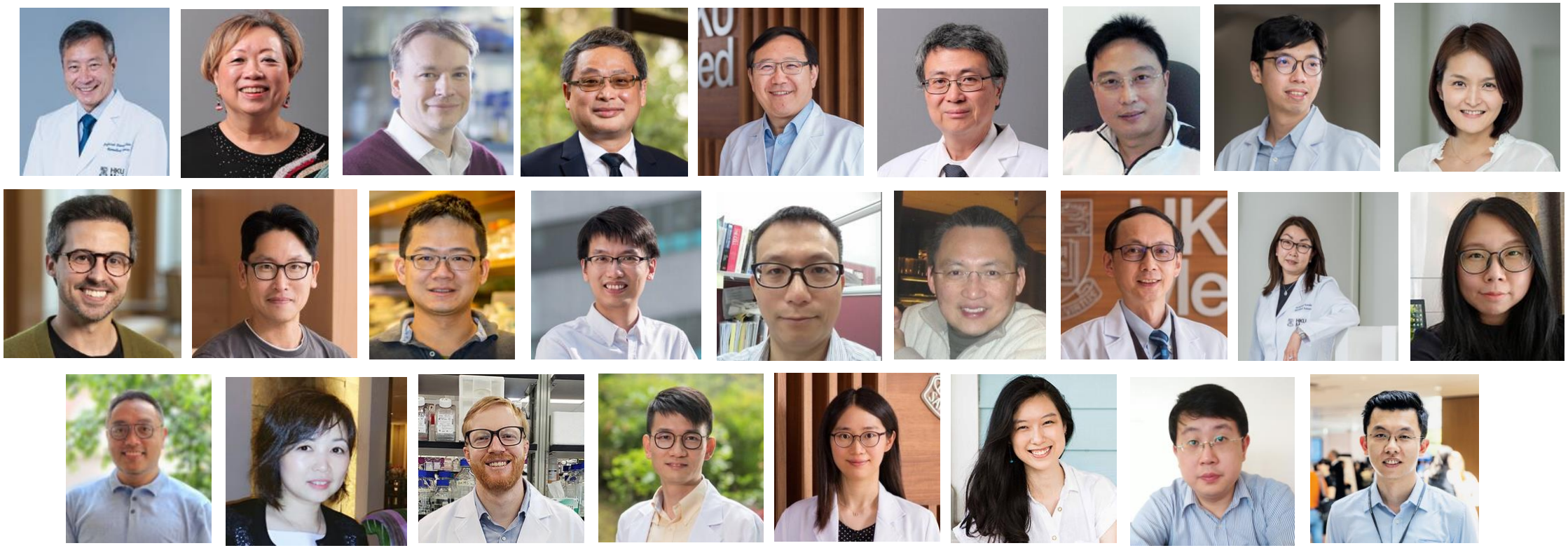
Biochemistry Major/Minor (Sch of Biomed Sc, LKS Fac of Med)



- Professors: 14 (http://www.sbms.hku.hk/staff/academic-staff)
- Lecturers: 8
- Postdoctoral Fellows and Research Associates: ~35
- Research Assistants: ~20
- Research postgraduates: ~90
- Administrative staff: 5
- Technical staff: 10 technicians & 5 supportive staff

Statistics: Jul 2024

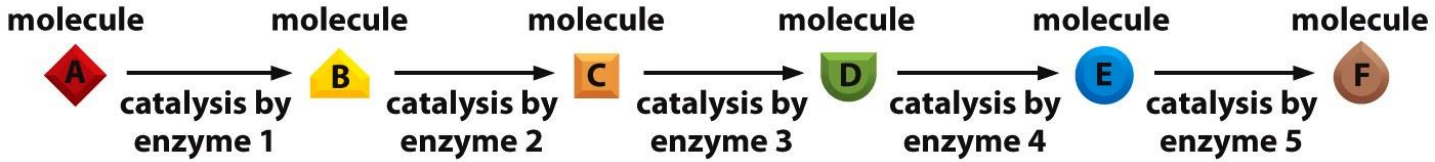
Introduction to Biochemistry (4-minute video)

https://youtu.be/tpBAmzQ_pUE

- Study of the chemistry of life processes!

Each second, there are over 500 quadrillion (10^{15}) chemical reactions occurring in our body!

Biochemistry is….



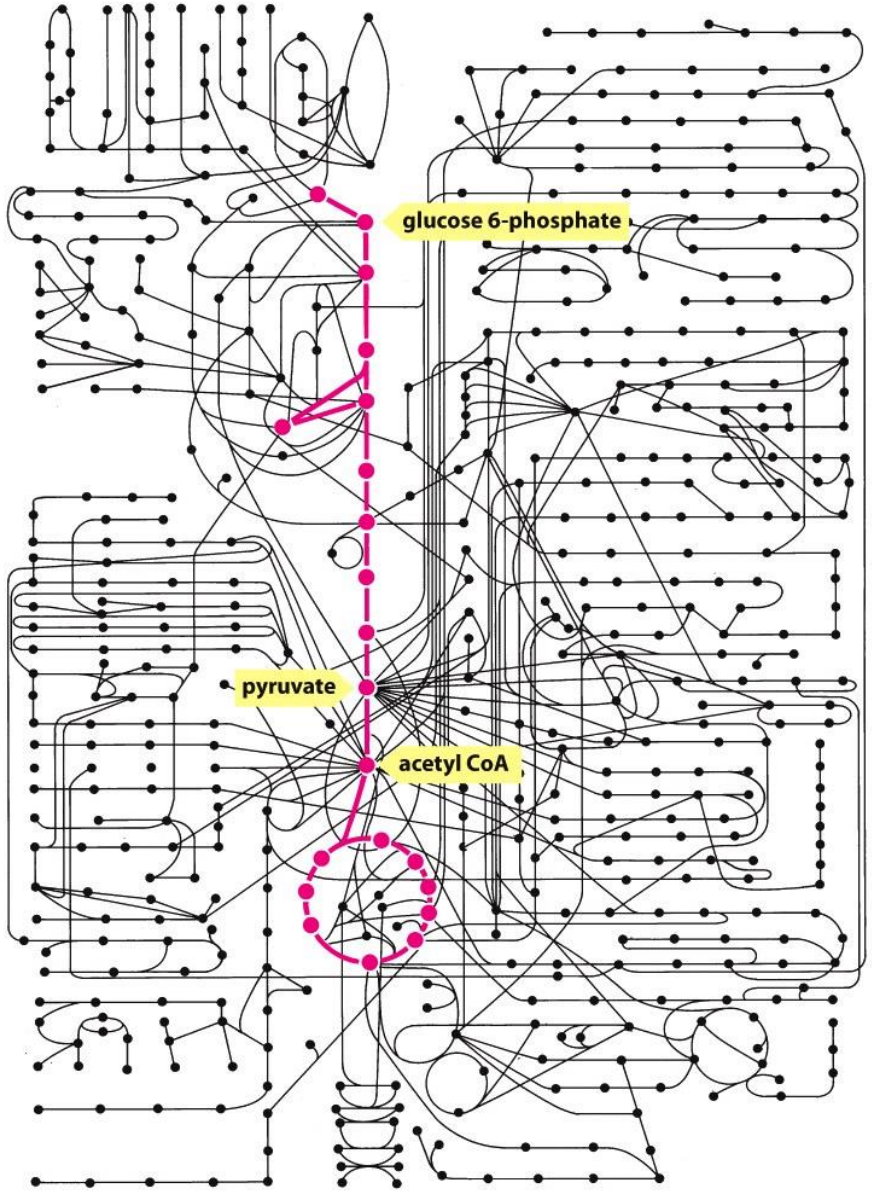


Figure 13-19 Essential Cell Biology 3/e (© Garland Science 2010)

Biochemistry is….

Study of the structures and functions of macromolecules i.e. proteins, carbohydrates, lipids, nucleic acids

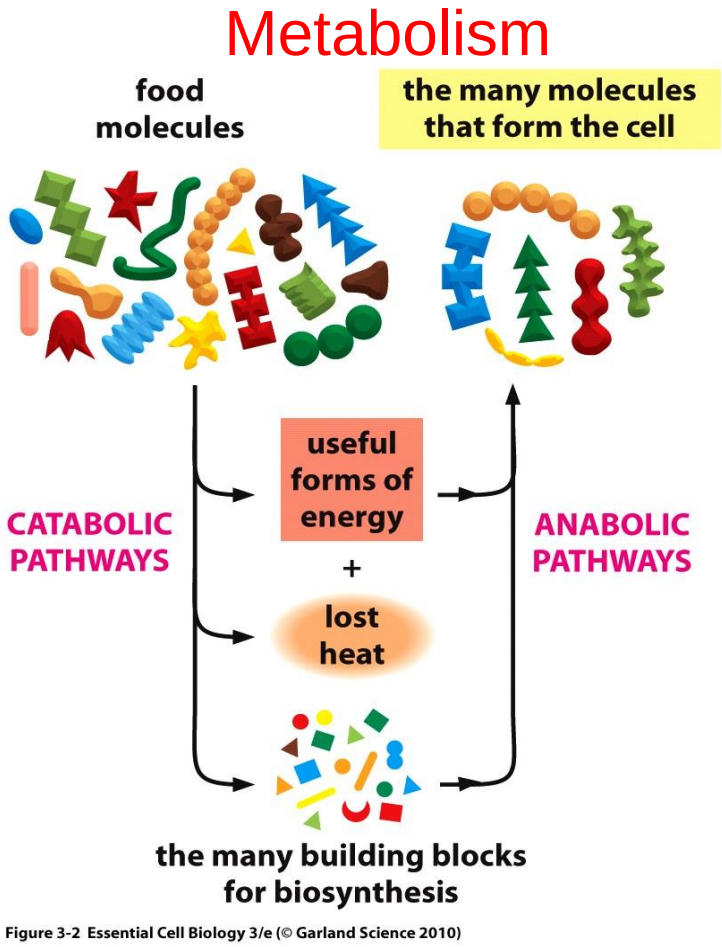


Figure 3-2 Essential Cell Biology 3/e (© Garland Science 2010)

Cells talking and reacting…

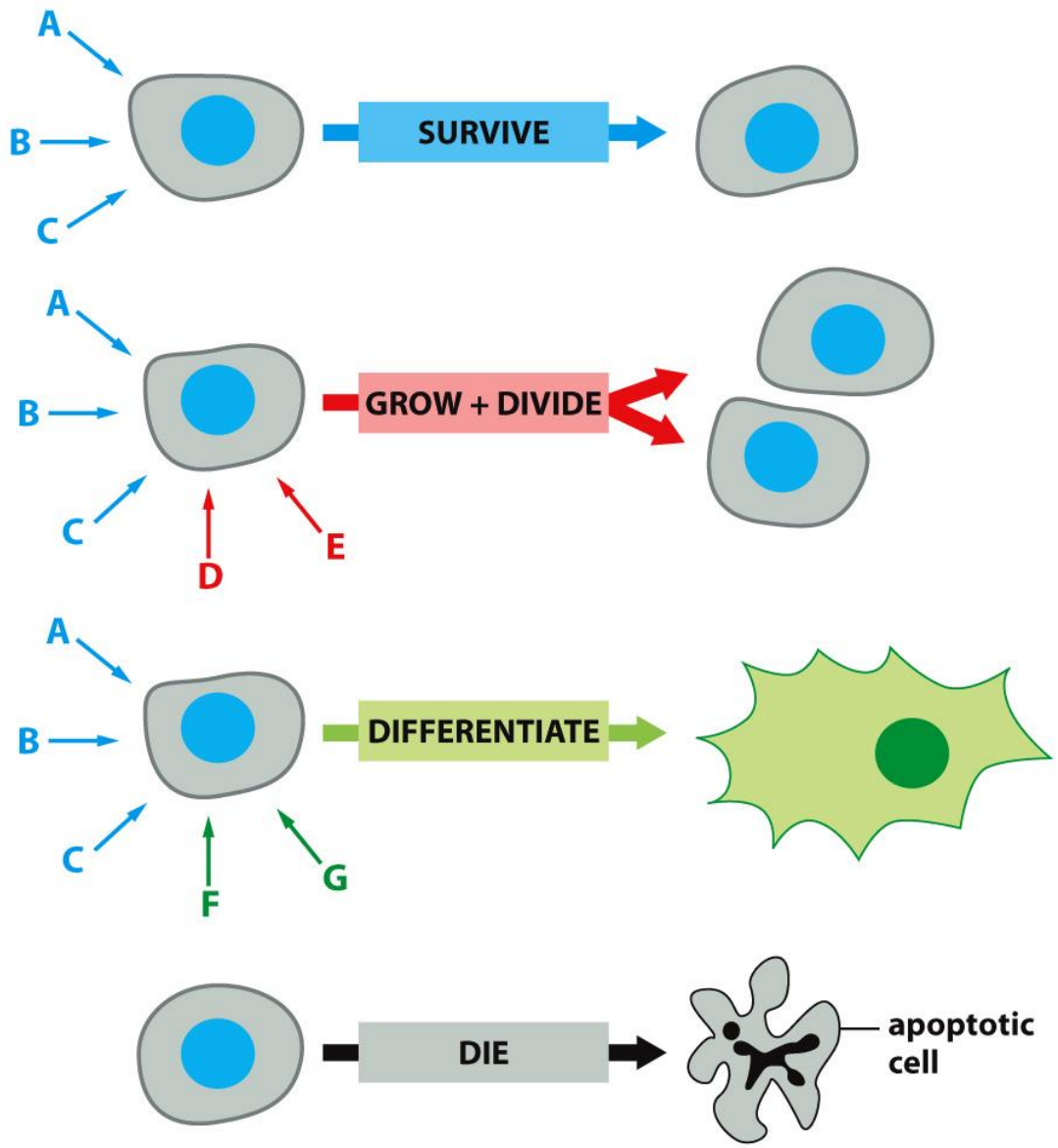


Figure 15-4 Molecular Biology of the Cell 6e (© Garland Science 2015)

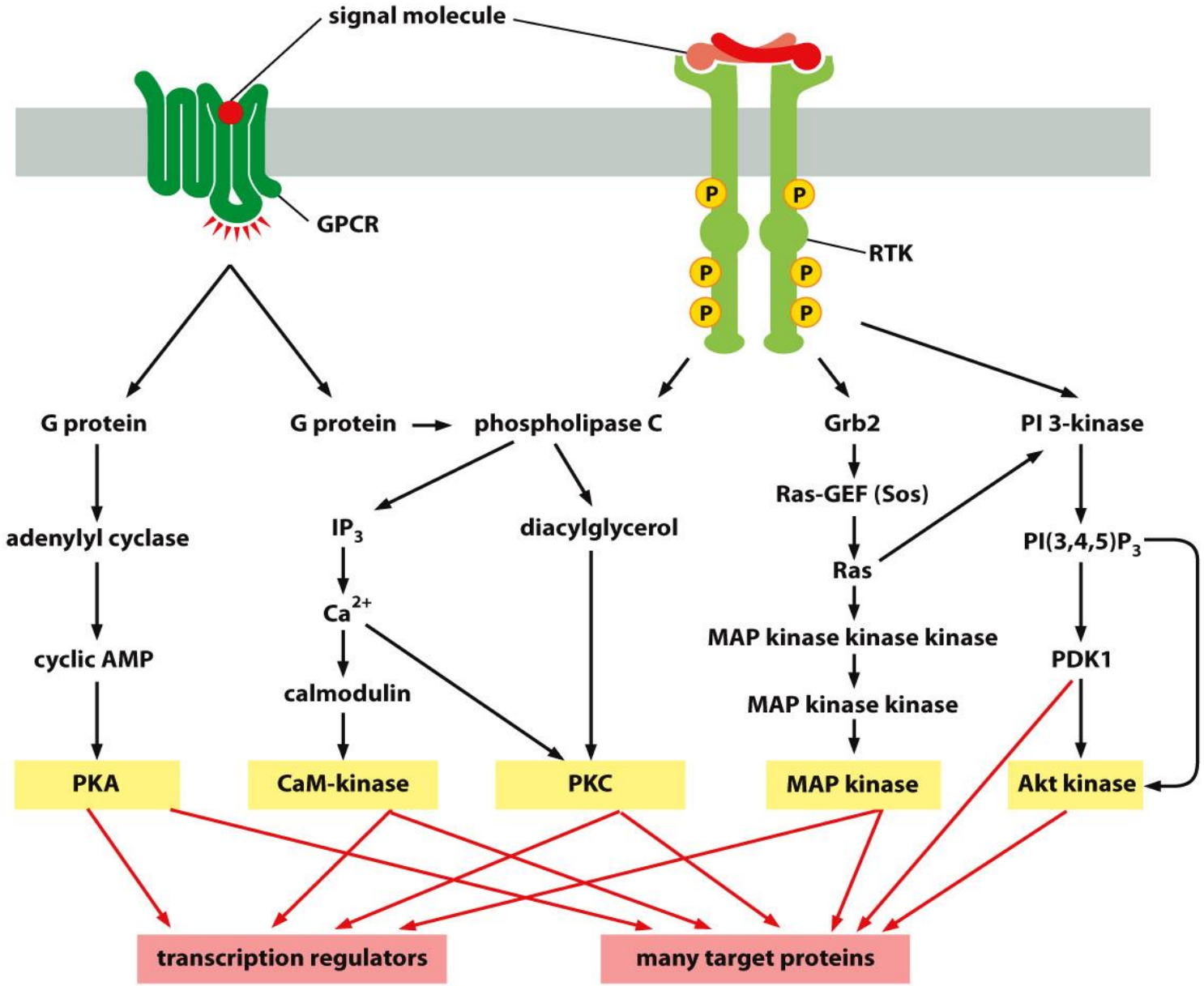
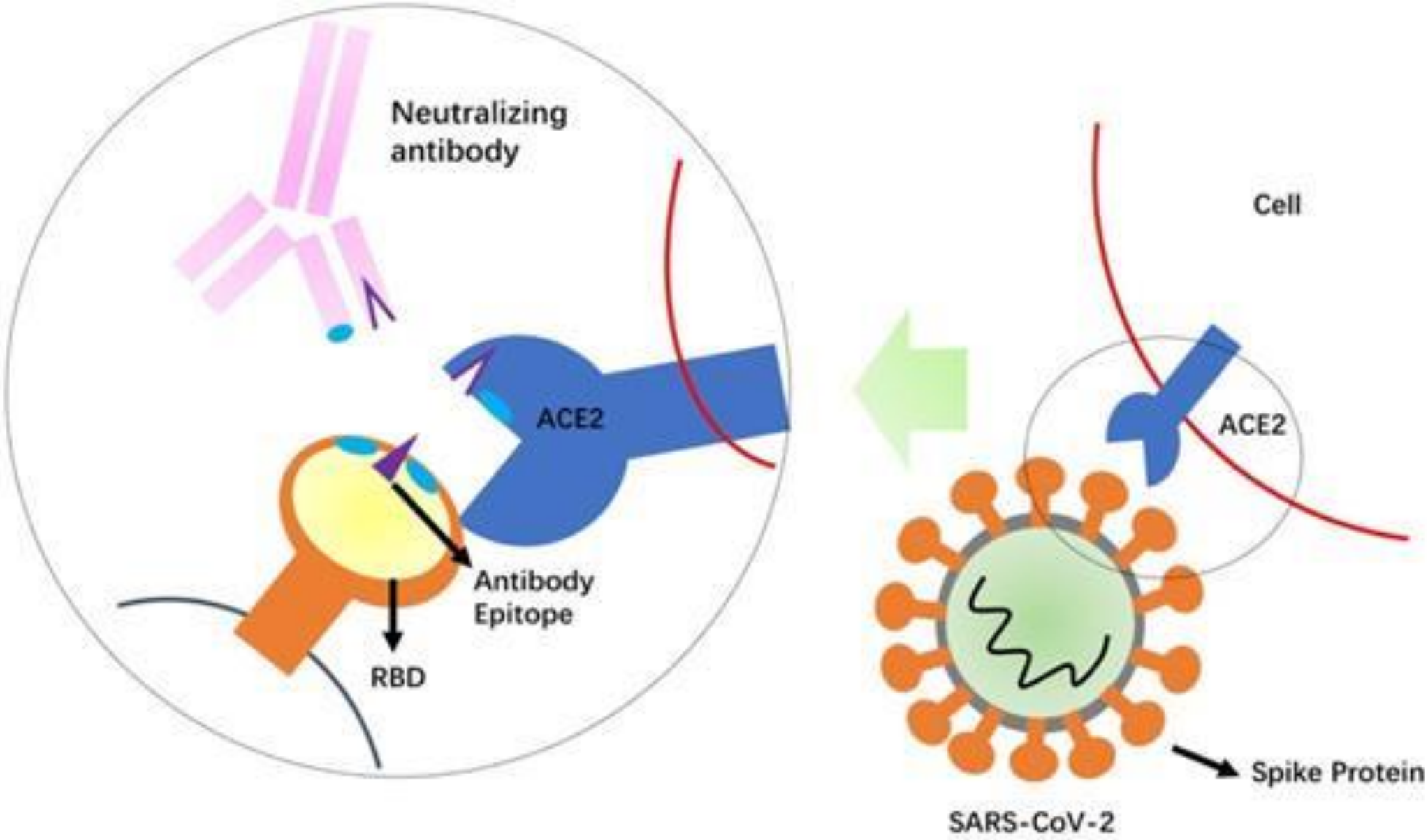


Figure 15-55 Molecular Biology of the Cell 6e (© Garland Science 2015)


Neutralizing antibody
ACE2
Antibody Epitope
RBD
Cell
ACE2
Spike Protein
SARS-CoV-2

Biochemistry of Development:

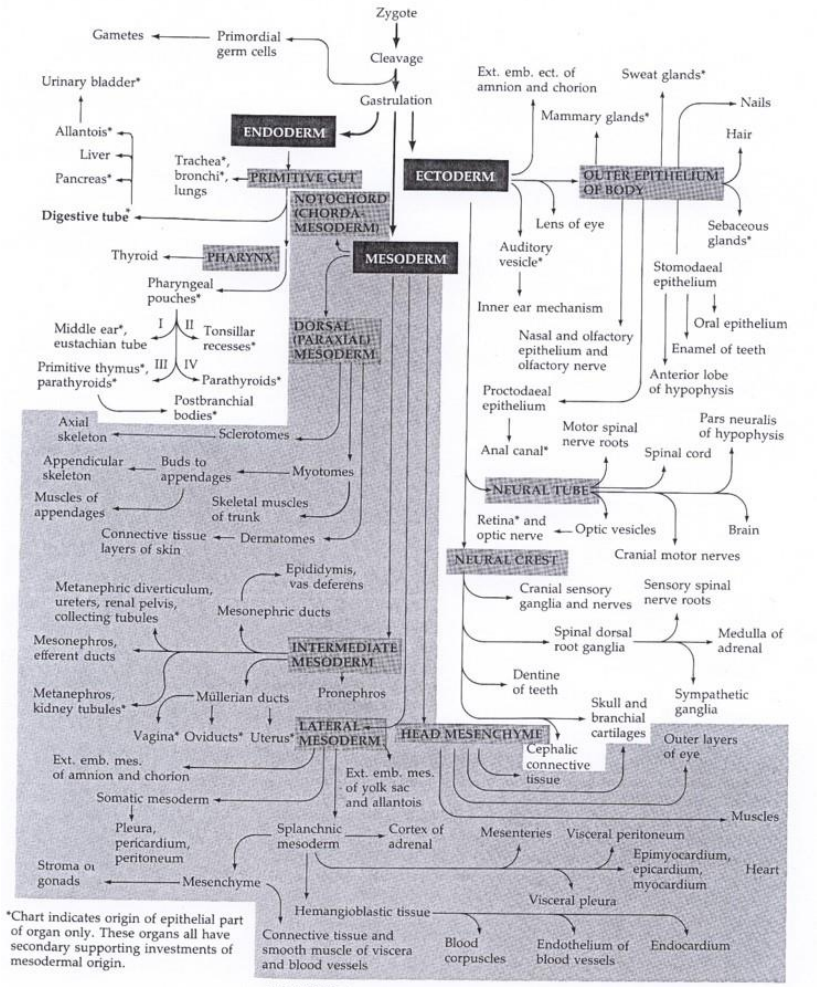


FIGURE 9.1
Chart depicting the lineage of the specialized parts of the amniote body through the three primary germ layers. The germ cells are represented as a line of cells separate from those of the three somatic germ layers because, although the germ cell precursors are located in the presumptive endoderm or mesoderm, they are probably a unique cell type. (After Carlson, 1981.)

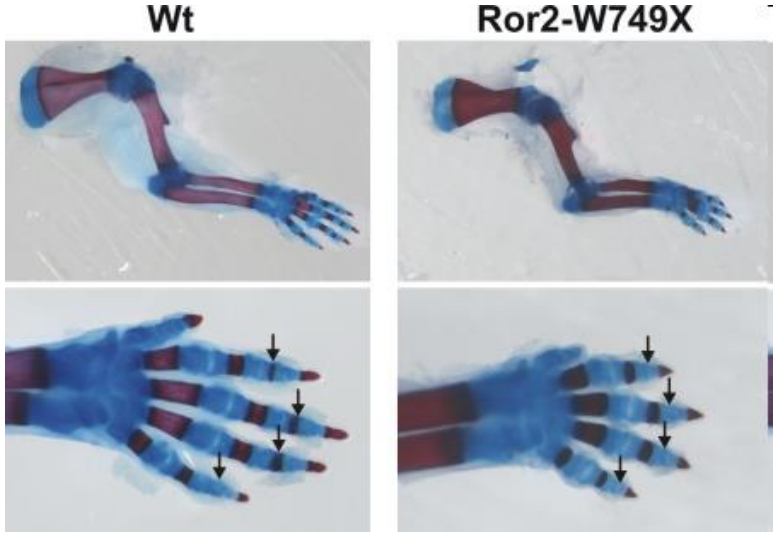
Development starts with one single cell

↓

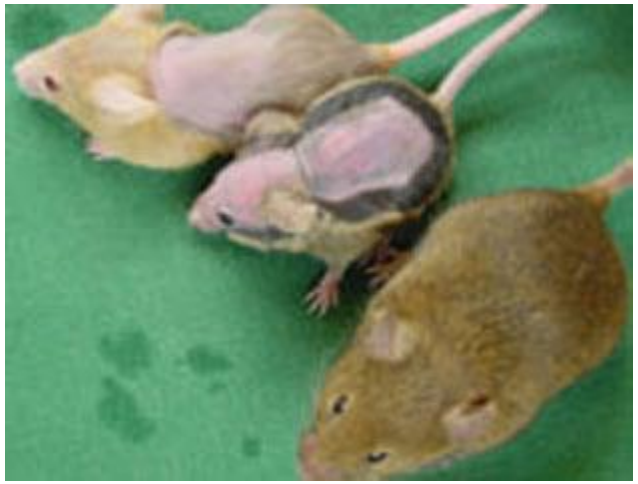
~100 trillion (~10^{14}) cells (of ~230 cell types) inside the human body on reaching adulthood

~10^{14} cell divisions undergone to reach adulthood

Mouse disease models



Skeletal



Aging

Deaf and balance

Study of Biochemistry:

- Evolving discipline - take on new meanings with time!

  E.g. Proteins (enzymes) in 60s-70s

  → Genes in 80s

  → Whole genomes in ~2000

  → System biology in ~2010 (transcriptome, proteome, metabolome)

  → Noncoding RNAs, epitranscriptome, single cell analysis, CRISPR/Cas9 genome editing more recently

- Broad

  → studied at different levels of complexity using various model systems (3D modeling, bioinformatics, cancer cells, chick neural tube, Planaria, mutant mice, etc.)

- Relevance to health and diseases

BIOCHEMISTRY MAJOR

Please access https://www.scifac.hku.hk/current/ug/academic/syllabuses to see the latest Biochemistry program structure.

Throughout the curriculum there is an emphasis on experiential learning through laboratory practicals, problem-solving exercises, group-based learning, industrial experience, overseas exchange and research-based projects.

Learning Outcomes:

By the end of this programme, students should be able to:

(1) describe the principles of biomolecular structure, metabolism, molecular interactions, molecular processes and their regulation, genetics and systems biology critical to contemporary biochemistry and molecular biology
(by means of coursework and experiential learning)

(2) apply biochemical, bioinformatics and molecular genetics technologies for new observations, measurements and analyses; and to design experiments that bring discovery and insight into the unknown
(by means of laboratory-based and research project-based learning)

(3) interpret and communicate scientific data and literature using appropriate scientific language
(by means of literature-based coursework and debate)

(4) work effectively as a team and synergize with their colleagues in a supportive manner
(by means of group-based learning and by group-based problem solving)

(5) recognize the interconnections of biochemistry with other disciplines in science, medicine and engineering, humanities and ethics, which are relevant fo diverse working environment in the society
(by means of multidisciplinary-based research projects, internship and debate)

Required courses (96 credits) (16 courses)

1. Introductory level courses (42 credits) (7 courses)		
Disciplinary Core Courses: Science Foundation Courses (12 credits)		**(semester)**
SCNC1111	Scientific method and reasoning (6)	(1,2)
SCNC1112	Fundamentals of modern science (6)	(1,2)
Disciplinary Core Courses (24 credits)		
CHEM1042	General chemistry I (6)	(1,2)
CHEM1043	General chemistry II (6)	(1, 2)
BIOC2600 (or BIOL2220)	Basic biochemistry (6) [or Principles of biochemistry (6)]	(1)
CHEM2441	Organic chemistry I (6)	(1,2)
Disciplinary Electives (6 credits)		
BIOC1600	Perspectives in biochemistry (6)	Take either BIOC1600 or BIOL1110, but not both. (1)
BIOL1110	From molecules to cells (6)	Take either BIOC1600 or BIOL1110, but not both. (1,2)

2. Advanced level courses (48 credits) (8 courses)		
Disciplinary Core Courses (30 credits)		**(semester)**
BIOC3601	Basic Metabolism (6)	(1)
BIOC3604	Essential techniques in biochemistry and molecular biology (6)	(2)
BIOL3401	Molecular biology (6)	(1)
BIOC4610	Advanced biochemistry (6)	(1)
BIOC4613	Advanced techniques in biochemistry & molecular biology (6)	(1)
Disciplinary Electives (18 credits)		
Plus at least 18 credits selected from the following courses:		
BIOC3605	Sequence bioinformatics (6)	(2)
BIOC3606	Molecular medicine (6)	(2)
BIOL3202	Nutritional biochemistry (6)	(1)
BIOL3402	Cell biology and cell technology (6)	(1)
BIOL3403	Immunology (6)	(2)
BIOL3404	Protein structure and function (6)	(2)
BIOL3408	Genetics (6)	(1)
CHEM3441	Organic chemistry II (6)	(1,2)
BIOC4612	Molecular biology of the gene (6)	(2) *
BIOL4417	'Omics' and systems biology (6)	(2)
CHEM4145	Medicinal chemistry (6)	(2)
CHEM4444	Chemical biology (6)	(2)
3. Capstone requirement (6 credits) (1 course)		
At least 6 credits selected from the following courses:		
BIOC3999	Directed studies in biochemistry (6)	(1,2,summer)
BIOC4966	Biochemistry internship (6)	(1,2,summer)
BIOC4999	Biochemistry project (12)	(1+2)
** BIOC4612 is not offered in 2024/25 AY*		

Black: Core (11 courses) Purple: Elective (4 courses) Green: Capstone requirement (1 course)	Science Foundation and Chemistry	Fundamental Biochemistry/ Molecular Biology	Advanced and Integrative Biochemistry/ Molecular Biology	Techniques/ Undergrad Research (Capstone)
Year 1	SCNC 1111 Scientific method and reasoning (6) SCNC1112 Fundamentals of modern science (6) CHEM1042 General Chemistry I CHEM1043 General Chemistry II	BIOC1600 Perspectives in biochemistry (6) or BIOL1110 From molecules to cells (6)		
Year 2	CHEM2441 Organic Chemistry I (6)	BIOC2600 Basic Biochemistry (6)	BIOC3605 Sequence bioinformatics (6) BIOC3606 Molecular medicine (6) BIOL3404 Protein structure and function (6)	BIOC3604 Essential techniques in biochemistry and molecular biology (6)
Year 3	CHEM3441 Organic Chemistry II (6)	BIOC3601 Basic Metabolism (6) BIOL3401 Molecular Biology (6)	BIOL3202 Nutritional biochem (6) BIOL3402 Cell biol & cell tech (6) BIOL3403 Immunology (6) BIOL3408 Genetics (6)	BIOC4613 Advanced Techniques in biochemistry and molecular biology (6)
Year 4	CHEM4145 Medicinal chem (6)		BIOC4610 Advanced Biochemistry (6) BIOL4417 “Omics” and systems boil (6) CHEM4444 Chemical biology (6)	BIOC3999 Directed studies in biochemistry (6) BIOC4966 Biochemistry internship (6) BIOC4999 Biochemistry project (12)

Suggested Electives at the Advanced Level

	Advanced and Integrative Biochemistry/ Molecular Biology
Premed/Graduate school track	BIOC3605 Sequence bioinformatics (6) BIOC3606 Molecular medicine (6) BIOL3403 Immunology (6) BIOL3404 Protein structure and function (6) BIOL3408 Genetics (6)
Biotech/Pre-business track	BIOC3606 Molecular medicine (6) BIOL3402 Cell biol & cell tech (6) CHEM3441 Organic Chemistry II (6) BIOL4417 “Omics” and systems boil (6) CHEM4145 Medicinal chem (6) CHEM4444 Chemical biology (6)
Teaching track	BIOC3606 Molecular medicine BIOL3402 Cell biol & cell tech BIOL3404 Protein structure and function BIOL3408 Genetics CHEM3441 Organic Chemistry II

Read more about Career Prospects and Student Sharing at
https://www.scifac.hku.hk/prospective/ug/6901-bsc/majors/biochemistry
Talk to your Academic Advisor!!!!!!!