
Physiology and Developmental Biology

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College of Biology and Agriculture Office of Academic
Advisement
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Admission to Degree Program

All degree programs in the Department of Physiology and Developmental Biology are open enrollment.

The Discipline

Physiology is the study of the *functions* of the body systems. Developmental biology is the study of how specific genes govern differentiation of cells, tissues, and organs with unique structure and functions. Both disciplines require a firm foundation of mathematics, chemistry, physics, and cellular biology. The related area of biophysics uses the methods of physics, chemistry, mathematics, and biology to investigate the *physical* basis of life.

Upper-division courses require synthesizing and integrating information from many areas of science to allow understanding of such remarkable processes as how the heart pumps blood, how neurons communicate with one another, how insulin regulates blood sugar, and how specific gene products determine the morphology and functional capacity of the nervous system. Knowledge in these areas is expanding rapidly as new techniques are applied in molecular biology. Hence, significant exposure to the concepts and techniques of molecular biology is an important component of the major.

Career Opportunities

A major in physiology and developmental biology prepares students to pursue advanced degrees in either the biological sciences or nonbiological fields or to enter directly into employment. This major provides outstanding preparation for students seeking admittance into professional programs in medicine, dentistry, optometry, podiatry, chiropractic, or pharmacy. Students who have aspirations of doing health-related research will find a challenging, thorough preparation for entrance into graduate programs and beyond. Graduates of the program will also have the academic and laboratory skills necessary for employment in medical, biotechnological, and pharmaceutical industries. This degree offers students pursuing advanced degrees in business, public management, or law the knowledge and training necessary to be admitted into professional schools and work in governmental agencies, health care and biotechnical industries, and patent or health care law.

Graduation Requirements

To receive a BYU bachelor's degree a student must complete, in addition to all requirements for a specific major, the following university requirements:

- The university core, consisting of requirements in general and religious education (See the University Core section of this catalog for details. For a complete listing of courses that meet university core requirements, see the current class schedule.)
- A minimum of 30 credit hours in residence
- A minimum of 120 credit hours
- A cumulative GPA of at least 2.0

Undergraduate Programs and Degrees

BS Biophysics
BS Physiology and Developmental Biology

Students should see their college advisement center for help or information concerning the undergraduate programs.

Note: For the neuroscience program, see the Neuroscience Center section of this catalog.

Graduate Programs and Degrees

MS and PhD degrees are offered. For information see the BYU 2007–2008 Graduate Catalog and the Web page for the College of Biology and Agriculture.

BS Biophysics (65.5–66.5 hours*)

Major Requirements

1. Complete the following biology core courses:
Biol 120, 220, 240, 241, 340, 360, 420.
2. Complete the following chemistry courses:
Chem 105, 106, 107, 351, 352, 353 (1 hour), 462, 481.
3. Complete one course from the following:
Chem 461, 468.
4. Complete one of the following options (the Phscs 121 sequence is strongly recommended):
Either Phscs 121, 123, 140, 220
Or Phscs 105, 106, 107, 108, 140.
5. Complete the following major core courses:
PDBio 362, 363, 455R.
6. Complete the following capstone course:
PDBio 568.
7. Complete 10 hours from the following. At least 5 hours must come from the mentored experience and at least 3 hours from electives.
 - a. Mentored laboratory experience (must be in an approved biophysics lab):
PDBio 494R, 495R.
 - b. Electives
Chem 223, 227, 482, 581, 583, 584, 586.
EC En 301.
MMBio 430, 441, 442.
Neuro 480.
PDBio 325, 365, 450R, 482, 484, 550R, 561, 565.
Phscs 145, 230, 240.

Recommended Courses

Professional schools and graduate programs may require additional courses not required for this major, such as calculus or statistics. Contact the programs to which you may apply to determine the specific courses required.

Students considering professional or graduate degrees should take at least two semesters of mathematical courses. The recommended sequences are:

1. Math 119, Stat 221 for students who want exposure to calculus and statistics.
2. Math 112, 113 for students who want a firm foundation in calculus.
3. Math 112, 113, Stat 221 for students who want a firm foundation in both calculus and statistics.

*Hours include courses that may fulfill university core requirements.

BS Physiology and Developmental Biology

(65–66 hours*)

Major Requirements

1. Complete the following biology core courses:
Biol 120, 240, 241, 340, 360, 420.
2. Complete the following chemistry and physics courses:
Chem 105, 106, 107, 351, 352, 481.
Phscs 105, 106.
3. Complete the following major core courses:
PDBio 220, 325, 362, 363, 455R, 482.
4. Complete one course from the following:
PDBio 365, 484.
5. Complete one course from the following advanced molecular biology courses:
MMBio 430, 441.
6. Complete one course from the following capstone courses:
Neuro 480.
PDBio 561, 562, 565, 568, 582.
7. Complete 6.5 hours from the following courses, including at least 1 hour from the mentored experience list and at least 2 hours from the advanced laboratory requirement list.
 - a. Mentored experience:
PDBio 349R, 494R, 550R.
 - b. Advanced laboratory experience:
Chem 581, 583, 584, 586.
MMBio 442.
PDBio 399R, 495R.
 - c. Elective courses (courses used to fill any requirements listed above cannot count for this requirement):
Biol 220, 350, 421.
Chem 482, 581, 583, 584, 586.
InBio 370.
MMBio 352, 430, 441, 442, 452.
Neuro 480.
PDBio 320, 365, 450R, 455R, 484, 561, 562, 565, 568, 582.

Recommended Courses

Professional schools and graduate programs may require additional courses not required for this major, such as Phscs 107, 108, Chem 353, calculus, or statistics. Contact the programs to which you may apply to determine the specific courses required.

Students considering professional and graduate degrees should take at least two semesters of mathematical courses. The recommended sequences are:

1. Math 119, Stat 221 for students who want exposure to calculus and statistics.
2. Math 112, 113 for students who want a firm foundation in calculus.
3. Math 112, 113, Stat 221 for students who want a firm foundation in both calculus and statistics.

*Hours include courses that may fulfill university core requirements.

Physiology and Developmental Biology (PDBio)**Undergraduate Courses**

- 205. Human Biology.** (3:3:0) For nonbiology majors. F, W
Body systems and influence of heredity.
- 210. Human Anatomy (without lab).** (3:3:0) Independent Study only.
Structure and function of the human body. No lab included.
- 220. Human Anatomy (with lab).** (3:2:2) F, W, Su
Structure and function of the human body. Lab included.

305. Human Physiology (with lab). (4:4:2) F, W, Sp Prerequisite: Chem 101 or equivalent. Recommended: a general biology course.
Function of body organ systems. Not acceptable for physiology and developmental biology, biophysics, or neuroscience majors. Designed for students with basic chemistry/no molecular biology. Students with chemistry/molecular biology should take PDBio 362.

320. Dissection Techniques in Human Anatomy. (1:0:3) On dem. Prerequisite: PDBio 220.
Techniques of human cadaver dissection.

325. Tissue Biology (with lab). (3:2:3) F, W Prerequisite: Biol 120.
Human anatomy and histology; function of cells in tissue; early stages of embryology.

349R. Physiology and Developmental Biology Teaching Seminar. (1–3:Arr.:Arr. ea.) F, W, Sp, Su Prerequisite: grade B or above in the specific physiology and developmental biology course; instructor's consent.

Undergraduate students teaching small help sections for lecture portion of physiology and developmental biology courses or helping to teach departmental student lab.

362. Advanced Physiology. (3:3:1) F, W, Sp Prerequisite: Biol 240; Phscs 106 or 220.

Integrated approach to organ system and cellular physiology. Problem solving/calculations. Requires background in chemistry and molecular biology. Students without this background should take PDBio 305.

363. Advanced Physiology Laboratory. (1:0:5:1.5) F, W, Sp Prerequisite: PDBio 362 or concurrent enrollment; or instructor's consent.

Experiments and exercises in advanced physiology emphasizing human physiology. Computer simulations of muscle function, endocrine disease, and human physiology. Problem solving and calculations.

365. Pathophysiology. (4:4:0) F, W, Sp Prerequisite: PDBio 305 or 362.

Variations in physiological mechanisms that account for development of common disturbances in normal control and activities of body's organs and organ systems.

399R. Academic Internship: Physiology and Developmental Biology. (1–9:Arr.:Arr. ea.) F, W, Sp, Su Prerequisite: department cooperative education coordinator's consent.

On-the-job experience in off-campus laboratories related to physiology, biophysics, or developmental biology.

450R. Topics in Physiology and Developmental Biology. (1–3:Arr.:Arr. ea.) F, W, Sp, Su

Subjects may include:
—Protein Expression in Bacteria
—Techniques in Embryology
—Clinical Pharmacology
—Herbal Pharmacology

455R. Physiology and Developmental Biology Seminar. (0.5:1:0 ea.) F, W

Seminar (research) presentations for undergraduates in physiology and developmental biology.

482. Developmental Biology. (3:3:1) F, W Prerequisite: Biol 240, 241, 360. Recommended: PDBio 225.

Invertebrate and vertebrate developmental biology. Embryonic gastrulation, neurulation, patterning, etc. Modern approaches and research strategies. Gene function, cell signaling, signal transduction during embryogenesis.

484. Human Embryology. (3:3:0) F Prerequisite: Biol 360 or equivalent. Recommended: PDBio 225.

Developmental milestones of prenatal life; etiology of congenital malformations, emphasizing molecular and cellular changes and their functional consequences.

Physiology and Developmental Biology

494R. Undergraduate Research in Physiology and Developmental Biology. (1–4:Arr.:Arr. ea.) F, W, Sp, Su
Basic (entry-level) research laboratory experience for students interested in physiology and developmental biology.

495R. Advanced Undergraduate Research in Physiology and Developmental Biology. (1–4:Arr.:Arr. ea.) F, W, Sp, Su
Prerequisite: 2 credit hours of PDBio 494R.
Senior-level research laboratory experience for majors in physiology and developmental biology.

499R. Senior Honors Thesis. (1–3:Arr.:Arr. ea.) F, W, Sp, Su
Honors thesis. Topic to be cleared with Honors Program and Physiology and Developmental Biology Department.

500-Level Graduate Courses (available to advanced undergraduates)

550R. Advanced Topics in Physiology and Developmental Biology. (1–4:Arr.:Arr. ea.) On dem. Prerequisite: instructor's consent.

Close interaction between small groups of students and instructor on topics in physiology, developmental biology, or biophysics.

561. Physiology of Drug Mechanisms. (3:2:3) F Prerequisite: PDBio 362 or instructor's consent.

Overview of physiological and pharmacological mechanisms and principles of human therapeutics as applied to clinically significant pathophysiology.

562. Reproductive Physiology. (3:3:0) F even yr. Prerequisite: PDBio 362 or equivalent. Recommended: Chem 481, PDBio 482, or equivalents.

Mammalian reproductive physiology.

565. Endocrinology. (3:3:0) W Prerequisite: PDBio 362 or instructor's consent.

Mammalian hormones.

568. Cellular Electrophysiology and Biophysics. (3:2:3) F Prerequisite: PDBio 362 or instructor's consent.

Using electrophysiology and biophysics as an approach to study of physiology. Extensive look at ion channels and cell signaling.

582. Developmental Genetics. (3:3:0) W Prerequisite: PDBio 482 or equivalent.

Gene function and regulation during cell specification and differentiation, pattern formation, and organogenesis in developing embryo.

Graduate Courses

For 600- and 700-level courses, see the BYU 2007–2008 Graduate Catalog.

Physiology and Developmental Biology Faculty

Professors

Bell, John D. (1990) BS, Brigham Young U., 1982; PhD, U. of California, San Diego, 1987.
Busath, David D. (1995) BA, MD, U. of Utah 1974, 1978.
Judd, Allan M. (1991) BS, MS, Brigham Young U., 1973, 1978; PhD, West Virginia U., 1982.
Lephart, Edwin D. (1994) BS, MS, Brigham Young U., 1979, 1982; PhD, U. of Texas Southwestern Medical Center, Dallas, 1989.
Porter, James P. (1998) BS, MS, Brigham Young U., 1976, 1978; PhD, U. of California, San Francisco, 1982.
Rhees, Reuben Ward (1973) BS, U. of Utah, 1967; PhD, Colorado State U., 1971.
Seegmiller, Robert E. (1972) BS, MS, U. of Utah, 1965, 1967; PhD, McGill U., Canada, 1970.
Winder, William W. (1982) BS, PhD, Brigham Young U., 1966, 1971.
Woodbury, Dixon J. (2001) BA, U. of Utah, 1980; PhD, U. of California, Irvine, 1986.
Woolley, Bruce H. (1977) BS, U. of Utah, 1965; PharmD, U. of Southern California, 1972.

Associate Professors

Kooyman, David L. (1997) BS, MS, California State Polytechnic U., Pomona, 1982, 1986; PhD, Ohio U., 1993.
Silcox, Roy W. (1992) BS, Brigham Young U., 1981; MS, PhD, North Carolina State U., 1984, 1986.

Assistant Professors

Barrow, Jeffery R. (2003) BS, Brigham Young U., 1990; PhD, U. of Utah, 1999.
Brown, Michael D. (2003) BS, Brigham Young U., 1993; MS, PhD, Colorado State U., 1998, 1999.
Edwards, Jeffrey G. (2007) BS, Brigham Young U., 1994; PhD, U. of Utah, 2003.
Hansen, Marc D. (2005) BS, Brigham Young U., 1997; PhD, Stanford U., 2002.
Stark, Michael R. (2001) BS, Brigham Young U., 1992; MS, Idaho State U., 1994; PhD, U. of California, Irvine, 1998.
Sudweeks, Sterling N. (2001) BS, Brigham Young U., 1992; PhD, U. of Utah, 1997.

Part-Time Faculty

Duane R. Winden.

Emeriti

Allen, A. Lester (1954) BA, PhD, U. of California, Los Angeles, 1946, 1951.
Anderson, Ferron L. (1967) BS, MS, Utah State U., 1957, 1960; MS, U. of Illinois, 1962; PhD, Utah State U., 1963.
Bloxham, Don D. (1978) BS, MS, Idaho State U., 1967, 1969; PhD, Louisiana State U., 1973.
Heninger, Richard W. (1966) BS, Brigham Young U., 1957; MS, PhD, Oklahoma State U., 1959, 1961.
Jaussi, August W. (1962) BS, U. of Idaho, 1953; MS, Brigham Young U., 1955; PhD, Oklahoma State U., 1960.
Smith, Lamont W. (1970) BS, Brigham Young U., 1960; MS, U. of Wisconsin, Madison, 1962; PhD, West Virginia U., 1970.
Whitehead, Armand T. (1969) BS, Brigham Young U., 1965; PhD, U. of California, Berkeley, 1969.