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Prenatal Body Language: A New Perspective on Ourselves

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Abstract: Body language is a direct form of communication which begins long before formal language, occurs continually, and has universal meanings throughout the life span. Current technologies permit us to observe human movement and expression during the entire period of human gestation and reveal the early origins of sensory perception, emotional expression, and personality. The author finds three types of prenatal body language: 1) self-initiated, spontaneous movements, 2) behaviors reactive to the environment, and 3) interactive, social behaviors. These early behaviors add greatly to the empirical database of prenatal psychology and have important implications for developmental psychology, neonatology, therapeutic work with primal trauma, and our understanding of human consciousness.

Zusammenfassung: *Vorgeburtliche Körpersprache: Eine neue Sicht auf uns selbst.* Die Körpersprache ist eine direkte Art der Kommunikation, die lange vor der formalisierten Sprache beginnt; sie geschieht ständig und hat grundsätzliche Bedeutung während des ganzen Lebens. Die heutigen technischen Möglichkeiten erlauben uns, Bewegung und Ausdruck während der ganzen Zeit der Schwangerschaft zu beobachten. Dabei werden die frühen Anfänge der sinnlichen Wahrnehmung, des emotionalen Ausdrucks und der Persönlichkeit deutlich. Der Autor beschreibt drei Formen der vorgeburtlichen Körpersprache: Erstens selbstinitiierte, spontane Bewegungen, zweitens Reaktionen auf die Umgebung und drittens interaktive, soziale Verhaltensweisen. Diese frühen Verhaltensweisen erweitern die empirische Datenbasis der Pränatalen Psychologie beträchtlich und haben bedeutsame Implikationen für die Entwicklungspsychologie, Neonatologie, die therapeutische Arbeit mit primären Traumen und für unser Verständnis des menschlichen Bewußtseins.

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Introduction

A combination of modern technologies makes it possible to observe human behavior throughout the entire period of gestation. Experiments using real-time ultrasound and refined measurement of vital signs have dramatically extended psychological observation in the early prenatal period, providing an expanded empirical foundation for prenatal psychology.

The findings are revolutionary! Nearly everything we thought we knew about prenatal behavior 30 years ago is at least suspect; much of it is obsolete, calling for new paradigms to describe prenates (Verny, 1986; Chamberlain, 1988, 1992; Smotherman & Robinson, 1987, 1989; Nijhuis, 1992). Early manifestations of self-expression, sensation, emotion, and interactive learning/memory argue for changes in developmental concepts, changes in routine prenatal and newborn care, and changes in public recognition of infant trauma and the need for its timely resolution.

While textbooks in developmental psychology give little hint of the profound importance of life before birth, critics point to the weakness of theories constructed without reference to prenatal life (Smotherman & Robinson, 1987, 1989; Hofer, 1981, 1989; Nijhuis, 1992). The widespread view that significant human behavior is not possible until months after birth (e.g., Preyer, 1888; Piaget, 1973; Flavell, 1977; Kagan, 1981) is no longer consistent with research findings.

Fetal body language offers a basis for new understanding of who we are. This paper reviews observations of human movement during the first 40 weeks of gestation. Movement serves many purposes, among them exploration, self-protection, expression of individuality, and communication. Movement inevitably reveals needs, interests, talents, feelings, and cognitive processes. Movement language has advantages over formal language because it begins much earlier than spoken language, is a rapid form of communication, occurs constantly, and has universal meanings throughout the human life-span. The youngest humans speak this language.

In highlighting current findings, I have sorted the data into three types of body language: (1) self-initiated, (2) reactive, and, (3) interactive movements. Examples include facial expressions, sounds, hand signals, leg and arm movements, swallowing, sucking, breathing movements, sleeping/dreaming, and heart activity. These three categories are not meant to represent isolated or mutually exclusive behaviors, nor do they exhaust the possibilities. They do provide new perspectives on the earliest observable origins of human behavior.

Self-Initiated Movement

Fetal movements, documented by ultrasound as early as the sixth week of gestational age (g.a.), increase steadily until most of the movement repertoire is visible between 8 and 10 weeks. By 10 weeks, hand-to-hand, hand-to-face, hand-to-mouth movements, independent flexion and extension movements of the limbs, rotational movements of the fetus along its longitudinal axis, swallowing, and mouth opening and closing have been recorded via ultrasound (Tajani & Ianniruberto, 1990). From 10–12 weeks onward, seasoned observers describe the movements as endogenous, spontaneous, and graceful, not as reflexive (Prechtl, 1985; deVries et

al., 1985). Spontaneous motility occurs earlier than evoked motility – a fact of embryonic life seldom noted (See Tajani & Ianniruberto, 1990; Provine, 1989). Twins in utero often show highly independent motor profiles and, over time, continue to distinguish themselves motorically both inside and outside the womb (Gallagher et al. 1992).

During their first trimester, individuals may exercise for as long as 7.5 minutes. The longest rest period in one study was 5.5 minutes (Van Dongen & Goudie, 1980). An analysis of third trimester motion indicates that the early movements continue throughout gestation until the intra-uterine space becomes too crowded (Roberts et al. 1980).

As the fetus grows longer, it is generally corralled into a longitudinal lie. William Liley (1972) discovered that babies move from one end of the uterus to the other by propelling themselves with their feet and legs. Changing sides, however, requires an elegant longitudinal spiral roll requiring a twist of the spine, rotation of the head and shoulders, and use of long spinal muscles. First seen by Liley at 26 weeks g.a., this ballet-like movement was not expected until two or three weeks after term when babies had adjusted to gravity and to "dry land."

Before 10 weeks, the fetus is taking in fluid via the open mouth. Swallowing and tongue movements occur in advance of 14 weeks when studies show the taste buds have matured (Cowart, 1981). Subsequently, swallowing will increase in response to sweet tastes offered in utero, but will decrease in response to bitter tastes (deSnoo, 1937). The preference for sweets continues to be strong, as revealed by experiments with both premature (Tatzer et al. 1985) and with full-term babies (Kobre & Lipsitt, 1972; Desor et al. 1973).

Sucking, first seen around 9 weeks, becomes a pastime, involving hands, fingers, feet, and toes. Thumb-sucking may be frequent enough to produce a callous which is visible at birth. After birth, the characteristic pauses, speeds, and bursts of sucking are a useful means of communication between babies and experimental psychologists.

Male erections (in conjunction with thumb-sucking) were first discovered at 26 weeks (Hitchcock et al, 1980). but with improved technology, erections can now be identified before 16 weeks g.a. – a time long before any consideration has been given to "infantile" sexuality.

In utero, fetal hands are constantly busy grasping not only feet and toes, but, more often, the ever-present umbilical cord, prompting one psychologist to suggest that babies might squeeze it tightly enough to produce altered states of consciousness (Straub, 1971, 1992). The continual interaction of hands, cord, toes, and face in the womb precedes the hand-mouth coordination noted by Butterworth & Hopkins (1988) after birth and the coordination and coupling of arm movements found shortly after birth by von Hofsten & Ronnqvist (1993).

With the aid of Doppler and ultrasound techniques, it has been possible to study fetal breathing movements (FBM's) (Johnson et al. 1989; Johnson & Johnson, 1993). These breathing movements appear in isolated bursts before the 24th week, become periodic around 28 weeks, and are uniform after 36 weeks. During the 3rd trimester, self-initiated breathing movements occur from 30 to 80 percent of the time and are considered a sign of good health. It is ominous when breathing movements diminish, as they do in response to maternal ingestion of barbiturates

and nicotine (Johnson, et al. 1989, Table 1). Fetuses stop breathing within minutes after a pregnant woman drinks vodka and ginger ale and do not begin these movements again until after the blood alcohol level has normalized (Fox et al. 1978).

Sleep studies of premature babies reveal intense dreaming activity (Roffwarg et al. 1966). In fact, the youngest preemies are the greatest dreamers. The percentage of dream time in sleep is about 100% at 30 weeks, diminishes to 67% from 33–35 weeks, dips below 50% at 40 weeks, and reduces to 30% by six months of post-natal age. Dreams occur in "active" sleep when body language is vigorous and at times dramatic. Observers see grimaces, whimpers, smiles, twitches of the face and extremities, and shifting of body and limbs.

During the rapid eye movements (REM's) that signal dreaming, there are frequent 10–15 second episodes of writhing of torso, limbs, and digits, suggesting the babies are having bad dreams. In contrast, babies seem also to have good dreams as evidenced by expressions of pleasure and graceful, peaceful movements. While a premature infant is dreaming, observers note a variety of expressions reflecting thought and emotion which are not part of the repertoire of the same babies when they are awake.

The first human smiles are usually seen on the faces of premature babies while they are dreaming (Emde et al. 1971). Awake babies born at term rarely smile but may be caught smiling in dreams. In Thailand, both reactive and spontaneous smiling in the first week after birth was observed in a group of babies who had participated in a prenatal stimulation program (Panthuraamphorm, 1993). Normally, babies are expected to smile in response to an adult smile at 46 weeks g.a., that is, about six weeks following full-term birth.

However, smiling during the REM state is possible as early as 23 weeks g.a. when the first REM's have been sighted via ultrasound. REM movements – and the possibility of smiles – become progressively more frequent until 36 weeks g.a. when a new state of "deep" sleep (non-REM) first occurs (Birnholz, 1981). In addition to the smiles that occur when babies are dreaming, some babies are smiling when they are awake and are interacting with a twin in utero.

Reactive Movements

Reactive body language is inspired by something happening in the environment: this reactive body language includes defensive, self-protective, and perturbed reactions. These constitute self-regulatory behavior (Lipsitt, 1990) or creative "coping" with the environment (Sternberg, 1988) – behaviors attributed to newborns or older children but not to prenates. Defensive behavior can be seen as early as seven weeks g.a. when an embryo reacts to a light hair stroke on its cheek by moving the head away, bending the trunk and pelvis, and extending arms and shoulders to push the hair away. Sensitivity to such strokes extends to the genital area by 10 weeks, and to the palms, arms, to the legs at 11 weeks, and to the soles of the feet by 12 weeks. By seventeen weeks, virtually all parts of the fetal body react to the light stroke of a single hair (Humphrey, 1978).

Fetal reactions to mother begin early. Between 10 and 15 weeks g.a., when a mother coughs or laughs, nearly all fetuses will move within seconds (Tajani & Ianniruberto, 1990).

Between 14 and 16 weeks g.a., when amniocentesis is usually done, fetuses react to needles entering the womb. Mothers, watching the procedure via ultrasound, have seen babies retreat from or attack the needle even though the babies' eyes are fused from about week 10 to week 26. Birnholz and colleagues (1978) viewed a 24-week prenate who was accidentally hit by a needle. The baby twisted away from it, located it with his arm, and struck the barrel of the needle repeatedly. This movement reveals keen sensory awareness, instant defensive activity, and precisely-focused aggression.

Following amniocentesis, some babies have become motionless, as if shocked by what has happened. Heart rates rise, plunge, and lose beat-to-beat variability (Ron & Polishuk, 1976; Neldham & Peterson, 1980). Also, fetal breathing movements are sharply reduced and may not return to the previous rate for several days (Manning et al. 1977; Hill et al. 1979). Experts are puzzled at such marked reactions to the removal of a small amount of amniotic fluid, but the body language of the babies speaks of alarm and distress. An obstetrician, poised to work with a fetal blood vessel via ultra-sound, tells us, "I was just about to strike when out of nowhere came this hand to knock away the needle" (Baker, 1978).

Fetal sensitivity to light is exquisite. A bright light shining on the fetal vertex through the abdominal wall will speed up the heartbeat. This acceleration is predictable enough to serve as a clinical test of fetal well-being (Smyth, 1965; Pegeg & Goldman, 1980).

Prenates react to music in discriminating ways. Fetuses have kicked hard enough to break their mothers' ribs during rock concerts (Olds, 1886). In another case, high-volume rock music played constantly at home left a pregnant mother with a thoroughly bruised abdomen. When the mother dropped the volume to half, the bruising gradually disappeared. Fetuses are known to become hyperactive during violent movies, prompting expectant mothers to exit the theater.

Several experiments have shown prenates calming down to passages from melodious classical pieces (Clements, 1977; Feijoo, 1981) lullabies and children's songs (Satt, 1984; Woodward, 1992) and even to soap opera theme music (Hepper, 1991). These reactions to sound have demonstrated learning and memory (See also Querleu et al. 1988 and Busnel et al. 1992).

The essential structures for hearing are in place by 25 weeks g.a., but earlier listening may utilize the vestibular and somatosensory systems (Blum, 1991). Shahidullah & Hepper (1992), using a combination of sound and ultrasound to detect early deafness, discovered that fetuses begin to react to sound at only 16 weeks g.a., 8 weeks before the ear is structurally complete. This means that prenates are listening and reacting to sound for six months before birth.

Hepper (1992) has also found that movement response latencies in response to a pure tone auditory stimulus are predictable. Thus, fetal listening behavior can be used to detect the severity of chromosomal and genetic abnormalities early in gestation.

Experiments using vibration and sound reveal fetal habituation learning (e.g., Leader et al. 1982 and Madison et al. 1986. For reviews see Busnel et al. 1992

and Kiselevsky & Muir, 1991). In these experiments fetal movement is recorded via ultrasound and fetal heart rate via Doppler. By 29 weeks g.a., fetal heart rate accelerations of up to 10 beats a minute are associated with the first vibrator trials (Kisilevsky et al. 1992). From 26 to 36 weeks, the percentage of fetuses responding with movement on the first vibrator trial increases from 58% to 100%, offering the opportunity to investigate prenatal learning.

Fetal movement was the means for demonstrating conditioned learning in an early experiment by Spelt (1948) later replicated by Hepper (1993). Feijoo (1981) conditioned a group of fetuses using the bassoon theme from Prokofiev's "Peter and the Wolf." After their births, when Feijoo's subjects heard this music, they stopped any crying and exhibited fewer clonic movements.

Reactive movement helps to establish the origins of emotion in the prenatal period. Protest kicking in reaction to violent-sounding music expresses strong feeling. Perhaps the earliest evidence for emotion can be seen in abortuses who are squinting, scowling, and sneering between 12 and 15 weeks g.a. (Humphrey, 1978). In an early literature review, Humphreys found several reports of audible crying between 21 and 23 weeks g.a. associated with therapeutic abortions. Crying is a dramatic expression of emotion. Henry Truby (1975), one of the first researchers to apply acoustic technology to the infant cry, reported audible crying in a 900 gram (26–27 week) abortus.

Because audible crying requires a supply of air available to the fetal larynx, it has never seemed credible that there could be any crying in the womb. However, under conditions where air is introduced to the uterus and reaches the fetal larynx, crying can be heard. This condition, vagitus uterinus, literally "squalling in the womb," is rare, but over 140 cases have been documented in the medical literature (See Ryder 1943.) Modern cases are usually associated with obstetrical procedures done near the end of gestation. Thus, we have a range of audible crying from 21 weeks to 40 weeks g.a. Yet, books on the development of emotion are silent on this evidence (e.g., Greenspan & Greenspan, 1985).

Reluctance to believe babies experience emotions before they are born is probably related to the refusal to believe that prenates and infants could feel pain. During the 20th Century, most medical practitioners have insisted that infants felt no pain: no pain in utero, no pain at birth, no pain at circumcision, and no pain even during major surgery! Refusal to believe babies feel emotion and pain means that much of the medical community has been unwilling or unable to read body language.

Ironically, surgeons have typically blocked body language by using curare, a muscle-paralyzing agent, to prevent movement and expression during surgery. Disbelief in the possibility of infant pain and obscuring it with curare has had dire consequences for babies. Reform to correct these abuses has only begun during the last decade (See Gottfried & Gaiter, 1985; Anand & Aynsley-Green, 1985; Harrison, 1986; Anand & Hickey, 1987; Rana, 1987; Giannakoulopoulos et al. 1994).

Infant crying is body language designed to reflect a range of feelings. The ferocity of crying after birth often pushes the heart rate to peaks in excess of 200 beats per minute (Pillai & James, 1990) and is not a benign phenomenon. Sophisticated measurement of cries during the last quarter century has revealed the

special cry sounds associated with types of illness, chromosomal abnormalities, starvation, and other types of suffering (See Lester & Boukydis, 1985). Crying is such a prominent feature of infant life it is acknowledged as a fifth behavioral state, joining (1) quiet sleep, (2) active sleep or REM sleep , (3) quiet awake, and (4) active awake states (See Prechtl, 1977 and Robinson & Smotherman, 1992).

Interactive, Social Movement

Perhaps the most surprising documentation of social interaction in utero comes from the systematic observation of twins via ultrasound. Alessandra Piontelli began publishing such observations in 1987. For example, she watched by the hour as Luca and Alicia met and touched each other gently through the membrane which divided them (1992). At 20 weeks, g.a., the boy was very active and vigorous, while his sister was quiet and sleepy. Periodically, he would come to the membrane and gently awaken her. She always responded. The two would rub heads, play cheek-to-cheek, seemed to kiss and hug, stroke each other's faces, and rub their feet together before returning to their separate activities. Dr. Piontelli and the twins' parents, who also watched the ultrasound images, nicknamed them "the kind twins."

The quality of their relationship at 20 weeks continued after their births. At one year of age, they could walk, were beginning to talk, and took great delight in playing together, sometimes standing on either side of a curtain and touching each other as they had done in the womb, an activity accompanied by giggles and smiles.

Such detailed recordings of fetal interaction are rare, but are not unique. Timothy Johnson (1993) has a video of twins engaged in what he describes as a "slug fest." A pediatrician at a twin study center has observed one twin "punching" another in utero. Birgit Arabin (1994), a prolific researcher with ultrasound, has a video showing twins kissing. I am told that the twin receiving the kiss wears a blissful expression. Such fetal twin sonograms document emotion along with social interaction.

Twins remind us of what we should already know intuitively: the womb is an interactive environment where relationships are more likely to be "duocentric" than "egocentric" (Freeman, 1987). Fetus and mother eat, sleep, exercise, smoke, take medicine, and have accidents together. When a psychotic husband goes on a rampage, both mother and fetus show distress (Sontag, 1966). During an earthquake in Italy, babies inside their pregnant mothers showed intense hyperkinesia lasting from two to eight hours, long after their mothers had quieted down (Ianniruberto & Tajani, 1981).

When a mother watches something horrible on television, her fetus can be measurably upset (Correia, 1987, 1994; Van den Bergh, 1992). Fetuses become more active when their mothers are waiting for amniocentesis than when their mothers are waiting for a much less serious routine sonogram (Rossi et al. 1989).

Inevitably, babies in the womb are drawn into their parents' sexual encounters. By the third trimester, they react to parental orgasms with wildly erratic heart rates: bradycardia, tachycardia, accelerations, and decelerations greater

than thirty beats per minute, and, in some cases, loss of beat-to-beat variability (Chayen et al. 1986; Goodlin et al. 1972).

In a popular program of prenatal stimulation and bonding (Van de Carr & Lehrer, 1992), parents are taught to pay attention to kicking movements in order to create an interactive game. Parental touching in response to kicks encourages prenates to kick on cue and to kick in the place that is touched. In a similar experiment, a Canadian father routinely greeted his unborn baby every evening, speaking close to the abdomen (Freeman, 1987). In the 25th week g.a., the baby responded by pushing a foot up to meet his touch. When he repeated his greeting on the opposite side, he was rewarded by a foot reaching up to him on that side also. This father and baby continued playing this kicking game for fifteen weeks until the child was born. (The same communication game worked with their next child also.)

Other demonstrations of social interaction can be seen in the prenatal learning of musical passages, stories, the voice of the mother and father, and the sounds of the parents' native language, compared with other languages. Babies pay keen attention to voices (especially their mothers') and distinguish phonemes like /bi/ and /ba/, the smallest units of speech (DeCasper & Fifer; DeCasper & Spence, 1982; Moon et al., 1993; and Hepper, 1988). Such demonstrations establish earlier time-lines for the types of learning which newborns have demonstrated (e.g., see Blass et al. 1984; Slater et al. 1984; Zelazo et al. 1989; and Moon and Fifer, 1990). These learnings depend on having a host of interactions with parents.

Recently, DeCasper and colleagues in France (1994) had mothers repeat a simple children's rhyme daily from week 33 to week 37 of gestation. At the end of four weeks, the prenates – still in the womb – signaled by a change in heart rate that they recognized the target rhyme to which they had been exposed. They showed no heart reaction to an unfamiliar rhyme.

In modern times, the body language of babies born prematurely provides us with a continuous look at the previously hidden behavior of infants between 25 and 40 weeks of gestation. This makes the neonatal intensive care unit a new window on early development and a laboratory for prenatal psychology. In a series of experimental interventions, psychologist Tiffany Field and colleagues have offered premature babies various experiences of touch ex utero. Touch improved the babies' breathing, reduced their startle responses, diminished their fist clenching, and increased wakefulness and activity (Field, 1990). Thoman, Ingersoll, and Acebo (1991) discovered that premature babies would reach for and increasingly contact a "breathing" teddy bear, but showed no particular interest in an ordinary, non-breathing teddy bear. Over time, the babies learned from the slow-breathing teddy bears to spend more time in quiet sleep. The experiment demonstrated that these preemies had perceptions, preferences, and abilities to learn and remember from their social interactions. This suggests that babies of the same age, still residing in utero, have these abilities and preferences. Field and colleagues (1983) also discovered that preemies of 35 weeks g.a. can imitate certain adult facial expressions and gestures just as newborns do (Meltzoff & Moore, 1977, 1985; Reissland, 1988; Vintner, 1986). Such engaging and expressive body language, generated in the context of social encounters is not expected from such "immature" babies.

Mosser (1989) has demonstrated the extraordinary sensitivity of premature infants to language spoken directly to them, compared to language directed to others. When someone speaks directly to a premature infant, its heart rate accelerates. When the speaker turns to another person, however, the baby's heart rate slows. When the speaker returns to direct attention to the baby, its heart rate rises again. This discriminating preference for infant-directed rather than adult-directed speech is shared also by full-term newborns (Cooper & Aslin, 1990).

Infant response to music can be magical. In a nursery for premature babies, playing Brahm's "Lullaby" speeded weight gain without any increase in caloric intake (Chapman, 1975)! In another experiment with intubated, agitated preemies, soothing music improved both oxygen absorption and behavioral states (Collins & Kuck, 1991). These suffering, irritable babies responded positively to cassette tapes of womb sounds, and to the sound of female singing, as it would have been heard in the womb. Babies seem to hunger for and thrive on the social environment of the womb.

This is further demonstrated in an experiment with low birth-weight pre-term babies under 2,000 grams. Babies were placed in a specially-designed crib which moved in a gentle "butterfly" pattern to mimic the feel of a mother's walking. In addition, intrauterine sounds were played (Gatts, et al, 1994). Babies assigned to these "walking" and "gurgling" cribs responded by growing more rapidly, breathing better, and tested as more emotionally and mentally mature than did their counterparts who were assigned to conventional cribs. The babies who felt the walking motion and heard familiar intra-uterine sounds left the hospital eight days earlier than did the control babies in ordinary cribs. Growing and thriving is body language par excellence.

Implications and Conclusions

1. New technology allows us to systematically observe fetal behavior and read fetal body language as never before. This makes it possible for us to understand ourselves from the earliest days and weeks of gestation.
2. Current research reveals prenatal pain perception, preferences, interests, learning, memory, aggressive behavior, emotional states of fear, anger, crying, smiling, and affection. Although unpredicted by medicine or psychology, this body language speaks for itself.
3. Self-initiated, spontaneous movement is a manifestation of interest, need, and personality. This movement expresses choice, will, and agency.
4. Movement in reaction to outside forces reveals surprising awareness and sensitivity. Acts of self-defense represent both tough and creative efforts to cope with environment from the earliest weeks of gestation.
5. Interactive movements reveal an innate capacity for intimate and social relationships whether between twins in utero or between infants and their families. These interpersonal relationships become organized around learning and memory.
6. Developmental psychology has been slow to integrate new data regarding behavior before birth and to acknowledge prenatal cognition and emotion. Similarly, the protocols of neonatology and obstetrics still generally reflect

19th Century concepts of life before birth. Most damaging has been the denial of infant pain and its persistence in memory.

7. Prenates and newborns are sentient beings who learn from experience. They are therefore vulnerable to psychic and physical trauma from early in gestation. Parents and birth professionals have the responsibility to protect babies and prevent needless suffering.
8. Therapists working with persons of all ages should understand that the primal period is not a grace period before life starts but is, in fact, formative in shaping the way people feel, think, and approach life. In primal experience, the foundations are laid for health, love and fear.
9. For some observers of prenatal body language, "seeing is believing" and leads to acceptance of the mental and emotional nature of life before birth. Others doubt what they see and remain wedded to the prevailing materialist paradigm of baby as brain matter. They criticize interpretations of early cognition, emotion, and personality as "anthropomorphic."
10. As observations of prenatal life continue to be amassed, I believe it will become more obvious that human consciousness both precedes and supersedes physical development of body and brain. If we give prenates the respectful attention they deserve, they will play a leading role in the construction of a larger paradigm describing who we are as human beings.

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