



# Pharmaceutical Science PharmSci PhD

DISCOVERY



DEVELOPMENT



MANUFACTURING

# What is Pharmaceutical Science?

- **Pharmaceutical Sciences** is a dynamic and interdisciplinary field that aims to integrate fundamental principles of physical and organic chemistry, engineering, biochemistry, and biology to understand how to optimize delivery of drugs to the body and translate this integrated understanding into new and improved therapies against human disease.
- Disciplines of pharmaceutical sciences may include medicinal chemistry, pharmaceuticals, pharmacogenetics, pharmacology, biotechnology, pharmacoeconomics, pharmacoepidemiology, pharmacokinetics/clinical pharmacokinetics, clinical pharmacy/ pharmacotherapy, patient safety, regulatory science, health informatics, outcomes, and public health aspects of drug discovery and optimization.

# Career Options with a Pharmaceutical Science Degree

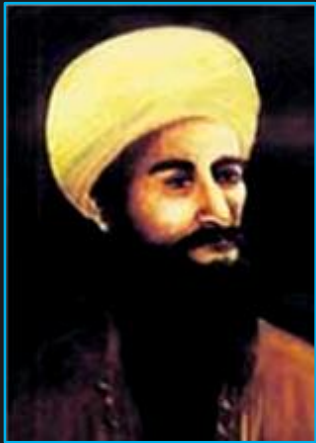
- **Research and Development**: Scientists, Senior Scientists, Principal Scientist. (It's likely a specialization will be mentioned in the title — e.g., pharmacology, neuroscience, oncology)
- **Regulatory Affairs**: Regulatory Affairs Specialist, Regulatory Affairs Officer
- **Clinical Trials**: Clinical Scientists, Clinical Research Associate
- **Business Development**: Business Development Manager
- **Sales and Marketing**: Medical Sales Representative, Account Manager, Product Manager, Brand Manager

# Common Pharmaceutical Science Subdisciplines

- Medicinal Chemistry
- Pharmacology
- Toxicology
- Pharmaceutics
- Social Administrative Sciences
- Clinical Pharmacy and Translational Sciences
- Regulatory Affairs
- Regulatory Science



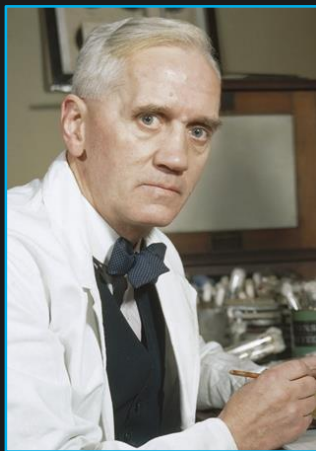
# Famous Pharmaceutical Scientists in History



[Jabir ibn Hayyan](#) (721-815)  
Muslim alchemist known as the father of Arabic chemistry and one of the founders of modern pharmacy. Jabir is credited with the introduction of experimental methodology into alchemy and the invention of several chemical processes used in modern chemistry.



[Gertrude B. Elion](#) (1918-1999)  
American biochemist and pharmacologist. She developed the first drugs to fight rejection in organ transplants and to treat herpes infection. She also won a Nobel Prize for her contribution to the use of innovative methods of rational drug design for the development of new drugs.



[Alexander Fleming](#) (1881-1955)  
Scottish biologist, physician, microbiologist and pharmacologist. Best known for his discovery of the world's first antibiotic substance penicillin. He has been knighted and received a Nobel Prize for his scientific achievements.



[Tu Youyou](#) (1930- )  
Chinese pharmaceutical chemist and malariologist. Her discovery of two medicines to treat malaria saved millions of lives. She is the first Chinese Nobel laureate in physiology or medicine and the first female citizen of China to receive a Nobel Prize in any category.

# PhD in Pharmaceutical Science Programs

- [University of Southern California School of Pharmacy](#) (Los Angeles, CA)
- [University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences](#) (Denver, CO)
- [Nova Southeastern University College of Pharmacy](#) (Ft. Lauderdale, FL)
- [University of Hawai'i at Hilo](#) (Hilo, HI)
- [Northeastern University Bouvé College of Health Sciences](#) (Boston, MA)
- [University of Michigan College of Pharmacy](#) (Ann Arbor, MI)
- [The University of North Carolina at Chapel Hill](#) (Chapel Hill, NC)
- [Rutgers Ernest Mario School of Pharmacy](#) (Piscataway, NJ)
- [Oregon State University College of Pharmacy](#) (Corvallis, OR)
- [University of Pittsburgh School of Pharmacy](#) (Pittsburgh, PA)

# College Selection Criteria

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Students should consider the following when choosing a school for pharmaceutical sciences:

- The degree options are varied for this career. Consider the curricula of programs of interest carefully.
- Research-focused applicants should make sure that there are faculty members with whom they share research interests who may act as dissertation or thesis advisors.

# Sample PhD PharmSci Curriculum

*at University of Michigan-Ann Arbor*

## Required Intradepartmental Courses

- Pharmacokinetics
- Equilibria & Dosage Forms
- Biopharmaceutics
- Physical & Chemical Kinetics
- Analytical Methods in Drug Delivery

## Elective Intradepartmental Courses

- Nanotechnology
- Biologics
- Solids
- Cellular Drug Transport
- Pharmaceutical Engineering
- Advanced Pharmacokinetics

## Core/Pre-req. Courses

- Physiology/Pharmacology/Cell Biology/Biochemistry
- Pharmacology
- Physiology
- Cell and Developmental Biology
- Human Genetics
- Statistics
- Differential Equations
- Physical Chemistry

## Extradedepartmental Courses

- Medicinal Chemistry
- Pharm
- Pharmacology
- Physiology
- Cell and Developmental Biology
- Human Genetics
- Cancer Biology
- Microbiology



# Sample PhD PharmSci Curriculum

*at University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences*

## Required Pharmaceutical Sciences Program Courses

PHSC 7310	Fundamentals of Pharmaceutical Sciences	3 credits
PHSC 7320	Physical Pharmacy and Pharmaceutical Sciences	3 credits
PHSC 7400	Ethical Issues in Toxicology and Pharmaceutical Sciences	1 credit
PHSC 7650	Research Rotation in Pharmaceutical Sciences (two required)	1 credit
PHSC 7568	Seminar in Pharmaceutical Sciences (each semester)	1 credit
PHSC 7330	Development of Drugs and Biologics	2 credits
PHSC 8990	Doctoral Thesis	≥30 credits

## Representative Elective Courses

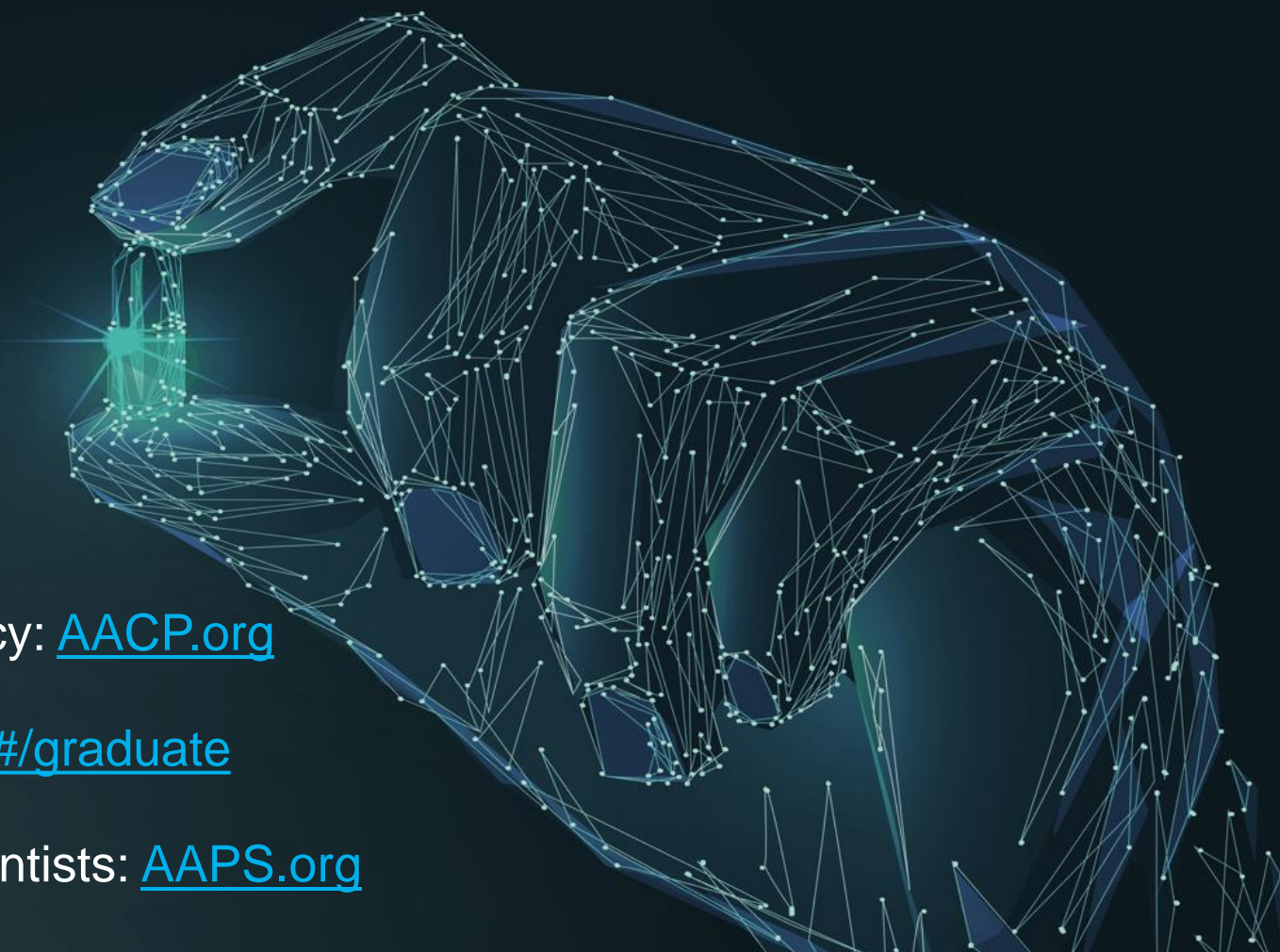
PHSC 7608	Molecular Interactions	3 credits
PHSC 7609	Biophysics and Spectroscopy	2 credits
PHSC 7651/CHEN 5838	Pharmaceutical Biotechnology	3 credits
PHSC 7345	Nanotechnology and Drug Delivery	2 credits
PHSC 7353	Protein Formulation	2 credits
PHSC 7660	Liposome-based Drug Delivery	2 credits
PHSC 7665	Pharmacokinetic Principles and Applications	3 credits

# Articles of Interest

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- [New Pharmaceutical Degree to Meet Needs of Regional Employers](#)
- [What are the Career Options for a PhD in the Pharmaceutical Industry?](#)
- [7 Things the Typical PhD Scientist Doesn't Know About a Biotech or Pharma Job Search](#)
- [Scientists Race to Develop Coronavirus Vaccine](#)
- [Big pharma backed away from brain drugs. Is a return in sight?](#)
- [First Peanut Allergy Drug Wins Approval From U.S. Regulators](#)

# Additional Resources



- American Association of Colleges of Pharmacy: [AACP.org](https://www.aacp.org)
- PharmCAS: [PharmCAS.org/school-directory/#/graduate](https://www.pharmcas.org/school-directory/#/graduate)
- American Association of Pharmaceutical Scientists: [AAPS.org](https://www.aaps.org)