

## In This Chapter

- Setting the Context
- The First Step: Fertilization
- Prenatal Development
- Pregnancy
- Threats to the Developing Baby
- Birth
- The Newborn

## Setting the Context

- Rituals such as this one in southern India are common around the world and embody our fears about this special time of life.

*Can you think of rituals attached to your culture, community, or family?*



AP Photo/Matt York

## The First Step: Fertilization

### • Female reproductive structures

- Uterus
  - Endometrium
  - Cervix (neck of uterus)
- Fallopian tubes
- Ovaries
  - Ova reside here
  - Ova contain mother's genetic material

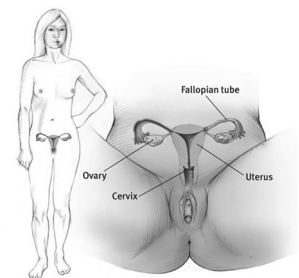


Figure 2.1a  
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## Reproductive Systems

- **Male reproductive structures**

- Testes (continually manufacture sperm)
- Penis

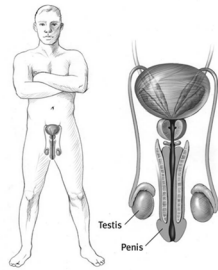


Figure 2.1b  
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## The Process of Fertilization

- **Ovulation occurs**

- Ovum expelled from ovary and suctioned into fallopian tube
- Millions of sperm travel up fallopian tube to ovum

- **Fertilization**

- One sperm penetrates the ovum
- Nuclei (genetic material) of the male and female cells combine



## LEARN THE TERMS

- Uterus
- Cervix
- Fallopian tube
- Ovary
- Ovum
- Fertilization
- Ovulation
- Hormones

## The Genetics of Fertilization

- **Chromosome:** Located in nucleus of every cell, threadlike strand of DNA, which carries genes that transmit genetic information

- **DNA (deoxyribonucleic acid):** Material that makes up genes, which bear hereditary characteristics

- **Gene:** Segment of DNA that contains a chemical blueprint for manufacturing a particular protein

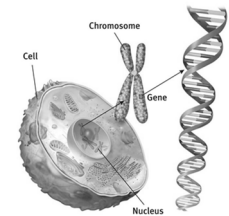
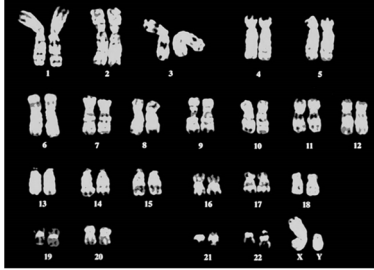


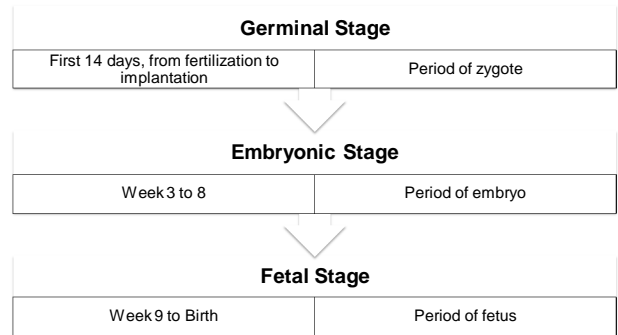
Figure 2.2  
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## A Map of Human Chromosomes



This magnified grid, called a karyotype, shows the 46 chromosomes in their matched pairs. The final pair, with its X and Y, shows that this person is a male. Also, notice the huge size of the X chromosomes.

## Prenatal Development



## Germinal Stage: First Two Weeks

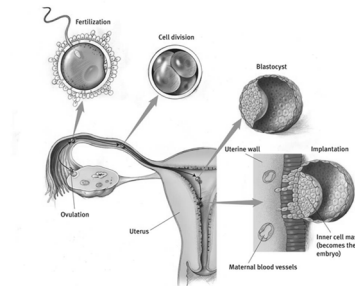


Figure 2.4  
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After looking at the above illustration, can you list the events of the germinal stage?

## LEARN THE TERMS

- Germinal stage
- Zygote
- Blastocyst
- Implantation

## Embryonic Stage: Weeks 3 to 8

- **Fast paced; all major organs constructed**
  - 3<sup>rd</sup> week, circulatory system forms and heart beats
  - 20 to 24 days *neural tube* forms—differentiates into brain and spinal cord
  - Day 26, arm buds form
  - Day 37, leg buds appear; feet, elbows, wrists, and fingers begin to appear
  - By week 8, the embryo is 1.5 inches long
  - Internal organs are in place and embryo begins to look human

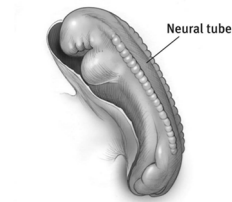


Figure 2.5  
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## Principles of Prenatal Development

- **Proximodistal**
  - Growth from middle to outside
- **Cephalocaudal**
  - Growth from head (cephalo=top) to feet (caudal=bottom)
- **Mass to specific sequence**
  - Large structures appear before finer details.
  - Large movements appear before finer movements.

*Do you see the proximodistal and cephalocaudal trends during these weeks of development?*



Week 3



Week 4



Week 9

## Fetal Stage: Week 9 to Birth

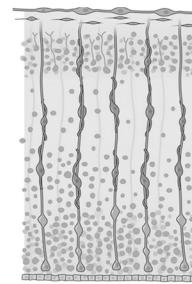


Figure 2.6  
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Forming a brain:  
climbing neurons

- Baby grows dramatically
  - Body structures are refined
  - Building blocks of brain are fully assembled
- Neurons ascend to top of the neural tube, reach their staging area, and begin to differentiate

## The Expanding Brain

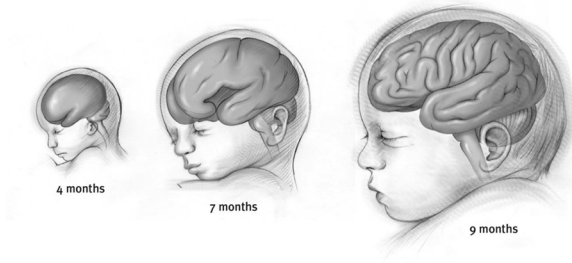


Figure 2.7  
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## Poised to Be Born!

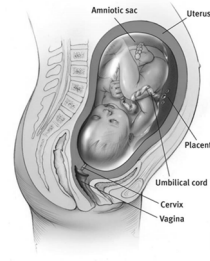


Figure 2.8  
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- **Age of viability** is 22 weeks (earliest date for possibility of survival)
- Fetus positioned in the womb late in pregnancy
- Notice the placenta, amniotic sac, and umbilical cord

## LEARN THE TERMS

- Placenta
- Embryonic stage
- Neural tube
- Neuron
- Proximodistal sequence
- Cephalocaudal sequence
- Mass-to-specific sequence
- Fetal stage

## Pregnancy

- **Gestation Period:** 267-277 days  
Divided into *trimesters* (about 3 months each)  
Each woman may vary in her experience (physical and emotional) of pregnancy.



© Robin Sachs/Photo Edit

## Scanning the Trimesters

First Trimester	Second Trimester	Third Trimester
<ul style="list-style-type: none"> <li>• Following implantation of blastocyst into uterus, flood of hormones <i>may</i> produce fainting, headaches, fatigue, tender breasts, and morning sickness.</li> <li>• Progesterone; human chorionic gonadotropin (HCG)</li> <li>• Miscarriages (spontaneous abortions) more prevalent at this time:             <ul style="list-style-type: none"> <li>• Roughly 1 in 10 pregnancies ends in miscarriage.</li> <li>• Miscarriage rate increases to 1 in 5 for women in their late thirties.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Physically may feel much better</li> <li>• By week 14, uterus grows (maternity clothes!)</li> <li>• <i>Quickening</i> occurs (first indication of movement of the fetus)</li> <li>• Feelings of <i>attachment</i> may begin</li> <li>• A strong sense of attachment during pregnancy predicts positive bonding after birth</li> </ul>	<ul style="list-style-type: none"> <li>• Physical Symptoms and Emotional States</li> <li>• Leg cramps, backaches, numbness in lower limbs, heartburn, insomnia</li> <li>• Irregular uterine contractions as baby sinks into the birth canal</li> <li>• Anxious anticipation may begin as the focus shifts to the birth</li> </ul>

## Pregnancy Is Not a Solo Act

- Dads also may experience strong emotions
  - May feel concerned about this life change
- **Negative forces that may contribute to distress during pregnancy**
  - Economic concerns; low SES
- **Positive forces**
  - Presence of a loving partner may predict a happy pregnancy

## LEARN THE TERMS

- Age of viability
- Umbilical cord
- Amniotic sac
- Gestation
- Trimester
- Miscarriage
- Quickening

## Threats to the Developing Baby: Threats from Outside

- **Teratogens:** Substances that may cross placenta to harm developing embryo or fetus



Taylor Jones/Peter Beach Photo

## Threats to the Developing Baby: Threats from Outside

### Examples of known teratogens

**Infectious diseases** – Rubella, cytomegalovirus, AIDS, Herpes, toxoplasmosis

**Medications** – Antibiotics, thalidomide, anti-seizure drugs, anti-psychotic drugs, antidepressants

**Recreational drugs** – Cocaine, methamphetamine

**Environmental toxins** – Radiation, lead, mercury and PCBs

**Vitamin deficiencies**

## Basic Teratogenic Principles

- Four principles: Teratogens
  - Most likely to cause structural damage during embryonic stage
  - Can affect developing brain throughout pregnancy
  - Operate in a dose-response fashion (threshold level)
  - Exert damage unpredictably, depending on fetal and maternal vulnerabilities
- Teratogens may also exert influence long after exposure

## Teratogens: Nicotine and Alcohol

- **Alcohol**
  - Excessive consumption contributes to chance of fetal alcohol syndrome.
- **Nicotine**
  - Constricts blood vessels
  - Increases risk of smaller- than-normal and less-healthy newborn
- **Measurement issues**
  - Hinder research

## Prenatal Stress

- **Impact of prenatal stress influenced by many forces**
  - Maternal personality and coping style
  - Intensity, quality, and timing
- **Swedish study**
  - Risk of infant death soon after birth rose only when mother experienced death of first degree relative within 6 months of conception

## Is Pregnancy a Programmer of Old Age?

- **Fetal programming research**
  - New research discipline; action oriented
  - Explores the impact of traumatic pregnancy events and intense stress on producing low birth weight, obesity, and long-term physical problems
- **The**