)
    a. can't get enough of it
    b. have it on your mind all the time
    c. consider it important
    d. find it a problem
    e. think you'd be better off without it
29. You have at some point been dependent on (circle any that apply)
    a. tranquilizers
    b. antidepressants
    c. sleeping pills
    d. painkillers
    e. speed
    f. marijuana
    g. cocaine
    h. heroin
    i. crack
30. Are you attracted to large, fat people?
    a. yes b. no
31. You suffer from
    a. a learning disability
    b. panic attacks
    c. phobias
    d. depression
    e. manic-depression
    f. schizophrenia
    g. antisocial behavior
32. You sometimes dream of
    a. falling or trembling
    b. floating in water
    c. tunnels or openings
    d. quicksand or swamps
    e. shipwrecks or breaking into pieces
33. Are you, or would you like to be, employed by a major organization offering good benefits and a pension plan?
    a. yes b. no
34. You describe yourself as
    a. optimistic
    b. outgoing
    c. people oriented
    d. pessimistic
    e. withdrawn
    f. shy
    g. rootless
    h. cautious
    i. reckless
    j. aggressive
    k. adventurous
    l. prudent
35. You enjoy
    a. getting ahead
    b. diving into things
    c. exploring new horizons
36. You fear
    a. losing your temper
    b. going crazy
    c. becoming violent and destructive
    d. becoming helpless
    e. being raped
37. You often experience
    a. the inability to get into what you are doing
    b. inexplicable fatigue
    c. lack of willpower
    d. intellectual stagnation
    e. the feeling that something is missing
38. You try to avoid wearing
    a. scarves b. hats
    c. turtlenecks
    d. neckties
39. You have a fear of
    a. open spaces
    b. closed spaces
40. You react to stress with
    a. increased activity
    b. decreased activity
    c. immobilization
    d. confusion
    e. anxiety
    f. anger
41. Record any intrauterine life or birth recollections on a separate sheet and attach it to this questionnaire.

mentary form of consciousness. To reach this conclusion, neuroscientist Dominick Purpura of New York's Albert Einstein Medical College used advanced microscope techniques to study brains removed from premature infants born of spontaneous abortion. Editor of the highly respected journal *Brain Research*, Purpura found that the human cerebral cortex—the seat of thought—forms the structure necessary for learning sometime between the twenty-eighth and thirty-second weeks of development.

Purpura also showed that by this stage fetuses' neural circuits are nearly as advanced as those of the newborn. Measuring fetal brain waves, other researchers distinguished between sleeping and waking states. And further studies showed that babies in the womb exhibit physiological measurements associated with dream sleep.

Verny also came across a number of studies tying adult personality to gestation and birth. In 1974, for instance, University of Salzburg psychologist Gerhard Rottman studied 141 women, dividing them into four categories of maternal suitability, from ideal to catastrophic. Rottman found that the women he labeled ideal (because tests showed they deeply wanted their children) had the easiest pregnancies and deliveries and the healthiest offspring. Those labeled catastrophic had the most extreme medical problems during pregnancy and the highest rate of low-weight, premature, and emotionally disturbed infants. The most interesting findings, however, concerned Rottman's two intermediate groups. These mothers claimed they were thrilled to be having babies. But Rottman's psychological tests—and, apparently, the babies themselves—detected something wrong. These unconsciously ambivalent mothers gave birth to babies who were often extremely irritable because of gastrointestinal trouble or simply nerves.

Verny also took a closer look at his own friends and clients by way of a questionnaire. The more difficult their birth, he learned, the more sexual problems his respondents had. Moreover, a particularly difficult birth was often related to sadomasochism. "I use the word *sadomasochism* loosely," Verny says. "I'm not talking about whips and chains but rather the feeling that pain and pleasure are kind of mixed up in the sexual act."

With evidence mounting, Verny decided to form an association of his own. He also decided to mark the event with a conference, inviting "those of us who didn't even know we belonged to a field so we could find a territory of our own."

From this first successful gathering, a medley of approaches emerged. Verny, the great synthesizer, has begun developing techniques for soothing the unborn child, making it feel wanted and loved. His new prenatal stimulation program, still in the development phase, includes such techniques as rhythmic breathing, guided imagery, and "claying," in which prospective parents literally sculpt the developing fetus out of clay. In one exercise the mother soothes the unborn child through massage. In another she tries to relive her own birth by visualizing a sprouting seed.

Other researchers claim to go far beyond Verny's brand of "emotional fitness for the unborn." Rene Van de Carr, an obstetrician from Hayward, California, for instance, has established the Prenatal University, in which parents-to-be "teach" the fetus through a complex system of touch and words.

Van de Carr entered the field of prenatal psychology much as Verny did, through a patient's compelling tale. In 1979, he explains, a prospective mother told him that every time she poked her baby through her abdomen it seemed to kick back. Van de Carr asked a few other pregnant patients to try poking or patting the fetus. And invariably the result was the same. If parents consistently stimulated the unborn child through touch, the child would consistently respond.

"Every time the baby kicks, we have parents poke back and say, "Good baby, kick again!" We find that sometimes after a couple of weeks, the baby kicks back immediately."

Based on these observations, Van de Carr began working with groups of parents-to-be. Today, he says, the complete Prenatal University course teaches the fetus to "pay attention," enhancing the spectrum of intellectual skills. In the first Van de Carr lessons, starting around the fifth month of pregnancy, parents are taught to respond to a baby's kicks by pushing back. "Every time the baby kicks, we have parents poke back and say, 'Good baby. Kick again!' " Van de Carr says. "We find that sometimes after a couple of weeks, the baby actually does kick back immediately. But that's not all. If the parent bangs the baby's foot twice, the baby will sometimes kick back twice. And if the parent bangs the baby's foot three times, the baby may kick back three times."

At seven months the Prenatal University fetus starts to master words. In twice-daily sessions lasting five minutes each, parents say, "Pat, pat, pat," as they pat the baby's back. After a week or two other words are added. For instance, parents say, "Rub, rub, rub," as they rub the baby's back and. "Shake, shake, shake," as they jiggle the abdomen.

"Some of our patients also use drums and xylophones," Van de Carr says. "We suggest the tubular xylophone, with which the individual can say, 'A,' and strike the note A or say, 'B,' and strike the note B. This allows the baby to learn that events are predictable and that some sounds will always be followed by others."

Finally, to prepare his near-term pupils for the months of infancy ahead, Van de Carr offers a secondary word list, including *hot, cold, wet, eye, nose,* and *mouth.* Says Van de Carr, "We're giving the baby a series of word tools that he or she will begin to use right after birth."

Is the Van de Carr program, which the doctor himself calls "human developmental engineering," effective? Van de Carr says it is. His techniques have been used by more than 1,500 babies in countries from Thailand to South Africa to the United States, he says. And in a recent study conducted by his wife, Kristen, a clinical psychologist, Prenatal University parents were compared with a control group about 48 hours after birth. In general, she says, "we found that the mothers who started to connect with their kids in the uterus had a deeper knowledge of their babies. As a result, the babies were easier to manage and the mothers were in a better frame of mind."

In another study Rene Van de Carr analyzed three groups of 50 children each. The first group included infants who were Prenatal University graduates. The second group comprised those who had had some exposure to the program. And the third group included the offspring of parents who had not participated in the program at all. Babies who had been strong program participants, Van de Carr found, spoke their first words earlier than moderate participants. And moderate participants spoke earlier than those who did not participate at all. Van de Carr tested other signposts as well: when a child first spoke a couplet of two words; when the child achieved object constancy (the ability to recognize when an object is present and when it has been taken away); and even when an infant first lifted its head. In each case, he found, dedicated program participants scored significantly better than moderate participants and much better than those who did not participate at all.

What was going on? "We're postulating," Van de Carr says, "that the stimulation literally increases the quantity of neural growth hormone in the brain. We also believe that the growth hormone is increased specifically in the brain areas we stimulate. For instance, when we play musical notes, we stimulate neural growth factor in the brain region for music. And when the baby learns to kick three, four,

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PRESCHOOL?

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and five times, we stimulate neural growth hormone in the brain region for math."

Van de Carr concedes that this theory will remain just a theory until laboratory tests are done for by-products of neural growth hormone. But, he points out, babies who go through his program are born with especially long nails and sometimes even teeth. Because neural growth hormone is often broken down into other types of growth hormones, he says, this unusual growth could signify that his theory is correct.

Van de Carr says his theory is also borne out by Prenatal University graduates now entering kindergarten and first grade. "We're starting to see a lot of these kids," he says. "Many of them test in the ninety-ninth percentile for reading and math; they have highly developed social skills; and they are confident as well."

Verny agrees that Van de Carr's graduates "seem to enter the world with an enhanced sense of confidence and calm. They are quick, adaptive, and socially aware. But whether they are actually developing lifelong intellectual capabilities, as Van de Carr believes, remains to be seen."

The Van de Carr approach may be radical, but it seems downright medieval compared to the techniques of Brent Logan, a Redmond, Washington, psychologist. Pushing the outside of the prenatal-stimulation envelope, Logan has recently developed what he calls the cardiac curriculum: a set of increasingly complex and skewed heartbeatlike sounds that he pumps into the womb. By taking the sound of the mother's heartbeat and making it more and more complex, he says, he is actually stimulating the fetal nervous system and even saving large numbers of brain cells from certain death. Children stimulated via his program, Logan claims, talk at the age of five or six months and read at a year and a half. At six months, he adds, these babies are in many ways developmentally equivalent to toddlers of a year and a half.

Logan's interest in prenatal stimulation dates back to 1982, when his wife, Helga, heard a radio interview with Joseph and Jitsuko Susedik, an Ohio couple whose four daughters were phenomenally gifted. One daughter, for instance, was in college at age twelve; another read at a sixth-grade level at age five. "The single strange ingredient," Logan learned, was that "every one of the Susedik children had been talked to before birth."

Logan was excited by the concept. But, he wondered, was merely *talking* to the fetus the best way to proceed? He began to research the issue and, he says, turned up a vital clue. In 1960, he discovered, the now-famous psychologist Lee Salk had visited the Central Park Zoo in New York. While watching the rhesus monkeys, Salk noticed that the females held their offspring over the left breast in the vicinity of the heart. To see whether this was a universal tendency, Salk studied several hundred human mothers at Elmhurst Hospital in Queens. His finding? Most mothers, whether left- or right-handed, invariably held the baby on the left, over the heart.

Wondering about the meaning of this behavior, Salk asked himself whether the heartbeat rhythm might play some role in the development of human nature. To explore the possibility, he played cardiac rhythms to a series of newborns. Three out of four babies exposed to the cardiac rhythms gained weight in the first four days after birth. In a control group consisting of babies not exposed to Salk's tape three out of four lost weight in the first four days after birth. Babies exposed to Salk's tape also demonstrated substantially reduced crying and more regular breathing.

Speculating about the importance of the maternal heartbeat, Salk later suggested that it might form the basis of music and dance—and many other human activities as well.

After reading the studies, Logan agreed. All learning, he told himself, is "a variation on the single theme—the heartbeat—engraved at life's start." While the singing, talking, and touching advocated by Verny, Van de Carr, and the Susediks were a step in the right direction, Logan concluded, heartbeatlike sounds would be better still.

But how should Logan's stimulant—heartbeatlike pulses created electronically by a sound expert—be administered? To orchestrate his input, Logan considered the development of the brain.

It had recently been shown by researchers at Stanford and the University of California at Los Angeles, Logan knew, that most of the neurons in the mammalian brain perish before birth. The scientists had even gone so far as to coin the term *protobrain,* their name for the prenatal brain before neuronal death. By stimulating rats prenatally, researchers had even managed to rescue some of the protobrain, producing superintelligent animals with extra neurons that could be detected after birth.

To Logan, the implication was clear. "There was a window of opportunity that existed prebirth," Logan reasoned. "If you didn't grasp that opportunity through stimulation, the extra brain cells—the extra human potential—simply went away."

To best grasp that potential, Logan decided, he would expose the fetal brain to "heartbeat variants"—cardiaclike rhythms that stimulated different neurons from those stimulated by the maternal heartbeat the fetus heard every day. Logan's incredible goal: creating a series of au-

"There are times when I think I want to take off for the East Coast and just intellectualize my life away."

diotapes that distorted the heartbeat a little at a time so that normally doomed brain cells could flourish and grow.

Toward that end, he founded the Prenatal Institute in Redmond and began designing his tapes. The complete cardiac curriculum, developed in the last couple of years, consists of 36 increasingly complex, hourlong tapes. The first tape, played in the middle of pregnancy, starts with the basic rhythm of the maternal pulse, set to the beat of A-A-A-A. It is played twice a day for a week. The next tape renders that pattern with a bit more complexity: AA-AA-AA-AA. It, too, is played twice a day for a week. The third tape delivers the beat of A-AA-A-AA; the fourth, the beat of A-AA-AA-A; the tenth, BAB-BAB-BAB-BAB; the twelfth, ABC-CBA-ABC-CBA, and so on.

With his curriculum set, Logan needed a volunteer, someone eager to have his sounds piped into the womb. Luckily for Logan, the perfect candidate lived nearby. Gayle Loyd, an experienced educator, had directed her own preschool, called Kids University, in Washington State for years. Devoted to prenatal education, she had even used Van de Carr's program in her previous pregnancy.

An attractive woman with piercing gray eyes, a delicate nose, and a wholesome, enthusiastic air, Loyd had met Logan at a conference in California. They had remained friends since. Fascinated by Logan's research, Loyd encouraged and cajoled him. And when she became pregnant, he had his volunteer.

Using a Walkman and a headset that she placed around her abdomen, Loyd played Logan's tapes during the hourlong commute to and from her job. "I started at the nine-week point, just before the first brain growth spurt," she explains. "The tricky part was trying to find the best decibel level. I finally set the Walkman volume at eight."

Was Loyd nervous about toying with the baby in her womb? Not at all. "If you're going to do something artificial in the womb," she says, "you should make it as close to natural as possible. To me, working with the heartbeat seemed best. Frankly," she adds, "my greatest worry was boring the baby. If it had been up to me, I would have changed the tapes more often than we did."

When Loyd's child, Stephen, was born in July 1987, his eyes were wide open. "It was amazing," Loyd says. "He looked up and said, 'Aha!' Six hours later, when a doctor examined him, he grabbed the stethoscope. I mean, this is *hours* old!"

Stephen is a very special boy, Logan says. He was sharing toys at six months of age, knew 50 words at fourteen months, and, most impressive, started to read at eighteen months. What's more, Logan says, Stephen is not alone. Eleven subsequent cardiac curriculum graduates have shown similar abilities. At six months of age, Logan says, these babies demonstrated many abilities not expected to show up for a year or more. Logan estimates that cardiac curriculum graduates will, in fact, demonstrate extraordinary IQs of 150 to 200 and up. These "engineered" children, Logan predicts, will also "exhibit extraordinary gains in creative abilities, interpersonal skills, character stability, athletic accomplishment, empathy" and more.

So convinced is Logan that he has even packaged his cardiac curriculum in a new product. Called The Prelearning Program, Logan's 16 "Babytapes" and maternal speaker belt (to be worn around the waist) retail for $149.95 through Prelearning, Inc.

Until Logan's results are confirmed by independent researchers, of course, the true value of his product remains up in the air. Many of his colleagues, refusing to be quoted, say they are horrified by such tampering in the womb.

Lee Salk, whose research inspired Logan, does not believe his studies validate the cardiac curriculum in any way. "I did my work to *observe* natural behavior," Salk says. "I'm very cautious about taking my studies and generalizing to cause and effect."

"Children stimulated via his program, Logan claims, talk at six months and read at a year and a half. At six months they are in many ways equivalent developmentally to eighteen-month-old toddlers."

Thomas Verny calls Logan "a brilliant guy" but says, "The cardiac curriculum seems awfully complicated for me." Even if the cardiac curriculum does work, however, Verny would not advocate it or any system aimed at enhancing intellectual achievement. "I do believe that stimulation and communication are important. But I do not believe in prenatal education, nor do I think that parents should want children to become little Beethovens or little Einsteins or whatever their idea of what the perfect person is. Instead, we should use the window into the brain to tell the child that it is wanted and loved."

Even Rene Van de Carr, research director for Logan's institute, has a wait-and-see attitude. "I have observed one cardiac curriculum baby and watched it mature over a period of months," Van de Carr says. "We found that in that case, respiratory rate became modulated to the complex rhythm of the tape. So for whatever it's worth, we do know that the taped sounds are passing through the abdominal wall and that they have had at least some sort of effect. But whether the curriculum is achieving the developmental milestones that Logan suggests needs the benefit of a larger study."

Scientists in the field of pre- and perinatal psychology seem more certain about the significance of another area: the experience of birth. Indeed, the notion that birth has any lasting impact was once considered absurd. But today it is widely believed that the birth experience may profoundly determine who we ultimately become.

Lee Salk, for instance, writing in the prestigious British journal *Lancet*, has attributed teenage suicide to the trauma of a difficult delivery. (See Body, November 1988.) Comparing the birth records of 52 suicide victims born between 1957 and 1967 with those of 104 controls, he found that the suicides generally lacked early prenatal care, had mothers who were chronically ill during pregnancy, and suffered respiratory distress for more than one hour after birth. In a related study, Dr. Bertil Jacobson of Stockholm's Karolinska Institute found a correlation between the *kind* of birth trauma and the *method* of suicide. For example, those who asphyxiated themselves, whether by hanging, drowning, or gas poisoning, were four times more likely than the controls to have suffered oxygen deficiency at birth. And drug addicts were frequently born in hospitals where doctors often administered opiates, barbiturates, or chloroform to women in labor.

In another fascinating body of research, some psychologists say they have evidence that we literally *remember* birth. One of the first people to get a peek at what seemed like bona fide birth memories was California obstetrician David B. Cheek. In one of his most impressive studies Cheek showed that people retain a muscle memory of the way their heads, shoulders, and arms moved as they entered the world. "As an obstetrician," Cheek explains, "I knew that when a baby comes out the birth canal, it automatically rotates its head in a particular fashion. I also noticed that whenever I asked my patients about birth, they spontaneously turned their head in a similar way. So I got the idea that maybe they were remembering the same physiological mechanism they'd experienced while being born."

To check this theory out, Cheek recruited some patients he had delivered decades before. He asked them to go over their birth, and, after checking his records, he found that "a hundred percent remembered the way their head rotated as it came out of the birth canal. Almost everyone remembered which arm came out first as well."

Finally, San Diego psychologist David B. Chamberlain has collected what he believes are detailed memories of birth. Chamberlain, author of *Babies Remember Birth* (Jeremy P. Tarcher, Inc., 1988) and one of the seminal figures in the pre- and perinatal psychology movement, still recalls the first time he heard a patient describe being born. "I was sitting opposite her," he says. "There was a big, beautiful asparagus fern and a huge picture window behind us, and the sun was shining in. Across the room was a baby grand. All of a sudden, my client, a fiftyish woman named Lee, described a vision of her birth. 'The doctor is holding me up, laughing,' she said. 'I told you it would be a girl, he said to Mother. Now Mother is turning her face away.' "

Determined to check this out further, Chamberlain conducted a study of ten mother-offspring pairs. He reports that while under hypnosis, mothers and offspring alike recalled startlingly similar details of the offspring's birth. One daughter, for instance, correctly described her mother's hairstyle at the time. Another correctly recalled her mother smelling her, then expressing concern over the normality of the baby's toes.

Other researchers have discovered a plethora of birth memories pouring forth from the young. Linda Mathison of Seattle has discovered that young children, inspired by some experience or association, frequently come up with detailed memories of birth. Most of these reports, Mathison has found, emerge between the ages of two and three.

One of the most spectacular reports comes from New York psychiatrist Rima Laibow. Laibow was giving her young son a bath, she remembers, when he looked up at her and said, "I have some questions about when I was new."

"What do you mean?" Laibow asked.

"When I was brand-new," he replied. And then his questions began.

"He wanted to know where the bottom half of everyone's face was," Laibow recalls, "and why there was a bright light over his head, and what the funny noise was. He also wanted to know why someone stuck a finger in his anus."

In fact, Laibow says, all these things had occurred. Doctors and nurses were wearing surgical masks, the noise came from suction equipment, and surgical lights were glaring for all to see. "He had a clear perception of chronology," Laibow says, "and I was shocked when he made a joke."

Laibow's son, it turned out, could speak some Yiddish. Turning to her, he said, "There was a *finster* in the *fenster.*"

"That means there was a window in the darkness," Laibow explains. "My son had been born by cesarean, so the description was precise."

Now one of the organizers in the growing field of pre- and perinatal psychology, Laibow is chairing the field's annual congress this month in Amherst, Massachusetts. The biggest meeting ever of experts in this discipline, the convention is expected to attract more than 800 participants and get broad coverage. And there will be a lot to discuss. This controversial new arena, after all, has created new perspectives and generated plenty of social and scientific debate.

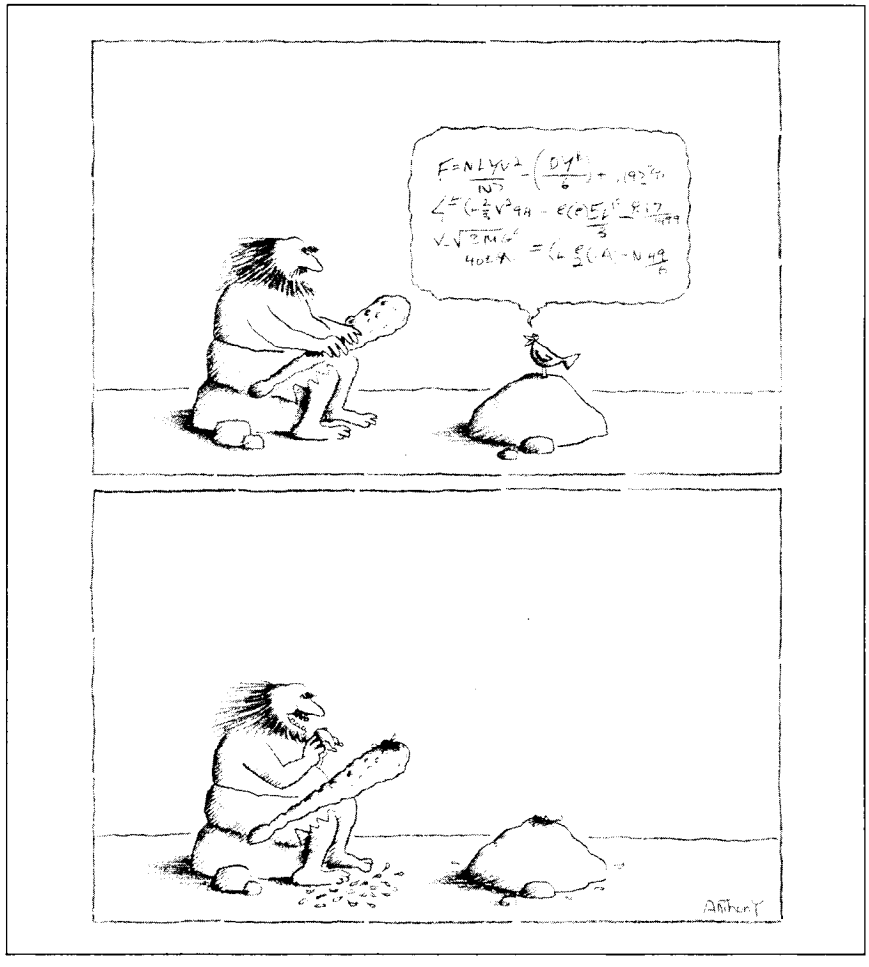
Many pro-lifers, for instance, argue that the research bolsters their contention that abortion is wrong. Most of the scientists don't agree. "The new information does not mean we should take choice away from women," Verny says. "Rather, it means we must reevaluate issues from infant anesthesia to surrogate motherhood. We must study the impact we are having on those who are ultimately born."

One thing that bothers Verny, for instance, is the neonatal intensive care unit (NICU), in which babies are hooked up to machines, exposed to "more sound than you would hear on Fifth Avenue at rush hour," and flooded with light. "Not long ago," Verny says, "I met a pediatrician from Seattle who told me the story of a sick NICU baby. The child was just not getting enough oxygen, and he was turning blue. The doctor decided the baby was going to die anyway, so he took the baby off life-support systems, shut off all the machines, and turned off the lights. Then he took the baby out of the crib and rocked him in his arms. Within a few minutes the baby turned pink, and his recovery was complete."

Verny is not suggesting that we banish the NICU. Rather, he says, we should create an NICU that is "more ideal. We should cut down on the light, the noise, the blood taking. We should start with the premise that the critically ill newborn needs calm and quiet, just like the critically ill adult."

For the most part this point of view sits well with doctors running NICUs. "We all feel the environment is not ideal," says neonatologist Ian Holzman, chief of the division of newborn medicine at Mount Sinai Medical Center in New York City. "When babies are not critical, we make every effort to reduce stimuli like noise. But we must still balance a more perfect atmosphere with our medical and legal constraints. We must observe and monitor the babies. If the lights were turned down low in the critical-care area, it would be difficult for personnel to see that a baby had turned blue. When we send these babies home, we tell parents about the excess stimulation and the unusual biorhythms we may have induced."

Verny would also like to see the birth experience rendered more personal and less high-tech. "I believe in medical intervention only when it's really necessary," he says. "We need mother's advocates, hospital birthing rooms, and obstetricians who catch babies instead



of extricating them by force."

If pre- and perinatal psychologists question modern science, modern science is still evaluating them. Lee Salk, scheduled to be keynote speaker at this month's congress in Amherst, says that the tenets of pre- and perinatal psychology are "certainly interesting and need to be explored."

New Jersey clinical psychologist Amy Altenhaus adds that some of the techniques and findings of pre- and perinatal psychologists may be beneficial. For instance, she says, "such things as music and massage, if they calm the mother down, can only be positive for the fetus."

Altenhaus, a long-time expert on women's health issues, believes, however, that some of the claims regarding IQ and other intellectual abilities may be premature. Says Altenhaus, "It is often difficult to predict behavior from developmental milestones before the age of three. A six-month-old who achieves exceptional development may not necessarily be exceptional down the road. Only later on, as the child gets older, is there much stability to the IQ score.

"Beyond that, parents who stimulate their babies prenatally are probably stimulating them more after birth as well. How do you tease out the factors responsible for the observed IQ?"

Even if we could determine for sure that prenatal stimulation enhances IQ, adds Altenhaus, "the drive to have a brighter child may, in the long run, do more harm than good. The pressure to be so exceptional could turn the child into the equivalent of a burned-out broker on Wall Street by the first grade. We need some perspective. There's so much to learn about the world; why focus on reading percentiles or IQ?"

Anthony DeCasper, the North Carolina professor applauded for his pioneering discoveries about the sensory capabilities of newborns, has other problems with the research. "My work shows that human fetuses do have some sensory experiences," DeCasper says. "But in terms of the data, the developmental significance of these experiences is unclear. As an experimental psychologist, I am skeptical of claims that you can make healthier, happier, more intelligent babies through extranormal sensory stimulation. Despite all the anecdotes, I know of no scientifically acceptable evidence showing this is so."

DeCasper also has reason to suspect that some of the more extreme forms of prenatal stimulation, especially those relying on special belts to pump sounds directly into the womb, may be damaging. "Despite the fact that sensory systems in the fetus are functioning," he says, "they are still immature. These systems develop according to an order established by Mother Nature. One sensory modality influences another, and overstimulating one system before it is ready could impair sensory or neurological functioning as a whole."

DeCasper takes particular issue with systems such as the cardiac curriculum, which claim to work by saving brain cells from death. "Not only is brain cell death a normal part of development," DeCasper says, "it is also essential. Think of the brain as a statue. At one time the statue was just a piece of marble. As the sculptor takes bits of the marble away, the finished statue will emerge. The brain is the same. Research with developing chicks, in fact, showed that when neurons were prevented from dying, neuronal control of movement was disrupted."

Finally, biologist and public policy expert Clifford Grobstein, author of *Science and the Unborn,* insists that we cannot study the human fetus in the same way we study a developing mouse or rat. "Intervention in the development of the human fetus, when safe and humane, is sometimes called for," Grobstein says. "For instance, intrauterine surgery may sometimes save a baby's life. Experimenting with a developing human fetus, however, even in hopes of some greater good sometime up the road, is always subject to some question."

Despite such questions, the new field of pre- and perinatal psychology is sure to change the way we treat the fetus and the newborn. Thomas Verny foresees the day when newborn children are routinely treated with gentleness, respect for their humanity, and love. And Rene Van de Carr believes that by stimulating the unborn, we will awaken many lost human traits. "By stimulating the brain before its plasticity shuts down," Van de Carr says, "we might be able to produce children capable of enjoying many subtle things, from all the nuances of flavor and scent to incredible flashes of insight to fast-moving visual cues."

At the outer edge of the field, Brent Logan predicts that pregnant women will one day wear tiny transistors clipped to clothing near their abdomens. These transistors will reproduce an advanced version of the cardiac curriculum, he declares, stimulating the fetus every day. This technology "will be the ultimate resource for the next millennium. It will create a revolution in how and when we learn. The impact could be especially profound," he adds, "in the Third World. Very simply, when you hand out contraceptives in a country like Ghana, you hand out a prenatal stimulator as well. When the woman is pregnant, she just clips it on like a talisman. And nine months later, out comes a national treasure. In one fell swoop we would optimize human intellect and behavior around the world."