

Life IN THE *womb*

HUMAN DEVELOPMENT FROM CONCEPTION TO BIRTH



At the moment of conception, when sperm meets egg, a new human being—independent of mother and father—comes into existence. For nine months this person grows and develops at a remarkable pace, nourished and protected by the mother's womb.

This development is hidden from direct observation, but advancing technology has allowed us to follow the child's growth and better understand the stages of preborn life.

From the act which results in the creation of a new life to the birth of a human being nine months later, this booklet tells a story of the one experience shared by every human being who has ever lived: life in the womb.

A note about pregnancy dating:

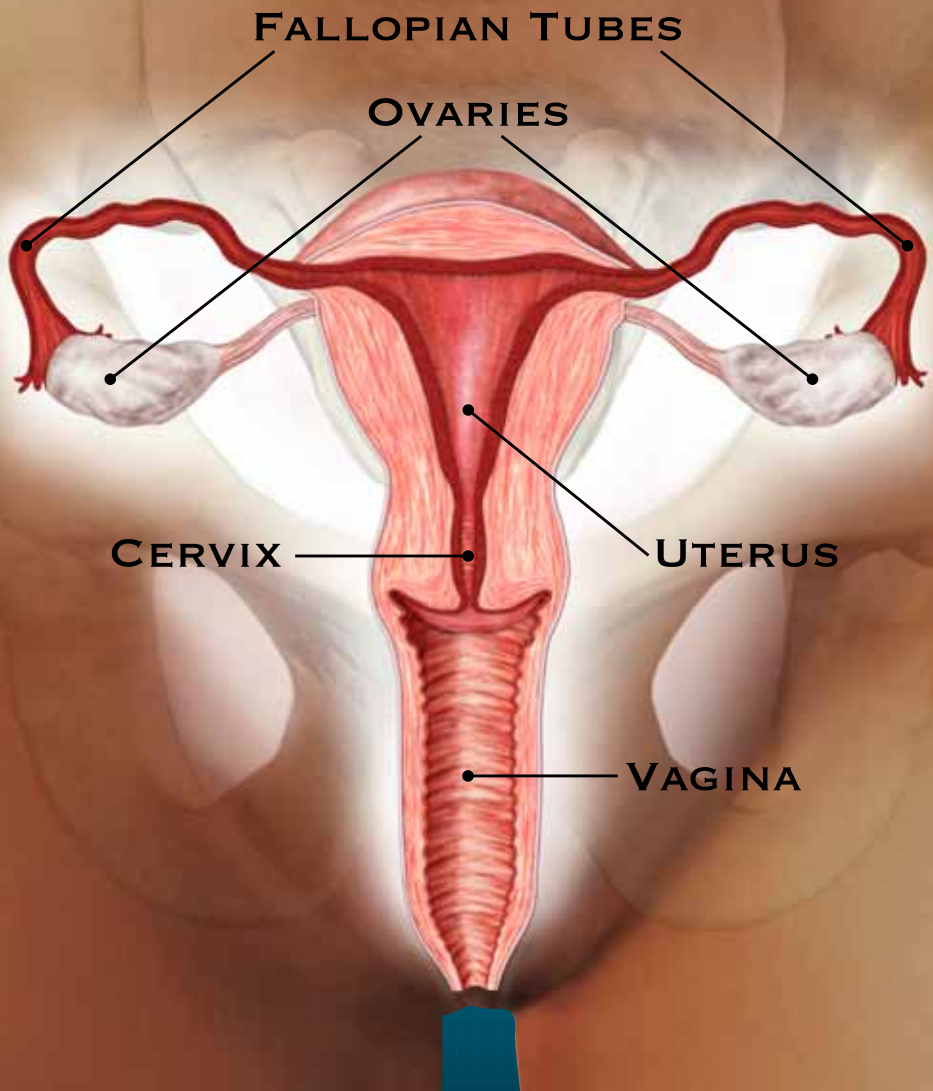
Pregnancy is generally dated by “gestational age,” in which day 1 of pregnancy is the first day of the woman's last menstrual period (LMP). Ovulation and fertilization generally occur around day 14, or two weeks, of a 40-week pregnancy term. By the time the woman's period is late, and she suspects she may be pregnant, the newly formed child is considered to be about “five weeks” old, even though fertilization actually took place only three weeks ago. The term of a pregnancy is measured in three trimesters: first, weeks 1–13; second, weeks 14–26; and third, weeks 27–40.

The circles on the bottom of each page designate the 40-week timeline of pregnancy. Each circle represents one week of pregnancy, from week 1 at far left to week 40 at far right. The marker on the timeline designates the week of pregnancy seen in each image. In addition, the colored highlights on each page indicate the corresponding trimester: green for first trimester ●, orange for second trimester ●, and red for third trimester ●.

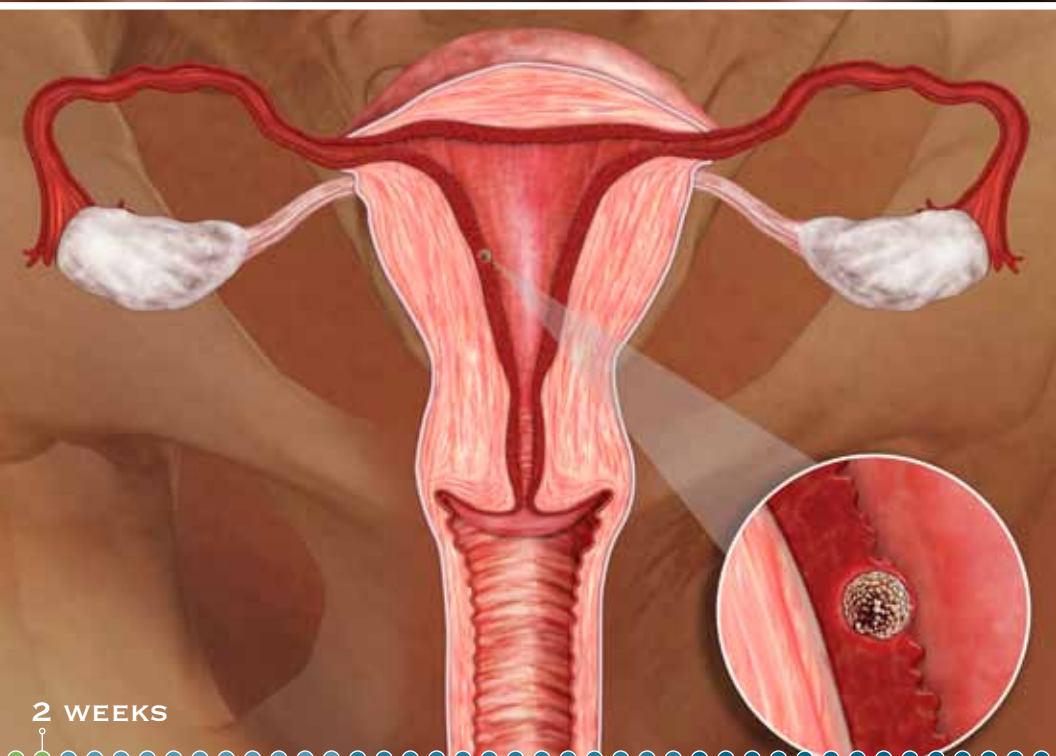
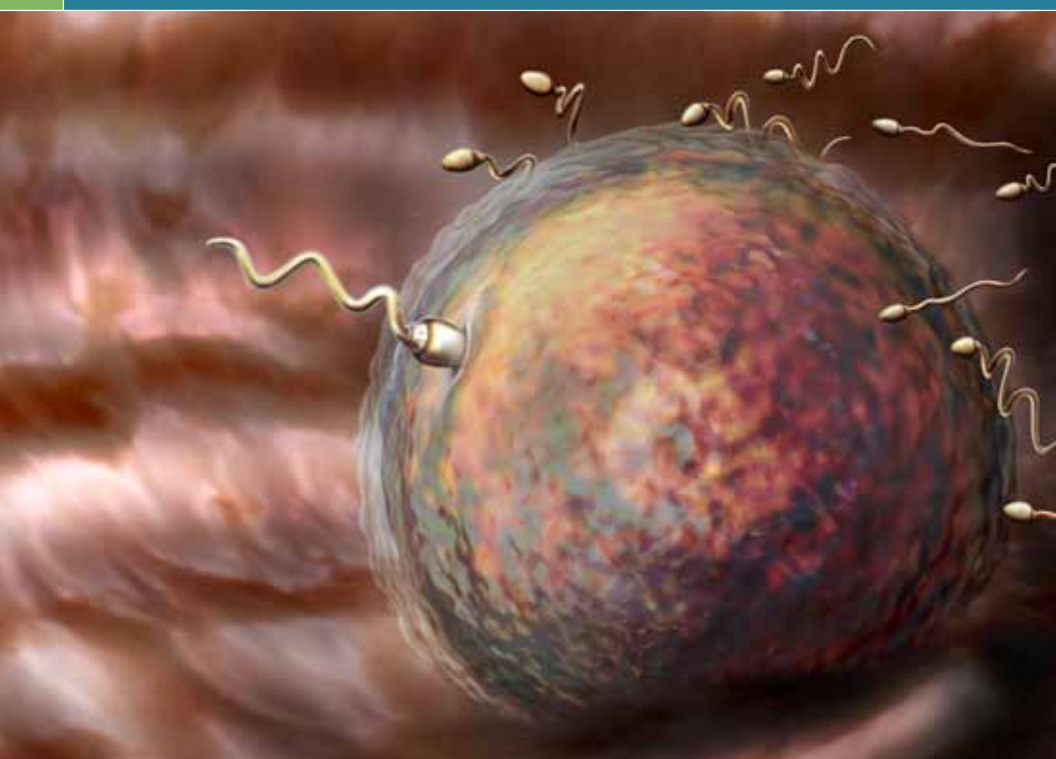
THE FEMALE REPRODUCTIVE SYSTEM

The ovaries are the female reproductive organs that produce eggs. During ovulation, an egg is released from one of the ovaries into the nearby fallopian tube. Upon ejaculation during sexual intercourse, the man's erect penis releases semen into the woman's vagina, where it then flows through the cervix into the uterus. The sperm contained in the

semen travel through the uterus into the fallopian tube and surround the egg, which is traveling in the opposite direction—from the ovary toward the uterus. If the egg is fertilized, a new human life has begun. For the first eight weeks of life this human being is called an embryo. From week nine of pregnancy until birth, this human being will be called a fetus.



FERTILIZATION & IMPLANTATION



2 WEEKS

FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

While semen contains millions of sperm, fewer than 1,000 sperm will make it to the egg. (The average number of sperm released during sexual intercourse ranges from 50 to 500 million.)

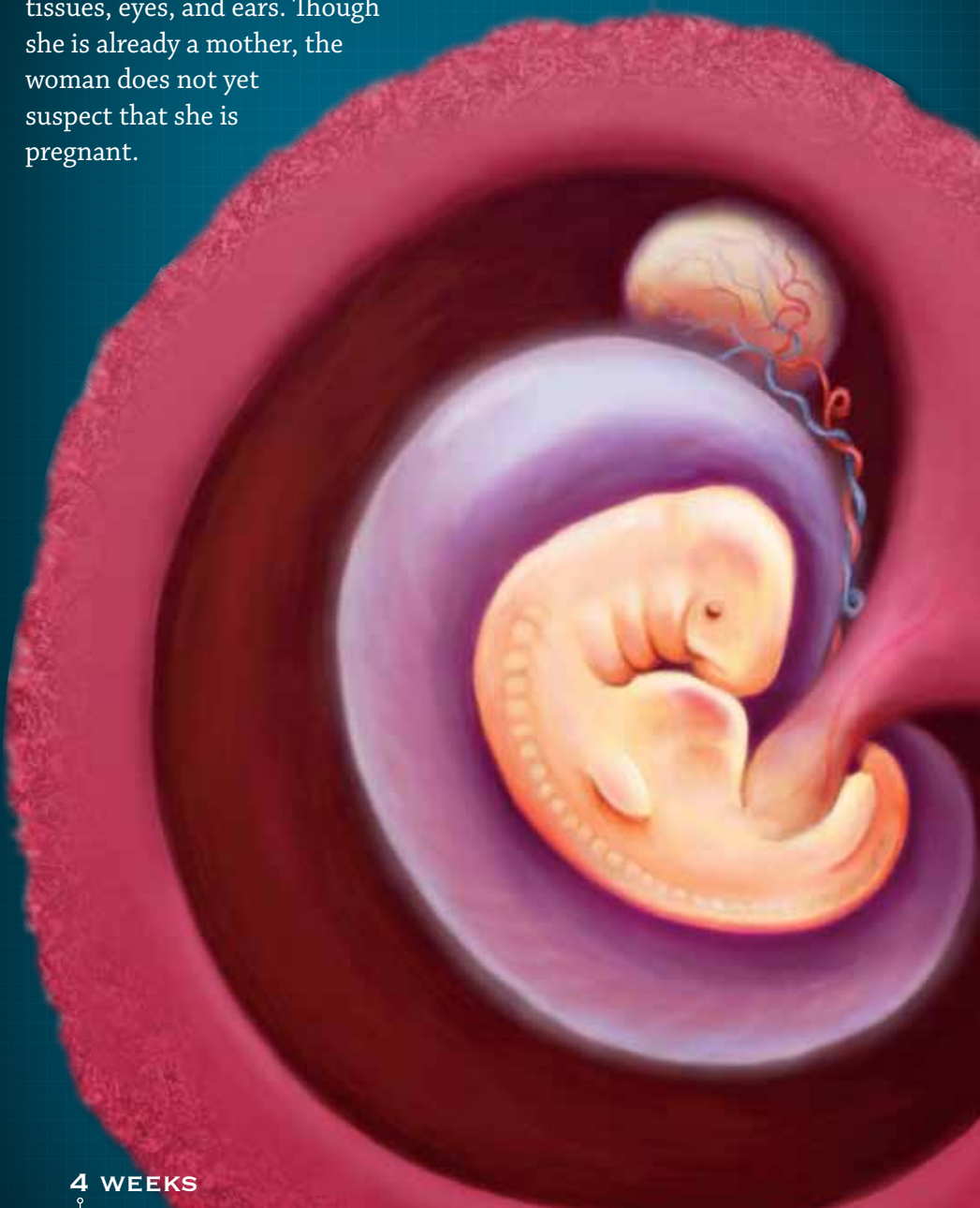
The head of each sperm contains the man's genetic material, called DNA, and the tail is used for movement. Each sperm is propelled forward by the whipping motion of its tail toward its destination—the egg.

The tip of the sperm contains enzymes to break through the outer layer of the egg. Once the egg has received a single sperm, it immediately creates a barrier to prevent penetration by additional sperm.

When a sperm penetrates an egg, the DNA from each parent combines to create a unique human being. Even though this human being, known now as a zygote, is only one cell at first, it is a distinct living organism and is completely separate from its parents. This single cell begins to multiply immediately—from one to two to four to eight to sixteen cells, and so on.

As the cells multiply within the zygote, the earliest stage of the human embryo, it continues to grow. It moves slowly through the fallopian tube toward the uterus, where it may implant into the lining of the uterus. If implantation occurs, the pregnancy will continue unless interrupted. The embryo will take approximately five days to reach the uterus, and it will be known as a blastocyst at this phase. The blastocyst is comprised of 70–100 cells. If implantation does not occur, the blastocyst will pass from the woman's body during menstruation, resulting in an early pregnancy loss.

Most organs and body structures have begun to form, including the brain and spinal cord, the heart, the stomach and intestines, bone tissues, eyes, and ears. Though she is already a mother, the woman does not yet suspect that she is pregnant.



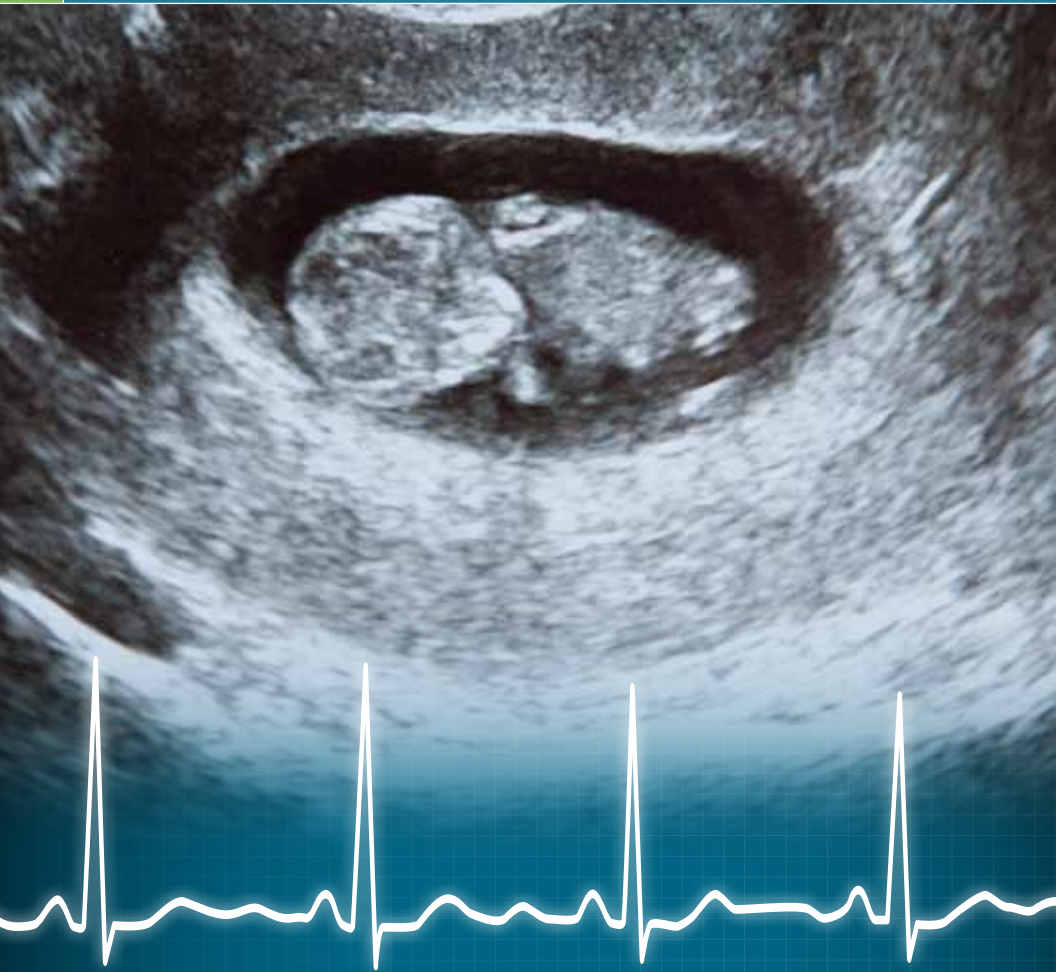
4 WEEKS

FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

THE FETAL HEARTBEAT



At five weeks' gestational age, or 21 days from conception, the embryo's heart will begin beating at a rate near the mother's, about 75–80 beats per minute (bpm). Within a month, the heart rate will have increased to a gestational peak of 185 bpm.

By the time this person has reached old age (80 years old), her heart will have beaten over 3.2 *billion* times!

*Note: Image above is of an 8-week embryo.
Used here for illustration purposes only.*

5 WEEKS

FIRST TRIMESTER

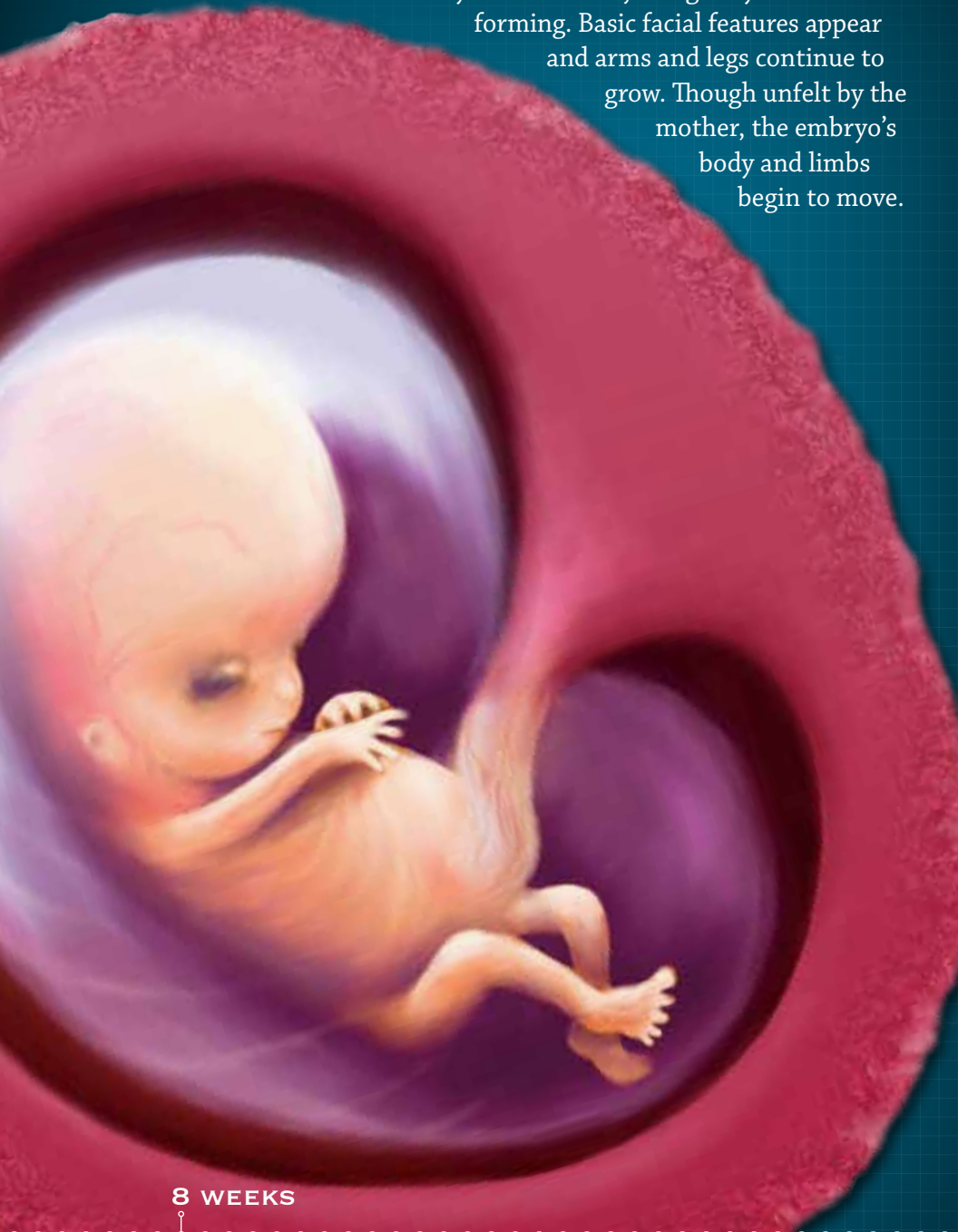
SECOND TRIMESTER

THIRD TRIMESTER

8 WEEKS

1.5 CM • 1 G | 0.5 IN. • 0.04 OZ.

By now, the embryo's heartbeat can be clearly heard on sonogram, and blood cells are circulating throughout the body. All of the major organ systems are now forming. Basic facial features appear and arms and legs continue to grow. Though unfelt by the mother, the embryo's body and limbs begin to move.



8 WEEKS

FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

The embryo is now known as a fetus, which in Latin means “young one.” This young one will soon start sucking her thumb. All essential internal organs are formed and functioning.



12 WEEKS

FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

The child can now make a fist with fingers that are fully differentiated. Fingernails can be seen and the child's skin is almost transparent. His arms have lengthened to be in proportion to the rest of his body.

In this photograph, oxygenated blood can be seen in the blood vessels running to the child's fingertips.

14 WEEKS

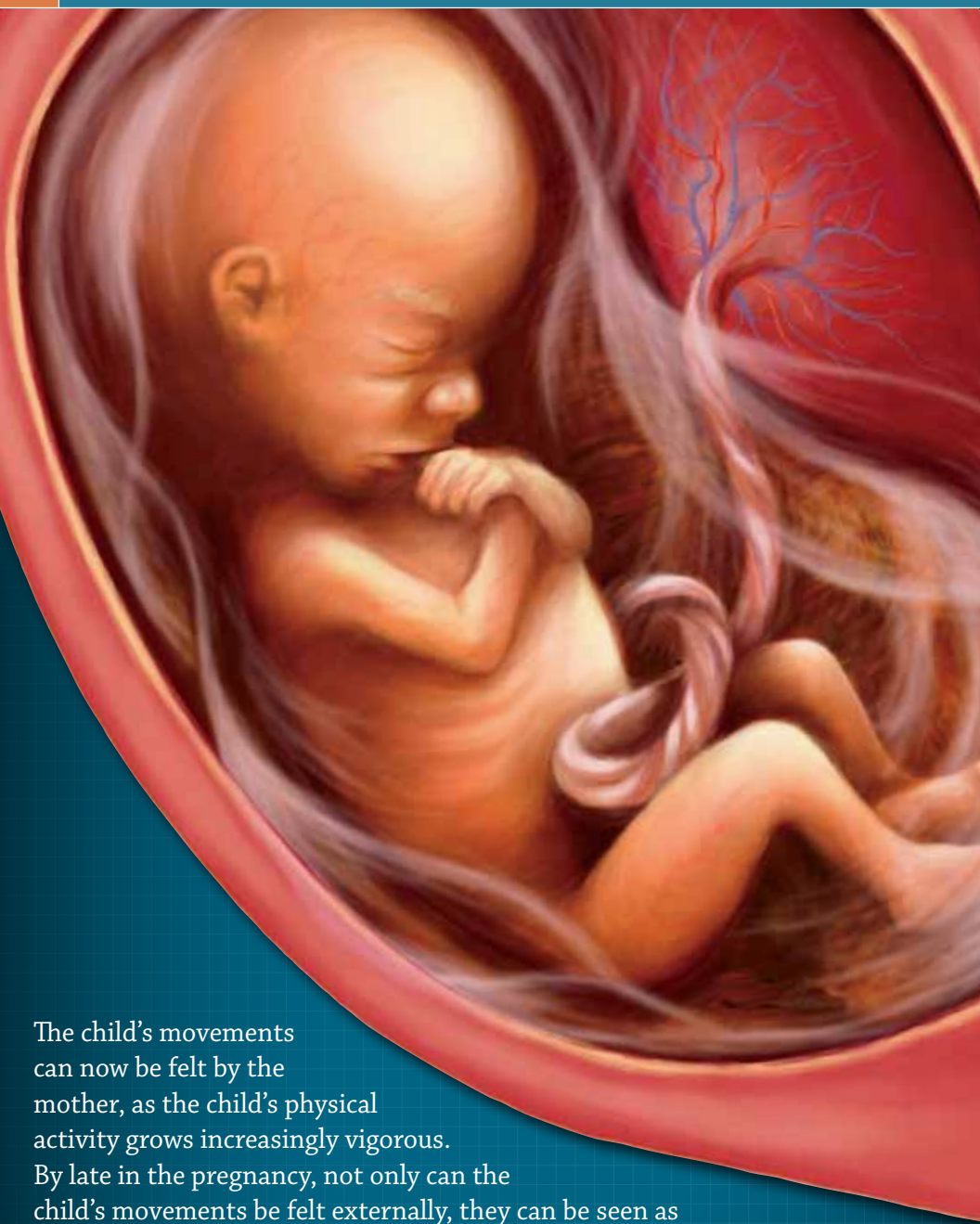
FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

16 WEEKS

12 CM • 100 G | 4.5 IN. • 3.5 OZ.



The child's movements can now be felt by the mother, as the child's physical activity grows increasingly vigorous. By late in the pregnancy, not only can the child's movements be felt externally, they can be seen as the growing child twists and turns in an increasingly confined space.

16 WEEKS

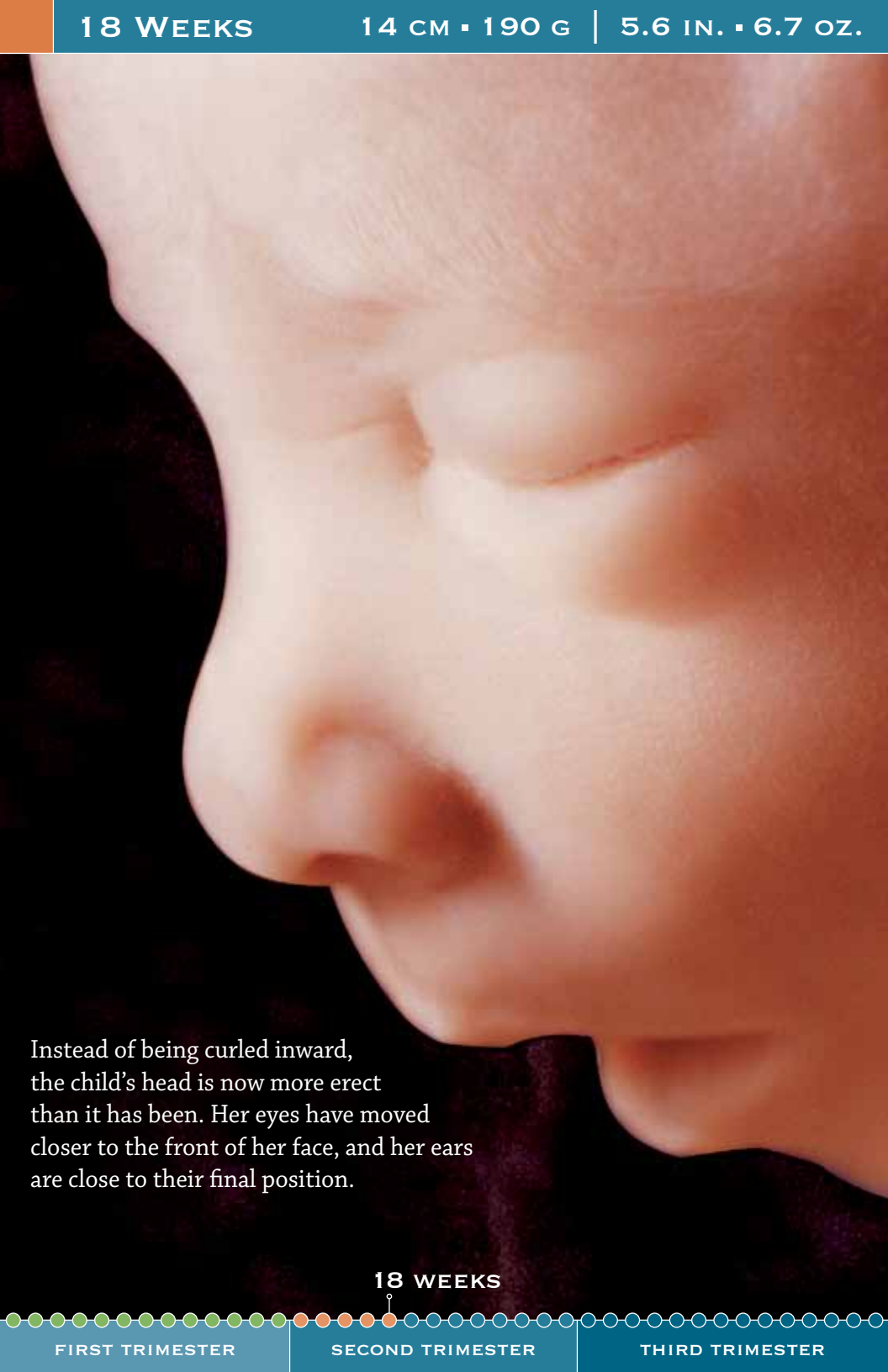
FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

18 WEEKS

14 CM • 190 G | 5.6 IN. • 6.7 OZ.



Instead of being curled inward, the child's head is now more erect than it has been. Her eyes have moved closer to the front of her face, and her ears are close to their final position.

18 WEEKS


FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

20 WEEKS

25 CM • 300 G | 10 IN. • 10.5 OZ.



Even though this fetus has been a unique human being since the moment of his conception, a significant outward form of that distinction can now be seen in his unique fingerprints and toe prints. Downy hair known as lanugo can be seen, and vernix, a waxy cream, coats and moisturizes the baby's skin. The child will likely have established waking and sleeping cycles by this point, and he may have even found a favorite position in which to sleep.

20 WEEKS

FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

24 WEEKS**30 CM • 600 G | 12 IN. • 1.3 LB.**

The child's ears can now perceive sounds from outside of the womb, and loud noises may even startle her. And though the mother can't hear her, the child's vocal cords are now active. If you were to peek into the womb through ultrasound, you'd be able to see her squinting, smiling, and frowning.

**24 WEEKS**

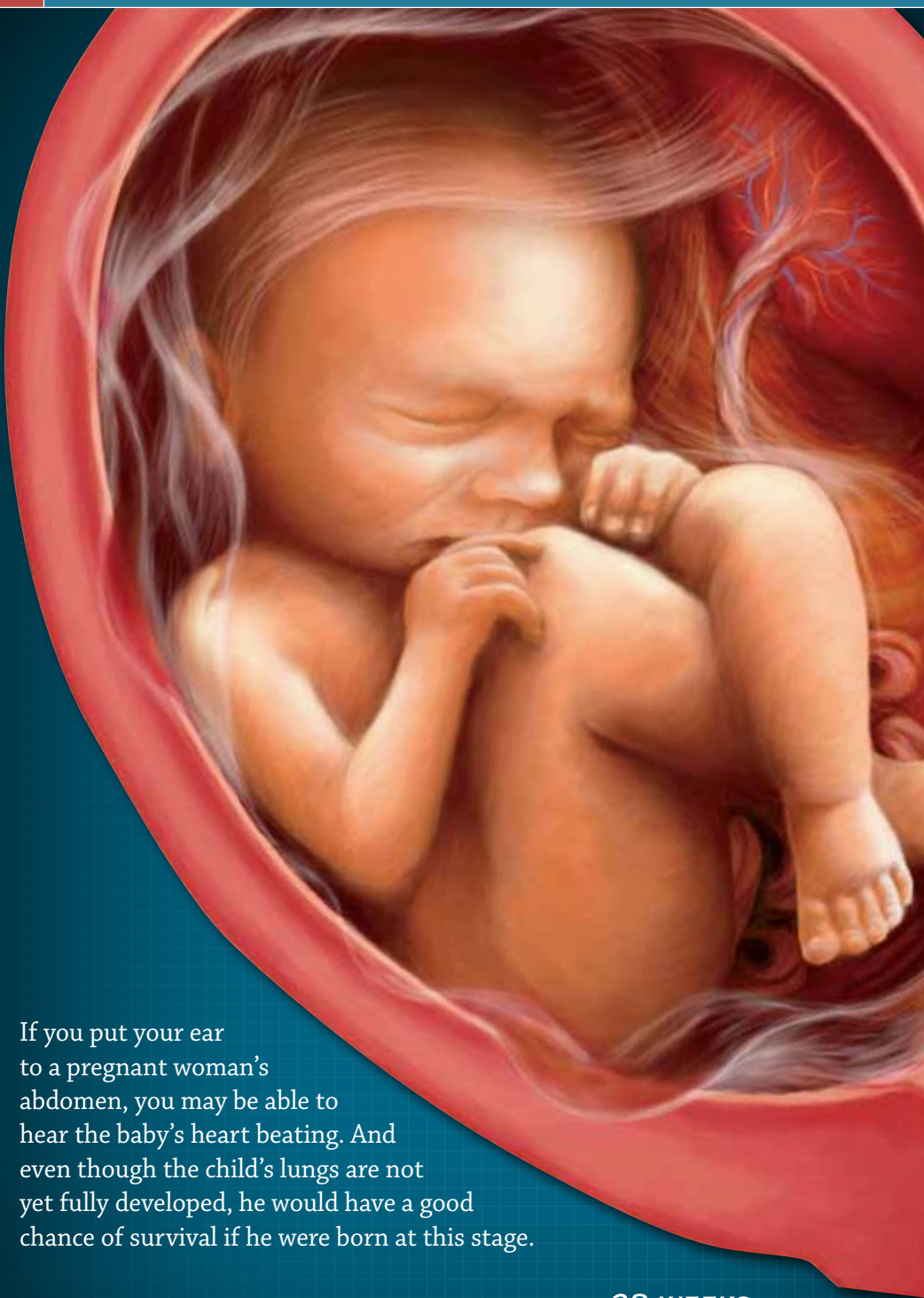
FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

28 WEEKS

38 CM • 1 KG | 15 IN. • 2.25 LB.



If you put your ear to a pregnant woman's abdomen, you may be able to hear the baby's heart beating. And even though the child's lungs are not yet fully developed, he would have a good chance of survival if he were born at this stage.

28 WEEKS

FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

28 WEEKS

38 CM • 1 KG | 15 IN. • 2.25 LB.



These are the first pictures taken of a 28-week-old boy named Luke. These three-dimensional (3D) images were taken with an advanced ultrasound system, which allows mothers and fathers to see their children months before they are born. Luke's brain is developing billions of neurons as he begins the third trimester—the last stage of pregnancy before he will be born.



28 WEEKS

FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

32 WEEKS

42 CM • 1.7 KG | 17 IN. • 3.75 LB.



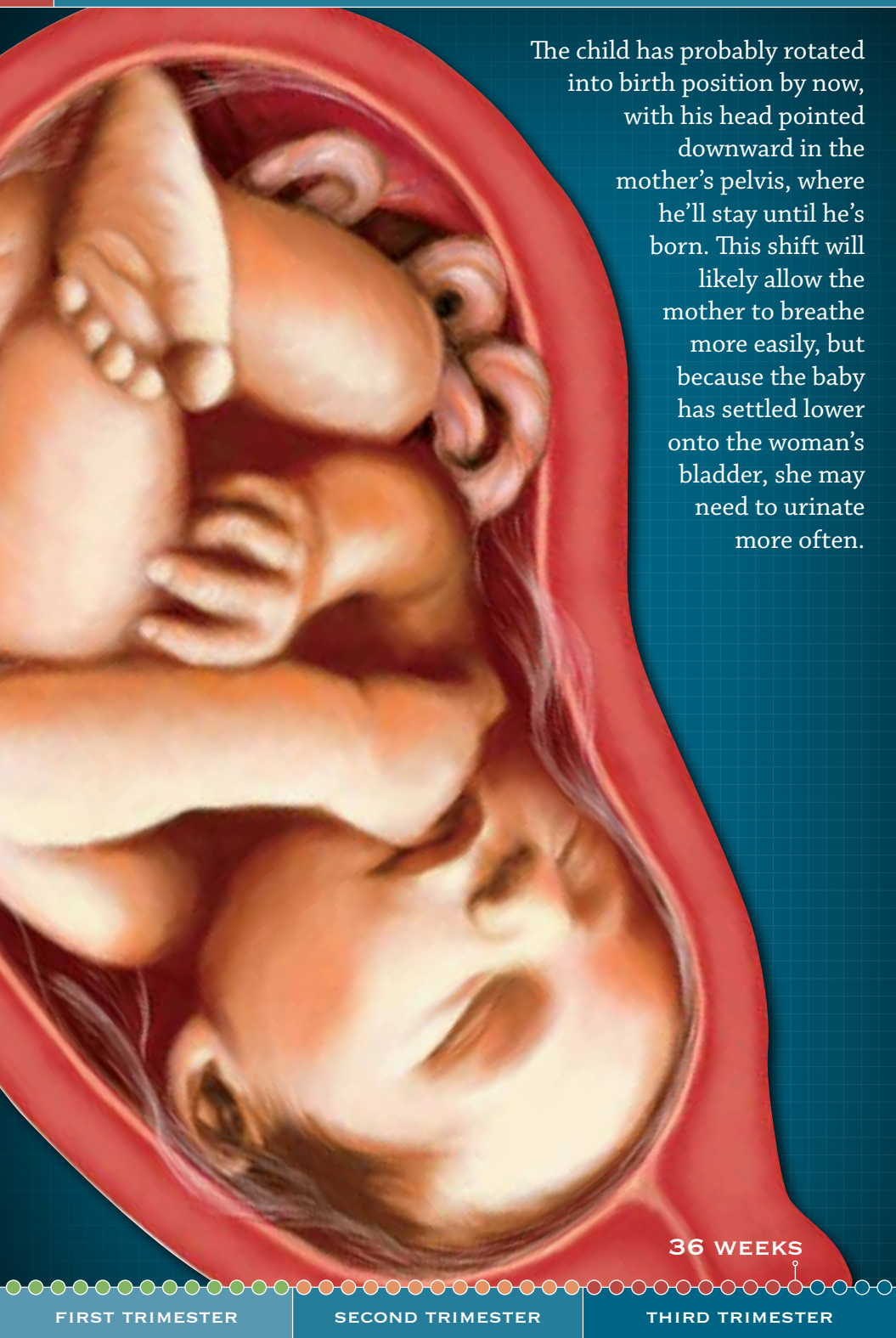
The baby's movements will soon grow less acrobatic as she settles into a head-down birth position. Most of the skin wrinkles will have disappeared from her face. By the time she is born eight weeks from now, her present weight will have more than doubled!

32 WEEKS

FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER



The child has probably rotated into birth position by now, with his head pointed downward in the mother's pelvis, where he'll stay until he's born. This shift will likely allow the mother to breathe more easily, but because the baby has settled lower onto the woman's bladder, she may need to urinate more often.

36 WEEKS

40 WEEKS

51 CM • 3.5 KG | 20 IN. • 7.5 LB.



The journey from conception to birth has been about nine months long, and the baby will be born sometime between weeks 38 and 42. Weight gain will continue rapidly throughout these weeks, and hair and fingernails will continue to grow.

Since the moment of her conception, the child has been a being of staggering complexity. For nine months, a unique genetic code, defined when the sperm met the egg, has guided the development of this person. Now she is ready to draw her first breath. Welcome to the world, young one!

40 WEEKS

FIRST TRIMESTER

SECOND TRIMESTER

THIRD TRIMESTER

Acknowledgments

- Doublet, P. M., Benson, C. B., Nadel, A. S., & Ringer, S. A. (1997). Improved birth weight table for neonates developed from gestations dated by early ultrasonography [Electronic version]. *Journal of Ultrasound Medicine*, 16(241), 241–249.
- The Endowment for Human Development. (n.d.). Prenatal Timeline: All. Retrieved March 1, 2010, from http://www.ehd.org/science_main.php?level=all
- Hadlock, F. P., Shah, Y. P., Kanon, D. J., & Lindsey, J. V. (1992, February). Fetal crown rump length: Reevaluation of relation to menstrual age (5–18 weeks) with high resolution real-time US. *Radiology* 182(2): 501–505.
- Mayo Clinic staff. (2009, July 25a). Fetal development: The first trimester. In *Pregnancy week by week*. Retrieved from <http://www.mayoclinic.com/health/prenatal-care/PR00112>
- . (2009, July 25b). Fetal development: The second trimester. In *Pregnancy week by week*. Retrieved from <http://www.mayoclinic.com/health/fetal-development/PR00113>
- . (2009, July 25c). Fetal development: The third trimester. In *Pregnancy week by week*. Retrieved from <http://www.mayoclinic.com/health/fetal-development/PR00114>
- Moore, K. L., & Persaud, T. V. N. (2008). *The developing human: clinically oriented embryology* (8th ed.). Philadelphia: Saunders/Elsevier.
- Sadler, T. W. (2009). *Langman's medical embryology* (11th ed.). Baltimore: Lippincott Williams & Wilkins.
- Usher, R., & McLean, F. (1969, June). Intrauterine growth of live-born Caucasian infants at sea level: Standards obtained from measurements in 7 dimensions of infants born between 25 and 44 weeks of gestation [Electronic version]. *Journal of Pediatrics* 74(6): 901–910.

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