PREGNANCY AND BIRTH
From Robert Wallace, *Biology: The World of Life*  

The First Trimester

In the first trimester the embryo begins the delicate structural differentiations that will lead to its final form. It is therefore particularly susceptible during this period to any number of factors that might influence its development. In fact the embryo often fails to survive this stage.

The first cell divisions result in cells that all look about alike and have roughly the same potentials. In other words, at this stage the cells are, theoretically anyway, interchangeable. Seventy-two hours after fertilization the embryo will consist of sixteen such cells. (So, how many divisions will have taken place?) Each cell will divide before it reaches the size of the cell that has produced it; hence the cells will become progressively smaller with each division. By the end of the first month the embryo will have reached a length of only $\frac{1}{3}$ inch, but it will consist of millions of cells.

In the second month the features of the embryo become more recognizable. Bone begins to form throughout the body, primarily in the jaw and shoulder areas. The head and brain are developing at a much faster rate than the rest of the body, so that at this point the ears appear and open, lidless eyes stare blankly into the amniotic fluid. The circulatory system is developing and blood is pumped through the umbilical cord out to the chorion, where it receives life-sustaining nutrients and deposits the poisons it has removed from the developing embryo. The nitrogenous wastes and carbon dioxide filter into the mother’s bloodstream, where they will be circulated to her own kidneys and lungs for removal. At about day 46 the primordial reproductive organs begin to form, either as testes or ovaries, and it is now, for the first time, that the sex of the embryo becomes apparent. Near the end of the second month fingers and toes begin to appear on the flattened paddles which have formed from the limb buds. By this time the embryo is about two inches long and is more or less human in appearance; it is now called a fetus. Growth and differentiation continue during the third month, but now the fetus begins to move. It breathes the amniotic fluid in and out of bulblike lungs and swallowing motions become distinct. At this point individual differences can be distinguished in the behavior of fetuses. The clearest differences are in their facial expressions. Some frown a lot; others smile or grimace. It would be interesting to correlate this early behavior with the personality traits that develop after birth.
The Second Trimester

In the second trimester the fetus grows rapidly, and by the end of the sixth month it may be about a foot long, although it will weigh only about a pound and a half. Whereas the predominant growth of the fetus during the first trimester was in the head and brain areas, during the second trimester the body grows at a much faster relative rate than the brain and begins to catch up in size with the head.

The fetus is by this time behaving more vigorously. It is able to move freely within its sea of amniotic fluid and the delighted mother can feel it kicking and thrashing about. Interestingly, the fetus must sleep now, so there are periods when it is inactive. It is capable of reacting to more types of stimuli as time passes. For example, by the fifth month the eyes are sensitive to light, although there is still no sensitivity to sound. Other organs seem to be complete, but remain nonfunctional. For example, the lungs are developed, but they cannot exchange oxygen. The digestive organs are present, but they cannot digest food. Even the skin is not prepared to cope with the temperature changes in the outside world. In fact, at the end of the fifth month the skin is covered by a protective cheesy paste consisting of wax and sweatlike secretions mixed with loosened skin cells \( (vernix caseosa) \). The fetus is still incapable in nearly all instances of surviving alone.

By the sixth month the fetus is kicking and turning so constantly that the mother often must time her own sleep periods to coincide with her baby's. The distracting effect has been described as similar to being continually tapped on the shoulder, but not exactly. The fetus moves with such vigor that its movements are not only felt from the inside, but can be seen clearly from the outside. To add to the mother's distraction, the fetus may even have periods of hiccups. By this stage it is so large and demanding that it places a tremendous drain on the mother's reserves.

At the end of the second trimester the fetus has the unmistakable appearance of a human baby (or a very old person, since its skin is loose and wrinkled at this stage). In the event of a premature birth around the end of this trimester, the fetus may be able to survive.

The Third Trimester

During the third trimester the fetus grows until it is no longer floating free in its amniotic pool. It now fills the abdominal area of the mother. The fetus is crowded so tightly into the greatly enlarged uterus that its movement is restricted. In these last three months the mother's abdomen becomes greatly distended and heavy, and her posture and gait may be noticeably altered in response to the shift in her center of gravity. The mass of tissue and amniotic fluid that accompanies the fetus ordinarily weighs almost twice as much as the fetus itself. Toward the end of this period, milk begins to form in the mother's mammary glands, which in the previous trimester have undergone a sudden surge of growth.
At this time, the mother is at a great disadvantage in several ways in terms of her physical well-being. About 85 percent of the calcium she eats goes to the fetal skeleton, and about the same percentage of her iron intake goes to the fetal blood cells. Of the protein she eats, much of the nitrogen goes to the brain and other nerve tissues of the fetus.

Some interesting questions arise here. If a woman is unable to afford expensive protein-rich foods during the third trimester, what is the probability of a lowered I.Q. in her offspring? On the average the poorer people in this country show lower I.Q. scores. Are they poor because their I.Q.’s are low, or are I.Q.’s low because they are poor? Is there a self-perpetuating nature about either of these alternatives?

In the third trimester, the fetus is large. It requires increasingly greater amounts of food, and each day it produces more poisonous wastes for the mother’s body to carry away. Her heart must work harder to provide food and oxygen for two bodies. She must breathe, now, for two individuals. Her blood pressure and heart rate rise. The fetus and the tissues maintaining it form a large mass that crowds the internal organs of the mother. In fact, the crowding of the fetus against the mother’s diaphragm may make breathing difficult for her in these months. Several weeks before delivery, however, the fetus will change its position, dropping lower in the pelvis (called “lightening”) and thus relieve the pressure against the mother’s lungs.

There are important changes occurring in the fetus in these last three months, and some of these are not very well understood. The effects of these changes, however, are reflected in the survival rate of babies delivered by Caesarian section (an incision through the mother’s side). In the seventh month, only 10 percent survive; in the eighth month, 70 percent; and in the ninth, 95 percent survive.

Interestingly, there is another change in the relationship of the fetus and mother at this time. Whereas measles and certain other infectious diseases would have affected the embryo during the first trimester of pregnancy, at this stage the mother’s antibodies confer an immunity to the fetus, a protection that may last through the first few weeks of infancy.

At some point about 255 to 265 days from the time of conception the life-sustaining placenta begins to break down. Certain parts shrink, the tissue structure begins changing, and the capillaries begin to disintegrate. The result is a less hospitable environment for the fetus, and premature births at this time are not unusual. At about this time the fetus slows its growth, and drops into position with its head toward the bottom of the uterus. Meanwhile, the internal organs undergo the final changes that will enable the newborn to survive in an entirely different kind of world. Its home has been warm, rather constant in its qualities, protected, and confining. It is not likely to encounter anything quite so secure again.

**Birth**

The signal that there will soon be a new member of the earth’s most dominant species is the onset of labor, a series of uterine contractions that usually
begin at about half-hour intervals and gradually increase in frequency. Meanwhile, the sphincter muscle around the cervix dilates, and as the periodic contractions become stronger, the baby's head pushes through the extended cervical canal to the opening of the vagina. The infant is finally about to emerge into its new environment, one that, in time, may give it the chance to propel its own genes into the gene pool of the species.

Once the baby's head emerges, the pattern of uterine contractions changes. The contractions become milder and more frequent. After the head gradually emerges through the vaginal opening, the smaller shoulders and the body appear. Then with a rush the baby slips into a new world. As soon as the baby has emerged, the umbilicus by which it is attached to the placenta is tied off and cut. The placenta is expelled by further contractions as the *afterbirth*. The mother recovers surprisingly rapidly. In other species, which deliver their young unaided, the mother immediately chews through the umbilicus and eats the afterbirth so that it will not advertise to predators the presence of a helpless newborn. Fortunately, the behavior never became popular in our own species.

The cutting of the umbilicus stops the only source of oxygen the infant has known. There is a resulting rapid buildup of carbon dioxide in the blood, which affects a breathing center in the brain. An impulse is fired to the diaphragm, and the baby gasps its first breath. Its exhaling cry signals that it is breathing on its own.

In American hospitals the newborn is then given the first series of the many tests it will encounter during its lifetime. This one is called the *Apgar test series*, in which muscle tone, breathing, reflexes, and heart rate are evaluated. The obstetrician then checks for skin lesions and evidence of hernias. If the infant is a boy, it is checked to see whether the testes have properly descended into the scrotum. A footprint is then recorded as a means of identification, since the new individual, despite the protestations of proud parents, does not yet have many other distinctive features that would be apparent to the casual observer. And there have been more than a few cases of accidental baby-switching.