Obstetrics and the Prenatal Psyche*

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Full Text: Headnote ABSTRACT: The routine collision of babies with medical technology betrays ignorance that the baby is sentient and is an active partner in pregnancy and birth. Nineteenth century ideas about the baby and the baby's brain keep obstetric "management" of birth from being baby-friendly. This paper illuminates the prenatal psyche, its sensory foundations, its social and cognitive orientation, and its vulnerability to obstetrical interventions. INTRODUCTION The encounter of babies with technology is not a new phenomenon. From earliest times, dire circumstances have always inspired intervention. For example, records show that the ancient Egyptians performed surgical deliveries. Much later, around 1600 A.D., a few European physicians, summoned to assist a woman at death's door, carried a proprietary weapon, forceps, in the hope of saving one life or the other. Such approaches were for emergencies only, so practitioners were probably not troubled about how the experience might affect the baby's psyche. In the latter half of the twentieth century, conditions for technical intervention have been reversed. We now witness the sudden and sweeping application of technology in nearly every pregnancy and birth. Few pregnant women escape the juggernaut of medical management. This unprecedented rush to technology is a complex phenomenon, reflecting fear of the unknown (which birth often represents), the peculiar modern day lack of familiarity with the normal physiology of birth, professional mistrust of the female body, hope for a pain-free experience, and wishful thinking that technology can always produce perfect babies and assume total responsibility for this outcome. The trend toward technologic birth also reflects widespread ignorance about the powerful synergy which exists between mother and baby all through gestation, as well as the importance to both mother and baby of completing the birth process through their own power. Additionally, technology also overlooks the nature of the baby as a sentient being, failing to see the long-term consequences of an infant's innate vulnerability before, during, and after birth. During the twentieth century, technical knowledge of the physiological aspects of human development has advanced by giant steps, as may be seen in comprehensive atlases of embryology (England, 1983; Moore, Persaud &Shiota, 1994). Best-selling books and videos featuring intrauterine photographs have attracted further public attention to the physical dimensions of intrauterine existence (Nilsson, 1983, 1990). Consistent with this has been the medical focus on birth as a physical event, requiring primarily physical management and avoiding those non-physical forces represented by the mother's thoughts and feelings. For fifty years, however, women have fought for a voice in shaping birth practices to meet their needs and to be "family-centered." Present efforts are focused on making hospitals more "home-like" and "baby-friendly." An example is the "Baby-Friendly Hospital Initiative" of the World Health Organization, which urges hospitals world-wide to be baby-friendly by giving full support to breast feeding. Much more needs to be done, however, to make hospitals truly baby-friendly. Research revealing the profound influence of mental and emotional forces on physical life has emerged slowly in a medical world preoccupied by physical life-exclusively. A movement toward a more whole or "holistic" perspective of birth can be seen in the infant research of the last three decades. This research revealed the impressive array of talents displayed by newborn babies, and more recently, has introduced us to the true scope and sensitivity of fetal life as well. (For review of this research, see Chamberlain 1990, 1994.) Unfortunately, these discoveries have had only a small impact on the way obstetricians and pediatricians approach their daily work with babies and mothers, leaving an embarrassing gap between knowledge and practice, and resulting in cruel misapplications of technology (Klaus &Kennell, 1976; Verny &Kelly, 1986). This lack of integration between medical and psychological research not only calls attention to the delays which occur when specialists work in isolation, but

betrays a deeper problem posed by certain persistent but inaccurate beliefs about the infant brain. The key belief which keeps many professionals from integrating psychological knowledge into medical practice is that no significant psychic interactions are possible at the time of birth because the brain and body of the baby are still immature. Tied to this obsolete scientific dogma is the false assumption that there can be no memory of early experiences. The result of this erroneous notion, is the allied belief that there can be no long-term psychological consequences of experiences, even the most traumatic ones in the womb, during delivery, or right after birth. In spite of these fundamental incongruities and misunderstandings, the twentieth century has marked the beginning of confident medical manipulation of reproductive processes, aggressive treatment of prematurely born infants, routine hospitalization for all mothers in childbirth, and routine chemical, mechanical, and surgical interventions in the labor of most healthy women. Ironically, some of the technologies developed to monitor heartbeat and respiration, to measure motor activity in utero, and to analyze and visualize physical defects in the fetus-technologies used to manipulate reproduction, pregnancy, and birth-have, in other hands, brought us to a new understanding of life before birth. Used creatively and non-aggressively to investigate the development of infant senses, infant-mother interactions, memory and learning in utero, these technologies (especially ultrasound) have permitted us to move away from perennial speculations about life in the womb to knowledge based on actual observation. Many of these observations are in conflict with both ancient and modern prejudices about babies, but support the traditional wisdom mothers have had about communicating with their unborn babies in the womb. Observations are providing empirical foundations for the emerging field of prenatal and perinatal psychology. Yet we continue to treat pregnant and birthing women as if their babies are insensitive, unaware, and unaffected by their encounters with the world. We still act as if fetal behavior and infant cries are not true communications, their smiles are only reflexes, their pain "not like our pain," their senses undeveloped, and their brains not yet working. Let's examine the current facts of life before birth by first summarizing: (1) the principle discoveries regarding the development of the senses during gestation, (2) the dynamic nature of the uterine environment including the interactive relationship of mothers and infants, and (3) then highlighting the misunderstandings of the prenatal psyche which have allowed the inappropriate and insensitive use of technology during pregnancy and birth. THE SENSORY DIMENSIONS OF FETAL LIFE Sensitivity to Touch The maternal womb is an optimal, stimulating, interactive environment for human development. Activity never ceases and a fetus is never isolated. Touch, the first sense, is the cornerstone of human experience and communication, beginning in the womb. (Montagu, 1978). Just before eight weeks gestational age (g.a.), the first sensitivity to touch manifests in a set of protective movements to avoid a mere hair stroke on the cheek. From this early date, experiments with a hair stroke on various parts of the embryonic body show that skin sensitivity quickly extends to the genital area (10 weeks), palms (11 weeks), and soles (12 weeks). These areas of first sensitivity are the ones which will have the greatest number and variety of sensory receptors in adults. By 17 weeks, all parts of the abdomen and buttocks are sensitive. Skin is marvelously complex, containing a hundred varieties of cells which seem especially sensitive to heat, cold, pressure and pain. By 32 weeks g.a., nearly every part of the body is sensitive to the same light stroke of a single hair. The Fetus In Motion The first dramatic motion, one that has come to symbolize life itself, is the first heartbeat at about 23 days after conception. This rhythmic activity continues while valves, chambers, and all other parts and connections are under construction. This illustrates an important fact about development-components are pressed into service as they become available. Furthermore, use is necessary for development. Between week six and ten, fetal bodies burst into motion, achieving graceful, stretching, and rotational movements of the head, arms and legs. Hand to head, hand to face, hand to mouth movements, mouth opening, closing, and swallowing are all present at 10 weeks (Tajani &Ianniruberto, 1990). By 14 weeks, the complete repertoire of fetal movements seen throughout gestation are already in evidence (deVries, Visser, &Prechtl, 1985). Movement is spontaneous, endogenous, and typically cycles between activity and rest. Breathing movements and jaw movements have begun. Hands are busy interacting with other parts of the body and with the umbilical cord.

From this early stage onward, movement is a primary activity, sometimes begun spontaneously, sometimes provoked by events. Spontaneous movement occurs earliest, probably expressing purely individual interests and needs. Evoked movement reflects sensitivity to the environment. For example, between 10 and 15 weeks g.a., when a mother laughs or coughs, her fetus moves within seconds. The vestibular system, designed to register head and body motion as well as the pull of gravity begins developing at about 8 weeks. This requires construction of six semicircular canals, fluid-filled structures in the ears, which are sensitive to angular acceleration and deceleration, and help maintain balance. Tasting and Smelling The structures for tasting are available at about 14 weeks g.a. and experts believe that tasting begins at that time. Tests show that swallowing increases with sweet tastes and decreases with bitter and sour tastes. In the liquid womb space, a range of tastes are presented including lactic, pyruvic, and citric acids, creatinine, urea, amino acids, proteins and salts. Tests made at birth reveal exquisite taste discrimination and definite preferences. Until recently, no serious consideration was given to the possibilities for olfaction hi utero, since researchers assumed smelling depended on air. However, the latest research has opened up a new world of possibilities. The nasal chemoreceptive system is more complex than previously understood, and is made up of no less than four subsystems: the main olfactory, the trigeminal, the vomeronasal, and the terminal system, which provide complex olfactory input to the fetus. The nose develops between 11 and 15 weeks g.a. Many chemical compounds can cross the placenta to join the amniotic fluid, providing the fetus with tastes and odors. The amniotic fluid surrounding the fetus bathes the oral, nasal, and pharyngeal cavities, and babies breathe it and swallow it, permitting direct access to receptors of chemosensory systems: taste buds in three locations, olfactory epithelia, vomeronasal system, and trigeminal system (Smotherman &Robinson, 1995). Associations formed in utero can alter subsequent fetal behavior and are retained into postnatal life. The evidence for direct and indirect learning of odors in utero has been reviewed by Schaal, Orgeur, and Rogan (1995). They point to an extraordinary range of available odiferous compounds, an average of 120 in individual samples of amniotic fluid! In addition, products of the mother's diet reach the baby via the placenta and the blood flowing in the capillaries of the nasal mucosa. Thus, prenatal experience with odorants from both sources probably prepare this sensory system to search for certain odors or classes of odors. In one experiment, babies registered changes in fetal breathing and heart rate when mothers drank coffee, whether it was caffeinated or decaffeinated. Newborns are drawn to the odor of breastmilk, although they have no previous experience with it. Researchers think this may come from cues they have learned in prenatal life. Listening and Hearing Although a concentric series of barriers buffer the fetus from the outside world-amniotic fluid, embryonic membranes, uterus, and the maternal abdomen-the fetus lives in a stimulating matrix of sound, vibration, and motion. Many studies now confirm that voices reach the womb, rather than being overwhelmed by the background noise created by the mother and placenta. Intonation patterns of pitch, stress, and rhythm, as well as music, reach the fetus without significant distortion. A mother's voice is particularly powerful because it is transmitted to the womb through her own body reaching the fetus in a stronger form than outside sounds. For a comprehensive review of fetal audition, see Busnell, Granier-Deferre, and Lecanuet 1992. Sounds have a surprising impact upon the fetal heart rate. A five second stimulus can cause changes in heart rate and movement which last up to an hour. Some musical sounds can cause changes in metabolism. "Brahm's Lullaby," for example, played six times a day for five minutes in a premature baby nursery produced faster weight gain than voice sounds played on the same schedule (Chapman, 1975). Researchers in Belfast have demonstrated that reactive listening begins at 16 weeks g.a., two months sooner than other types of measurements indicated. Working with 400 fetuses, researchers in Belfast beamed a pure pulse sound at 250-500 Hz and found behavioral responses at 16 weeks g.a.-clearly seen via ultrasound (Shahidullah &Hepper, 1992). This is especially significant because reactive listening begins eight weeks before the ear is structurally complete at about 24 weeks. These findings indicate the complexity of hearing, lending support to the idea that receptive hearing begins with the skin and skeletal framework. The skin is a multireceptor organ integrating input from vibrations, thermoreceptors, and pain receptors. This primal listening

system is then amplified with vestibular and cochlear information as it becomes available. With responsive listening proven at 16 weeks g.a., hearing is clearly a major information channel operating for about 24 weeks before birth. Development of Vision Vision, probably our most predominant sense after birth, evolves steadily during gestation, but in ways which are difficult to study. However, at the time of birth, vision is perfectly focused from 8 to 12 inches, the distance to a mother's face when feeding at the breast. Technical reviews reveal how extraordinary vision is in the first few months of life (Salapatek &Cohen, 1987). Although testing eyesight in the womb has not been feasible, we can learn from testing premature babies. When tested from 28 to 34 weeks g.a. for visual focus and horizontal and vertical tracking, they usually show these abilities by 31-32 weeks g.a. Abilities increase rapidly with experience so that by 33-34 weeks g.a., both tracking in all directions as well as visual attention equals that of babies of 40 weeks g.a. Full-term newborns have impressive visual resources including acuity and contrast sensitivity, refraction and accommodation, spacial vision, binocular function, distance and depth perception, color vision, and sensitivity to flicker and motion patterns (Atkinson &Braddick, 1982). Their eyes search the environment day and night, showing curiosity and basic form perception without needing much time for practice (Slater, Mattock, Brown, &Gavin, 1991). In utero, eyelids remain closed until about the 26th week. However, the fetus is sensitive to light, responding to light with heart rate accelerations to projections of light on the abdomen. This can even serve as a test of well-being before birth. Although it cannot be explained easily, prenates with their eyelids still fused seem to be using some aspect of "vision" to detect the location of needles entering the womb, either shrinking away from them or turning to attack the needle barrel with a fist (Birnholz, Stephens, &Faria, 1978). Similarly, at 20 weeks g.a., twins in utero have no trouble locating each other and touching faces or holding hands! The Senses in Action Sense modalities are not isolated, but exist within an interconnecting, intermodal network. We close this section about fetal sensory resources by citing a few examples of how fetal senses work in tandem. We have already indicated how closely allied the gustatory and olfactory systems are, how skin and bones contribute to hearing, and how vision seems functional even with fused eyelids. When prenates experience pain, they do not have the air necessary to make sound, but they do respond with vigorous body and breathing movements as well as hormonal rushes. Within ten minutes of needling a fetus's intrahapatic vein for a transfusion, a fetus shows a 590% rise in beta endorphin and a 183% rise in cortisol-chemical evidence of pain (Giannakoulopoulos, 1994). Ultrasonographers have recorded fetal erections as early as 16 weeks g.a., often in conjunction with finger sucking, suggesting that pleasurable self-stimulation is already possible. In the third trimester, when prenates are monitored during parental intercourse, their hearts fluctuate wildly in accelerations and decelerations greater than 30 beats per minute, or show a rare loss of beat-to-beat variability, accompanied by a sharp increase in fetal movement (Chayen et al., 1986). This heart activity is directly associated with paternal and maternal orgasms! Other experiments measuring fetal reactions to mothers' drinking one ounce of vodka in a glass of diet ginger ale show that breathing movements stop within 3 to 30 minutes. This hiatus in breathing lasts more than a half hour. Although the blood alcohol level of the mothers was low, as their blood alcohol level declined, the percentage of fetal breathing movements increased (Fox et al., 1978). As was mentioned earlier, babies have been known to react to the experience of amniocentesis (usually done around 16 weeks g.a.) by shrinking away from the needle, or, if a needle nicks them, they may turn and attack it. Mothers and doctors who have watched this under ultrasound have been unnerved. Following amniocentesis, heart rates gyrate. Some babies remain motionless, and their breathing motions may not return to normal for several days. Finally, researchers have discovered that babies are dreaming as early as 23 weeks g.a. when rapid eye movement sleep is first observed (Birnholz, 1981). Studies of premature babies have revealed intense dreaming activity, occupying 100% of sleep time at 30 weeks g.a., and gradually diminishing to around 50% by term. Dreaming is a vigorous activity involving apparently coherent movements of the face and extremities in synchrony with the dream itself, manifested in markedly pleasant or unpleasant expressions. Dreaming is also an endogenous activity, neither reactive or evoked, expressing inner mental or emotional conditions. Observers say babies behave like adults

do when they are dreaming (Roffwarg, Muzio, &Dement 1966). SOCIAL DIMENSIONS OF FETAL LIFE In the uterine environment life is interactive and interdependent: relationship is everything. Never isolated from each other, fetus and mother eat, sleep, exercise, get excited, and have accidents together. When a mother smokes, the baby smokes. When a mother takes a pill, the baby is taking it also. In one case, when a mother was shot, yet not seriously harmed, the fetus died. In another, when a psychotic husband went on a rampage, both mother and fetus were in distress. Reacting to an earthquake, fetuses inside pregnant mothers continued to show intense hyperkinesia hours afterward. The social nature of the infant-mother relationship may be viewed in the larger perspective of the social life of twin fetuses. Ultrasound shows them repeatedly interacting, even at 20 weeks g.a. (Piontelli, 1992). Observers have seen kind twins, gently interacting, playing cheek to cheek in adjoining compartments, showing interest in each other, and responding happily. Observers have also seen twin boys in the same compartment boxing with each other. Others have been seen kissing or holding hands! The Motherly Womb In the womb, several vital activities are carried forward simultaneously, with consequences for the prenatal psyche. These include body-building, brain-building, hormone balancing, and establishing rapport. In the post-industrial world, spread with environmental hazards, male sperm has been remarkably degraded, and female ovulation affected by teratogens which compromise the construction of brain and body. In addition, lifestyle habits like smoking, drinking, drug taking (whether prescribed or not) and eating (or not eating) have direct and indirect effects on fetal mental and emotional well-being. The grand illusion that the placenta would somehow magically protect the fetus from mother or from the world has had a slow, but convincing, death. We have been equally slow in recognizing that emotion is a key ingredient of intrauterine life. Mother and baby are both capable of emotion and an emotional field unites them. Violent movies can send a baby into spasms of hyperactivity, driving mothers from theaters. Loud rock music has a similar effect, and infant's kicking has bruised pregnant abdomens and broken ribs. Numerous studies have uncovered a relationship between maternal emotion and reproductive outcome (see review of earlier studies by Carlson &Labarba, 1979 and Istvan, 1986). Formal experiments have confirmed the link between maternal anxiety and fetal activity. Experiments conducted at the University of South Wales, Australia, measured both the immediate and long-term impact on the fetus of mothers watching an agonizing segment of a Hollywood movie. After 20 minutes, the babies began kicking and their heart rates accelerated. When re-exposed to that movie segment at two and three months after birth, they were equally disturbed (Correia, 1994). In Belgium, a longitudinal study using many tests with 70 pregnant women and their babies as old as 28 days, found that maternal state anxiety correlated with measures of fetal behavior (Van den Bergh, 1989). Fetuses of mothers with higher trait anxiety scores showed higher levels of activity than fetuses of low anxiety mothers. Babies whose mothers were highly anxious during pregnancy are more likely to have gastro-intestinal problems, cry frequently, and are perceived as having difficult temperaments. Similarly, severe maternal stress during pregnancy has been linked with the sexual orientation of their offspring (Ellis et al., 1988). Retrospective analysis revealed that the most critical tunes for severe stress to have impact on children were 9 to 12 months before the birth and during the second trimester of pregnancy. Severity ratings helped to predict whether offspring were homosexual or heterosexual. This is coherent with findings on the critical nature of brain sexual differentiation during gestation (Dorner, 1991). Maternal depression in pregnancy has been associated with newborn inconsolability and excessive crying. In a study of 1,123 mothers and their term infants, the mothers' depression scores, taken during pregnancy, correlated with the emotionality of their babies 8-72 hours after delivery (Zuckerman et al., 1990). Mothers with high depression scores were about three times more likely to give birth to inconsolable babies than those with low scores. Studies are revealing subtle forms of telepathic connectedness between mother and baby. Using hypnosis, clinicians have found evidence of telepathy and clairvoyant hearing in utero. The reports were verified by the patient's mothers (Cheek, 1992). Similarly, in a group of pregnant women using a hypnotic technique of ideomotor signaling, 25 of 26 women correctly identified the gender of the baby before any ultrasound tests and before they were born (Dobrovolsky, 1995). In a cohort of 8,000 women, divided into those

who wanted their pregnancies and those who didn't, researchers discovered that the unwanted babies were 2.4 times more likely to die within the first 28 days of post-natal life (Bustan &Coker, 1994). Note that these were middle class women covered under a health insurance plan, all of whom had received early prenatal care, were married, and should have had a reduced risk of adverse pregnancy outcomes. Large crosscultural studies have convincingly demonstrated the troubled life course which unwanted babies are likely to have (David et al., 1988). On the positive side, a cross-cultural study of planned conception found that when the babies were tested at three months of age, the planned infants showed higher levels of cognitive processing and greater attachment to their mothers than those in the unplanned category (Roe &Drivas, 1993). Classwomb Anecdotal evidence for learning and memory in utero comes from parents who have succeeded in teaching their children to kick on cue as early as 25 weeks g.a., or who have discovered that a child already knows a story which has not been read to him since he heard it in the womb. Such stories are now being confirmed with research subjects. In Ireland, the babies of mothers who had listened regularly to the television series, The Neighbors, were found to react distinctively to the theme music, compared to babies whose mothers had not listened to this music (Hepper, 1991). In other experiments newborns were found to prefer a lullaby their mothers had sung to them in the womb to an unfamiliar one sung by their mothers (Satt, 1984; Panneton, 1985). After birth, babies prefer to hear stories read to them in the womb, rather than unfamiliar stories (DeCasper &Spence, 1986). Similar results have been reported by Woodward (1992). Most recently, French women were involved in an experiment in prenatal learning, reciting a short child's rhyme aloud three times in succession daily for four weeks from week 33 to 37 g.a. After this exposure, the familiar rhyme elicited a predictable change in heart rate, while an unfamiliar rhyme did not (DeCasper et al., 1994). Perinatal Learning All newborns show great interest in their mothers' voice and face. Her voice, made familiar by months of listening to it in the womb, is definitely preferable to any other voice. Newborns quickly perceive the difference in native language sounds, showing a preference for their mother tongue (Mehler et al., 1988; Moon, Cooper &Fifer, 1993). Babies have exquisite awareness of when adults are talking directly to them versus talking to someone else. Their heart rates rise and fall accordingly. This preference for infant-directed speech is true of both premature and full term babies (Cooper &Aslin, 1990; Mosser, 1989). Babies sense when a voice they know is mismatched with a stranger's face (or vice versa), and they detect when lip movements do not match the sounds they are hearing. They are upset when their mother wears a mask or adopts a still-faced position. From first sight, newborns gaze intently into their mother's face and start memorizing it. This is accomplished in hours, with only periodic contact in the first days of life, and is based on visual cues alone (Field et al., 1984; Bushnell, Sai, &Mullin, 1989). Newborns also quickly learn to identify their mother's breast and underarm odors, and show a preference for perfumes she has used repeatedly, or for artificial odors such as cherry or ginger which were placed in their bassinets for a day (Balogh &Porter, 1986; Porter, 1991). Newborns listen keenly to the cries of other babies and usually join in the chorus. Tests show they are most upset by the cries of babies their own age. They react to recordings of their own cry with a rising heartbeat, a sign of self awareness (Martin &Clark, 1982). Newborns listen to adult speech with intense fascination and tend to move in synchrony with the segments of adult speech. Their perception of the smallest units of sound, like the vowels a and i, or phonemes like ba and bi is actually superior to adult perception for the first several months of life. Perhaps the most startling manifestation of the prenatal psyche is found in the now abundant evidence for learning and memory. (See reviews by Rovee-Collier &Lipsitt, 1982; Busnel, Granier-Deferre, &Lecanuet, 1992). Habituation and various types of conditioning have been demonstrated by prenates, prematures, and full term babies. The centerpiece of infant cognition, however, is the memory of birth itself, which so far exceeds any of the experimental findings in detail and comprehension, that it constitutes evidence of a higher consciousness. While academicians still doubt the possibility of birth memory, proof of this ability comes from very young children who are just learning to talk. Their spontaneous recall is accurate, cogent, and often intellectually critical of how things were done at birth. The memories demonstrate understanding of human relationships and character, and are telepathic in grasping ideas without

language. (For a review see Chamberlain, 1990.) These memories clearly transcend all age-related expectations and show that infants possess a wisdom and sense of self that is fundamental to being human, rather than something they can only develop in time. Further support for this level of consciousness comes from similarly transcendent memories of life in the womb, memories of past lives, and other forms of psychic knowing. In traditional thinking, these should all be impossible but results of empirical studies of consciousness now make it possible to place these infant feats of knowing securely within an emerging paradigm which accommodates these larger human capacities (e.g., see Stevenson, 1987; Grof, 1992; Hallett, 1995). In the perspective of infant learning, memory, and higher consciousness, we must admit that so-called modern birth routines in hospital obstetrical units are cruel and inappropriate. TECHNOLOGY COLLIDES WITH INFANTS The medical specialty of obstetrics mushroomed in 20th century America when obstetric services became reimbursable under newly available insurance plans. Although doctors initially also did home deliveries, financial "coverage" for hospital birth became increasingly attractive. In the year 1939, more people were born in hospitals than were born at home. This trend continued and by the mid 1960's about 97% of all births in the U.S. were taking place in hospitals. During this cultural upheaval, family practitioners lost out to obstetricians, and the profession of midwifery was nearly destroyed. Technology increased, natural birth decreased. Breast feeding rates plummeted as bottles were heralded as a superior technology. As we approach the close of the century, traditional childbirth has been replaced by "managed deliveries" under medical supervision. In this concluding section on technologic birth, the focus will be on routine hospital birthing, intensive care for premature babies, the harm done by technology, and our thoughts about an appropriate technology for babies. Technologic Birth The technology involved in birthing today includes an array of drugs and chemicals to start labor, provoke stronger contractions, provide sedation, kill pain, or to affect the uterus after birth. For the baby, drugs include everything given to, or taken by, the mother from conception through birth and during breastfeeding after birth. Additional medication is put in the baby's eyes immediately after birth. For many years physicians used a caustic solution of silver nitrate. After much consumer pressure they began to use painless, but vision-blurring antibiotic ointment. Babies are given antibiotics and other drugs during their hospital stay-perhaps even to counteract common hospital pathogens. Technology may mandate fetal scalp monitoring via an electrode screwed into the baby's scalp while still in the birth canal, or delivery via vacuum extractor, an increasing practice now that the use of forceps is officially discouraged. Even assuming an unmedicated natural birth (which has become rare) a baby's encounter with modern neonatal treatment will be painful. The light in the delivery room and in the nurseries is too bright, the noise level too high. A vitamin injection will pierce the skin and injure nerves and a deep heel wound will be made to withdraw a large sample of blood for testing, physical handling will be rushed and disorienting, while compulsive wiping, washing, weighing and measuring all irritate. If the baby is not already crying, a cry must be provoked to obtain a full Apgar rating of newborn well-being! All of these experiences tend to erode trust and work against a totally comfortable first engagement of mother and baby after the supreme effort of birth. More often than not, these offenses will be magnified by a period of isolation and observation in the hospital nursery where nurses may give them bottles of sugar, water, artificial milk formula, or pacifiers with plastic teats that bear little resemblance to the pliant, fragrant human nipple and breast. While in the hospital, all mothers and babies are on professional turf where everything is regulated by hospital protocol, designed not for patients but for staff. Two separate staffs will look after baby and mother, in keeping with the technological view that they are separate entities once the umbilical cord is cut. Even in the most lenient hospital environments, parents must expect to insist upon continuous contact with their baby, as well as privacy, or they will not get it. These are the challenges of technologized birth which routinely greet a mother, father, and baby. If a newborn is male, he may face another gauntlet of trauma-a 60% chance that his hospital birth will include circumcision. This surgical procedure, traditionally done without a painkiller while the baby is strapped helplessly to a circ board, removes the foreskin, a sexually functional and protective area of his penis. Somehow, the doctors who do this operation expect the entire experience of shock and pain

to pass from the infant psyche without a trace! The right to torture a baby, to rob him of healthy tissue, and ignore his human rights are flagrant abuses of medical power. Neonatal Intensive Care: A Theater of Pain The ultimate encounter with modern technology awaits the baby who is ill or who is born early. The architecture of the intensive care nursery, first introduced in 1967 at Yale University, followed a large room design to accommodate many babies, incubators, and machinery under intense 24-hr fluorescent lighting. This environment is replete with noise, electromechanical hazards, ionizing radiation, and outgassing of surface materials. It transformed new parents into frightened, passive visitors (Kellman, 1980). About 7%, or 280,000, babies per year experience neonatal intensive care for an average of two to three weeks. As many as 20% of healthy full-term babies also spend some time here for purposes of observation which includes painful heel laneings for blood samples, or a septic work-up which involves a risky spinal tap and administration of antibiotics. Babies who enter a NICU face pain as well as the risks that accompany all invasive procedures in this man-made womb. It has been described as a theater of violence because babies are tied or immobilized while breathing tubes, suction tubes, and feeding tubes are pushed down their throats and invasive procedures are done, without regard to the baby's experience of pain. Such tubes, needles, and wires are stuck into babies at regular intervals, their delicate skin can be burned with alcohol prior to venipuncture, or accidentally pulled off when adhesive monitor pads are removed. For a comprehensive list of the many environmental hazards, see Gottfried and Gaiter (1985). In the midst of chaotic noise and alarms, a baby's peace is interrupted an average of 130 times a day. Most of these interruptions are painful. The NICU has functioned as an experimental laboratory for new surgical techniques, medications, and equipment, and babies have paid in broken bones, gangrene, amputations, nerve damage, lungs damaged by the respirators, eyes blinded by too much light and too much oxygen, X-ray damage, damage to heart and brain by routine suctioning of intubated infants, brain damage from anti-bacterial soap, and the unacknowledged hazards of anesthetics and other drugs given the mother during the entire hospital experience. Most babies who enter the NICU are in delicate condition. Some are on the edge of viability around 25 weeks g.a. when it takes a supreme technological effort just to save them, probably at a cost no individual family or government can afford. Many die. Those very tiny or very sick babies who leave the unit and rejoin their families often suffer emotionally and cognitively. As many as 20% suffer from severe neuromotor abnormalities, including cerebral palsy. Studies show that half the graduates manifest psychiatric problems! Calculating the cost and benefit to those who survive and appear normal, as well as to those who leave with life-long handicaps has provoked agonizing debate about medical ethics and public policy (Gustaitis &Young, 1986; Guillemin &Holmstrom, 1986). Perhaps the most egregious failing of neonatal technology has been the denial of infant pain. For nearly 150 years, dating from the discovery of ether anesthetic in 1846, medical specialists remained blind to one of the most obvious things about babies-their sensitivity to pain. Doctors argued with one another for forty years after discovery of ether anesthesia about who needed ether for surgery and who did not. Babies stayed on the list of those who did not (Pernick, 1985). This blindness persisted through the launching of neonatology and cast a pall over neonatal intensive care. The black cloud has not completely dissipated over either "normal" birth or neonatal intensive care, but its days were numbered following a parent rebellion which received widespread media support in 1986 (Lawson, 1986,1990; Harrison, 1986, 1990). At that time, the most common surgery for preterm neonates, thorocotomy for ligation of patent ductus arteriosus (PDA), was done without anesthesia. Necessary for 50% of infants born under 33 weeks g.a. or weighing less than 1500 g., PDA involved cutting holes in both sides of the neck, another in the right chest, an incision from the breastbone around to the backbone, prying the ribs apart, and tying off an extra artery near the heart. The left lung must be retracted and a hole cut for a chest tube. The operation lasts about an hour and a half. For this, babies were given a muscle paralyzer so they could not move but were left completely conscious of pain and emotion during and after the surgery. Since the 1986 rebellion initiated by parents, and the concurrent publication of definitive studies showing not only the risks associated with unanesthetized surgery, but the benefits of pain-killing anesthetics with neonates, the tide has turned in favor of

adequate anesthesia (Anand, 1986; Anand &Hickey, 1987; Anand &McGrath, 1993). However, follow-up surveys of doctors' attitudes and practices on this issue have been both heartening and disappointing (Franck, 1987; McLaughlin et al., 1993; Wellington &Rieder, 1993). How Technology Hurts Babies The cultural warping of childbirth noted by Doris Haire (1972) and Suzanne Arms (1975) two decades ago has moved forward at a steady pace, doubling and redoubling the national percentage of cesarean deliveries between the mid-1960's and mid-1990's, and achieving nearly universal use of anesthetics in labor albeit with changing fashions in chemical compounds and the favorite place to inject them (Brackbill, Rice, &Young, 1984). This took place in spite of strong opposition by some consumers, birth educators, and most midwives. History now enables us to see more clearly some of the classic failures of obstetric technology. We have already noted many specific ways which technology has hurt both premature babies and full-term babies at a normal hospital birth. These specific injuries fit under larger headings of failure, each of which has had negative consequences for the prenatal and newborn psyche: (1) large-scale, yet undeclared, experimentation on mothers and babies, where mothers had little to say about their treatment, and the babies themselves were not acknowledged as patients (2) introducing machinery such as incubators, fetal heart monitors, respirators, and suction devices before the dangers were known (3) failure to consider the whole baby in applying its technology and without considering the short- or long-term impact of shocking and painful practices and (4) polypharmacy, the prescription and use of multiple drugs and combinations of drugs before knowing how they would affect the baby's developing brain. The fourth problem, polypharmacy, the ominous destructive potential of obstetrical chemicals, is singled out for emphasis. Although physicians always said (and still say) that drugs would not reach and would not affect the baby, in retrospect, this has proven not to be true. Drugs given the mother reach the baby in inappropriate doses, linger longer than initially believed, and damage brain growth processes. After initial tryouts, physicians backed off from using general anesthetics for deliveries, and learned to complete cesareans speedily because the effects on babies were noticeable. Unfortunately, the full range of effects could not possibly be assessed in such a superficial way. It has taken many years to develop the tests needed to detect the full extent of the damage. Along the way, however, obstetricians paid little heed to research reports on how anesthetics were affecting the babies (e.g., Brackbill, 1979; Brackbill, McManus, &Woodward, 1985). This is just one example of technology running wild. (Another illustration would be the obsession with electronic fetal heart monitoring, a discredited technology which is still in wide use.) The pharmaceutical flood continues. Today, studies indicate that 80% of pregnant and lactating women are given drugs in the name of caring for them, in spite of the fact that the fetal and infant brain is especially vulnerable to these chemicals. Experts are deeply concerned that damage during the third trimester, for example, is not grossly evident, but causes permanent microscopic and biochemical alterations in the formation of neurites, synapses, transmitters, and receptors. This damage is described as behavioral "teratogenicity" or "functional neuroteratology" (Mirmiran &Swabb, 1992) and could be responsible for the surge in hyperactivity symptoms seen in clinics and counseling offices today. Long-term consequences of obstetric anesthetics can be seen in the birth records of 200 addicts and their siblings in Stockholm (Jacobson et al., 1988; Jacobson et al., 1990). Mothers had received combinations of opiates, barbiturates, and nitrous oxide during labor. The relative risk for offspring becoming addicts increased with the number of administrations of any of the three drugs. When addicts were matched with siblings, the relative risk of future addiction was nearly five times for those who received three drugs compared to those to whom no drugs were given. Drugs given for ten hours prior to birth were the most damaging. These Swedish medical researchers link the first use of heavy analgesia and sedation in the 1940's to the pronounced increase in drug misuse in the 1960's. However, in the U. S., such reports of drugs administered in labor have not been assembled. In the Swedish 1988 study, which matched 73 addicts with 109 nonaddicted siblings, the researchers found that the risk of amphetamine addiction increased with the duration of intermittent administration of pure nitrous oxide. The risk was almost six times greater when nitrous oxide had been given for about four consecutive hours. It would require another 15 years to determine the effect of the latest designer

anesthetics on today's children. Extending their statistical investigations to the birth records of those who committed suicide, the Swedish researchers discovered that suicides involving asphyxiation were closely associated with asphyxia at birth: Suicides by violent mechanical means were associated with mechanical birth trauma (Jacobson et al., 1987). This finding echoed something from a study of 52 Rhode Island adolescents who committed suicide between 1975 and 1983. When compared with matched controls born in the same hospital, birth records revealed that many in the suicide group had experienced respiratory distress which lasted more than an hour at birth (Salk et al., 1985). Much respiratory distress is caused by drugs given their mothers or from cesarean surgery. Discoveries of this kind suggest the great openness and vulnerability of the newborn psyche to a range of insults which become "imprinted." Yet today's parents who try to protect their babies from medical hazards are often made to feel guilty for not allowing them to receive "the best medical care." Technology has not been a benign influence on babies. Can technology be used appropriately with truly sentient, truly human babies? This question can only be answered when those applying technology recognize that a baby is not a machine: a baby has emotions and senses which can be violated, and a baby has a mind capable of learning from experience, especially from shocking and painful experience. Everyone who deals with babies will have to cope with the fact that sentience and consciousness are permanent aspects of the human psyche. There are no free periods at the beginning of life when violent treatment can be offered babies in the name of science, even "for their own good." A neonatal intensive care unit should strive to be a uterine analog environment (Gatts, Winchester, &Fiske, 1992), not a medical factory for cyborg babies. The mental and emotional damage done by birth technology to infants in the last century has followed our babies into childhood and right into adulthood, and has made necessary the development of reconstructive therapies for body and mind. Today an array of these therapies are available, but they are costly remedies for problems that do not need to occur in the first place. An appropriate medical technology would take the radical step of returning to an earnest attempt to follow the dictum of the Hippocratic Oath: "Above all, do no harm!" Footnote * This is the initial publication of the article. Suzanne Arms, the author of seven books, is a renowned photojournalist and child birth activist. Her books include Immaculate Deception (1975) and Immaculate Deception II: Myths, Magic and Birth (1997). Her latest production is the Video: Giving Birth: Challenges and Choices. She may be contacted at P.O. Box 830, Durango, Colorado 81302 (Phone) 1-877-247-8446 and at her web site, <www.birthing the future.com> References REFERENCES Anand, K. J. S. (1986) "Hormonal and Metabolic Functions of Neonates and Infants Undergoing Surgery," Current Opinion in Cardiology, 1: 681-689. Anand, K. J. S. and Hickey, P. R. (1987). Pain and Its Effects In the Human Neonate and Fetus," New England Journal of Medicine, 317 (21): 1321-1329. Anand, K. J. S. and McGrath, P. J. (Eds.). (1993). Pain in neonates. Amsterdam: Elsevier. Arms, Suzanne. (1977). Immaculate deception: A new look at women and childbirth in America. New York: Bantam. Atkinson, J. and Braddick, O. (1982). "Sensory and Perceptual Capacities of the Neonate." in Psychobiology of the Human Newborn. Paul Stratton, ed., pp. 191-220. London: John Wiley. Balogh, R. D. and Porter, R. H. (1986). "Olfactory Preferences Resulting from Mere Exposure in Human Neonates." Infant Behavior and Development 9: 395-401. Birnholz, J., Stephens, J. C. and Faria, M. (1978). "Fetal Movement Patterns: A Possible Means of Denning Neurologic Developmental Milestones in Utero." American J. Roentology 130: 537-540. Birnholz, Jason C. (1981). "The Development of Human Fetal Eye Movement Patterns." Science 130: 679-681. Brackbill, Y., Rice, J. and Young, D.(1984). Birth trap: The legal low-down on high-tech ostetrics. St. Louis: C.V. Mosby Co. Brackbill, Y., McManus, K. and Woodward, L. (1985). Medication in maternity: Infant exposure and maternal information. Ann Arbor, Michigan: University of Michigan Press. Brackbill, Yvonne. (1979). "Obstetrical Medication and Infant Behavior." in Handbook of Infant Development. New York: Wiley-Interscience. Joy D. Osofsky, ed., pp. 76-125. Busnel, Marie-Claire, Granier-Deferre, C. and Lecanuet, J. P. (1992) "Fetal Audition." Annals of the New York Academy of Sciences 662:118-134. Bushnell, I. W., Sai, F. and Mullen, J. T. (1989) "Neonatal Recognition of the Mother's Face." British J. Developmental Psychology, 7(1): 3-15. Bustan, M. N. and Coker, A. L. (1994). "Maternal Attitude Toward

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