# DEPARTMENT OF BIOLOGICAL SCIENCES

# BS DEGREE IN BIOMEDICAL SCIENCES

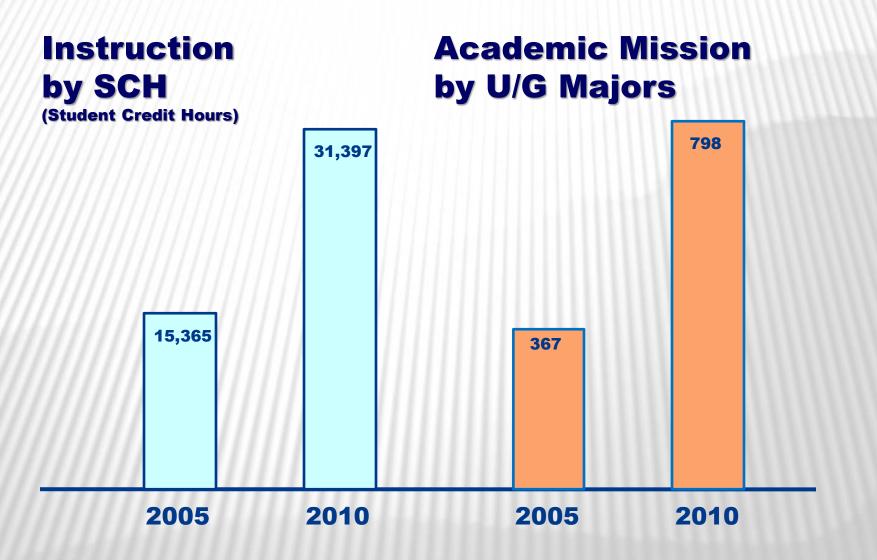
## WHAT IS THE PROGRAM ABOUT?

# **An Advanced Science-based Pre-medical Preparation More Breadth and Rigor Attracting the Most Capable Students**

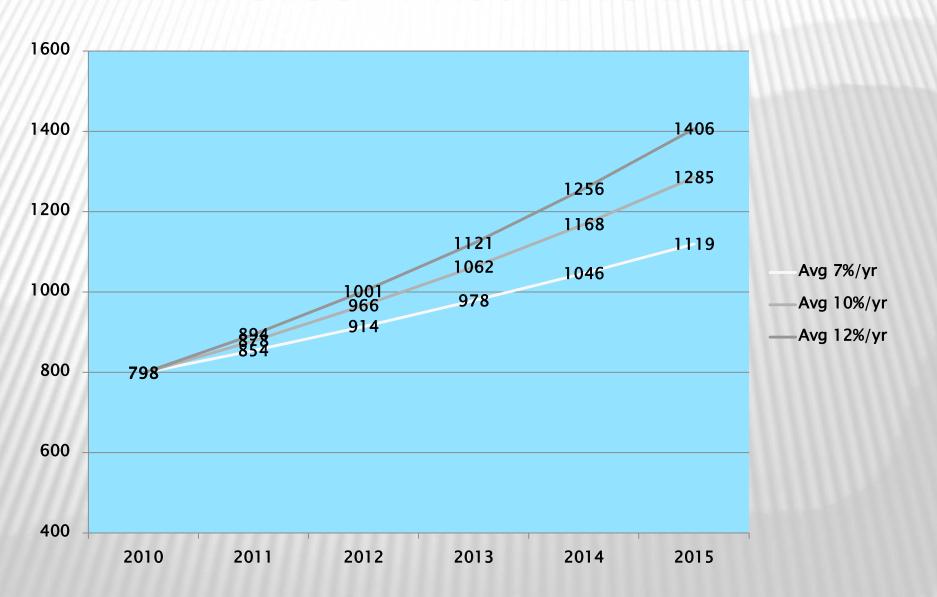
### WHY WE WANT TO OFFER IT?

- DEMAND
- OUR STUDENT BASE
- EMERGING TRENDS
- STAYING COMPETITIVE
- OUR LONG-TERM COMMITTMENT TO PRE-MEDICAL EDUCATION





## OIRA ESTIMATES OF GROWTH IN U/G BIOLOGY MAJORS TO 2015



### FORECASTA

## ENROLLMENTS IN BIOLOGICAL SCIENCES NATION-WIDE CONTINUES TO INCREASE

TRAINING IN BIOLOGICAL SCIENCES PROVIDES AN IMPORTANT FOUNDATION FOR ACADEMIC AND VOCATIONAL TRACKS

DEMAND FOR BIO-SCIENCTISTS IN INDUSTRY IS INCREASING RAPIDLY AND IS PREDICTED TO CONTINUE FOR AT LEAST 8-10 YEARS

NATION-WIDE THE DEMAND FOR MEDICAL TRAINING IS INCREASING AND SO IS THE DEMAND FOR QUALITY PRE-MEDICAL EDUCATION

## OUR STUDENT BASE:

WE ALWAYS SEEK TO FIND OUT WHO OUR STUDENTS ARE AND WHAT ARE THEIR GOALS. VERY RECENTLY WE SURVEYED OUR ENTIRE U/G STUDENT POPULATION:

DO YOU CONSIDER YOURSELF A PRE-MEDICAL STUDENT?

**YES = 78%** 

ARE YOU PLANNING TO CONTINUE YOUR EDUCATION IN GRADUATE OR PROFESSIONAL SCHOOL?

**YES = 96%** 

## OUR STUDENT BASE:

WE HAVE A DISTINCT STUDENT BASE. NOT INTERCHANGEABLE WITH STUDENTS IN OTHER PROFESSIONAL TRACKS: THEY LIKE BIOLOGY AND THEY LIKE SCIENCE.

A VERY SUBSTANTIAL PORTION OF OUR STUDENTS COME TO US FOR PRE-MEDICAL EDUCATION

OUR STUDENTS ENJOY THE BENEFIT OF A BROAD BIOLOGICAL SCIENCE EDUACATION AND LIKE BIOLOGICAL RESEARCH.

### OUR STUDENT BASE:

#### **FOR ALL THESE REASONS:**

### WE STRIVE TO OFFER THE VERY BEST PRE-MEDICAL EDUCATION TO OUR U/G STUDENTS

WE DO NOT WANT TO TURN OUR BIOLOGY DEGREES COMPLETELY TO PRE-MEDICAL DEGREES

### EVOLVING TRENDS:

THE AMERICAN ASSOCIATION OF MEDICAL COLLEGES (AAMC) HAS RECENTLY CONDLUDED SEVERAL YEARS OF STUDY ON MEDICAL SCHOOL EXPECTATIONS AND PROVIDES RECOMMENDATIONS FOR FUTURE ADMISSION EXAMS (MCAT) AND PREMEDICAL PREPARATION.

THIS IS INDICATED IN A 2009 REPORT AND FURTHER INDICATED IN 2010 AND 2011 UPDATES

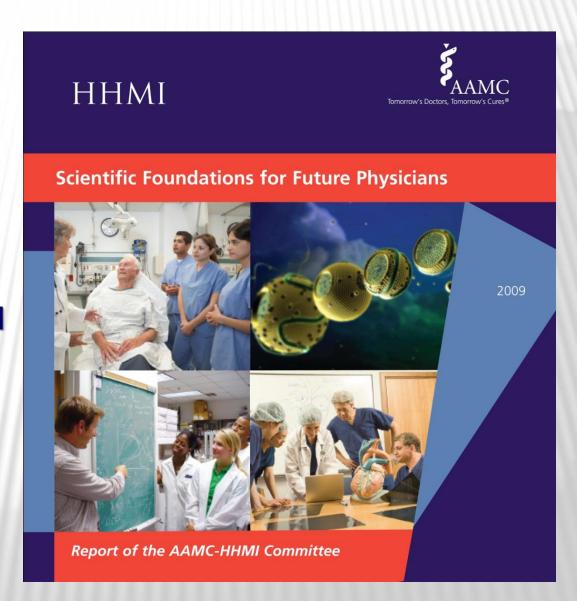
### AAMC/HHMI: THE 2009 REPORT

### The main points:

More Rigorous Science Foundations

Emphasis on the Scientific Method and Reasoning

Extending out to Social and Cognitive Sciences



## AAMC: MARCH 29, 2011 LETTER



2450 N Street, N.W., Washington, D.C. 20037-1127 T 202 828 0690 F 202 828 4799

March 29, 2011

Dear Colleagues,

The AAMC is in the third year of a multi-year review of the MCAT exam. At this juncture, the 22-member Fifth MCAT Review (MRS) Committee has drafted preliminary recommendations for the future exam. The committee is scheduled to announce final recommendations at the 2011 AAMC Annual Meeting in November. AAMC's leadership will propose the final recommendations to the AAMC Board of Directors in February 2012.

The committee developed its recommendations based on input from blue-ribbon and advisory committees and groups, including the AAMC-HHMI Scientific Foundations for Future Physicians (SFFP) Committee, the AAMC Behavioral and Social Sciences Expert Panel, the Holistic Review Project Advisory Committee, and others. Committee members received over 2,700 completed surveys from baccalaureate and medical school faculty, administrators, residents, and medical students. Additionally, the MR5 committee held more than 75 outreach events to solicit input, including seven at the 2010 AAMC Annual Meeting.

The committee's preliminary recommendations preserve what works best about the current MCAT exam, eliminates what doesn't, and enriches the exam by giving attention to concepts that future physicians are likely to need—using a testing format that already has proven to be successful. The following preliminary recommendations provide a basis for conversation as the committee prepares for its final recommendations. They are likely to recommend a new exam

- 1. Includes four test sections and reports four scores:
  - · Molecular, Cellular, and Organismal Properties of Living Systems
  - · Physical, Chemical, and Biochemical Properties of Living Systems
  - · Behavioral and Social Sciences Principles
  - · Critical Analysis and Reasoning Skills
- Tests examinees' knowledge and use of the concepts in biology, chemistry, physics, biochemistry, cellular/molecular biology, research methods, and statistics that medical school faculty, students, and residents rate as most important to entering students' success.
- Tests examinees' knowledge and use of the concepts in behavioral and social sciences, research methods, and statistics that provide a solid foundation for medical students' learning about the behavioral and socio-cultural determinants of health.
- 4. Tests examinees' ability to analyze and reason through passages in ethics and philosophy, cross-cultural studies, population health, and a wide range of social sciences and humanities disciplines to ensure that students possess the necessary critical-thinking skills to be successful in medical school.

iple section.

r to the current 1-15 scale, rather than a pass/fail or other

on a regular schedule to ensure the MCAT exam keeps pace

inary recommendations publicly at the upcoming National alth Professions (NAAHP) and Group on Student Affairs rious other AAMC spring meetings in April. Since those nembers, the AAMC also will issue a press release about the farch 31.

's recommendations, including the resources that should : AAMC should do to develop new measures of integrity, nal characteristics that admissions committees can use early : Web site: www.aamc.org/mr5. This Thursday, new mmendations will be added to the site and the latest edition so will be sent outlining details.

mittee Chair

of Medicine

nmittee Vice Chair

ge of Medicine

MCAT® is a program of the Association of American Medical Colleges

#### The new MCAT that will take effect in 2015:

The new directions for the MCAT exams will include four test sections and report four scores:

- Molecular, Cellular, and Organismal Properties of Living Systems
- Physical, Chemical, and Biochemical Properties of Living Systems
- Behavioral and Social Sciences Principles
- Critical Analysis and Reasoning Skills

The MCAT will test examinees' knowledge and use of the concepts in biology, chemistry, physics, biochemistry, cellular/molecular biology, research methods, and statistics that medical school faculty, students, and residents rate as most important to entering students' success.

These points are directly and completely addressed in our new program. They clearly reaffirm the central importance of Biological Sciences in pre-medical education.

# OUR EXPERIENCE AND COMMITTMENT:

WE HAVE BEEN DOING PRE-MEDICAL AND BIOMEDICAL EDUCATION FOR THE LAST 40 YEARS. AND EVIDENTLY, WE HAVE BEEN VERY SUCCESSFUL AT THAT.

WE ALREADY OFFER AN EXTENSIVE COLLECTION OF COURSES THAT ARE COMPLETELY ON TARGET WITH PRE-MEDICAL AND BIOMEDICAL EDUCATION.
HERE IS A SELECTION OF COURSE TITLES IN BIOLOGY (NEXT SLIDE)

**Histology Lab Advanced Endocrinology Human Anatomy Science of Vision Genetics Lab Biochemistry I Anatomy and Virology Physiology Lab Molecular Biology Immunology Stem Cell Biology** Histology **Developmental Biology Medical Microbiology Advanced Neuroanatomy Gross Human Anatomy** Human **Physiology Cell Biology of Cancer Physiology Human Anatomy Functional Genomics Human Anatomy Lab Human Physiology Neurobiology** Cellular **Biochemistry II** Advanced Genetics

Biochemistry **Neuropharmacology** 

# Biological Sciences



#### **Pre-Professional Studies** Pre-dental

Pre-medical Pre-optometry Pre-veterinary

#### Ecology

K. Berven S. Tiegs



**Doctoral Program** Ph.D. in biological communication

**Cell Physiology** 

A. Banes-Berceli

F. Hansen

C. Lindemann J. Reddan

#### Genetics/Bioinformatics

S. Lal

J. Liang

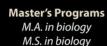
**B. Shastry** 





G. Gamboa

T. Grudzien



#### Microbiology/Immunology

S. Suvas

S. Walia



R. Chaudhry

S. Gordon

A. Hitt



#### **Undergraduate Programs**

B.A. and B.S. in biology B.S. in biochemistry B.S. in bioengineering

#### **Biochemistry**

C. Govind

A. Dvir

Z. Liu

V. Moudgil



### BEING COMPETITIVE:

WE ARE NOT THE ONLY GAME IN TOWN, BUT ALREADY WE ARE BECOMING A VERY SUBSTANTIAL FORCE IN THE REGIONAL PRE-MED NICHE.

WHERE DO WE WANT TO GO IN THE NEXT FIVE YEARS?

WE ARE AIMING TO HAVE THE BEST PRE-MEDICAL PROGRAM IN THE STATE OF MICHIGAN.



## STRONG PUBLIC AWARNESS OF OU WITH THE LAUNCH OF OUR MEDICAL SCHOOL

THE CLOCK IS TICKING WITH THE COMING CHANGES IN THE MCAT EXAMS

WE ARE GOING TO BE THE FIRST IN THE REGION WITH A PROGRAM THIS GOOD

## JUNIOR/SENIOR SURVEY:

To determine the potential for our students' interest in the BMS program, we have just surveyed our 300- and 400-level classes. We received 321 unique responses:

	Students thinking we should offer the program:	89%
	Students that would have been interested in such a program if it had existed when they entered OU:	69%
×	Students who would recommend it to other students:	88%
	Students who believe the program would specifically attract new students to OU:	70%

## ADDRESSING SOME BUDGET CONCERNS:

During the Senate review process there were concerns that pertained to the budget.

We have always maintained that our budget is based on significant net revenue with regards to projected enrollments. We were fairly optimistic that these projections are realistic (see OIRA chart).

However, because of the concerns, we have adjusted the budget to reflect a more modest enrollment projection and trimmed the requested resources accordingly.

## ADJUSTED BUDGET:

Original Budget 10/2010	7 2 2 3 3 3				HILLIAM
Headcount	50	100	150	200	200
Total Revenue	\$475,031.25	\$958,687.50	\$1,450,968.75	\$1,943,250.00	\$1,943,250.00
Total Compensation	\$143,260.50	\$418,584.00	\$698,781.00	\$781,422.00	\$781,422.00
Total Operating Expenses	\$75,398.00	\$432,620.00	\$387,968.00	\$423,451.00	\$317,458.00
Total Expenses	\$218,658.50	\$851,204.00	\$1,086,749.00	\$1,204,873.00	\$1,098,880.00
Net	\$256,372.75	\$107,483.50	\$364,219.75	\$738,377.00	\$844,370.00

Revised Budget 4/2011	1 1 1 1 1 1 1 1 1			11111111	1111111
Headcount	25	50	75	100	125
Total Revenue	\$237,515.63	\$479,343.75	\$725,484.38	\$971,625.00	\$971,625.00
Total Compensation	\$63,770.00	\$178,366.00	\$299,962.00	\$323,162.00	\$323,162.00
Total Operating Expenses	\$66,750.00 \$130,520.00	\$212,352.00 \$390,718.00	\$160,566.00 \$460,528.00	\$168,915.00 \$492,077.00	\$170,922.00 \$494,084.00
Total Expenses	φ130,320.00	φ390,716.00	<b>Ψ400,326.00</b>	φ492,077.00	φ <del>494</del> ,004.00
Net	\$106,995.63	\$88,625.75	\$264,956.38	\$479,548.00	\$477,541.00

#### **ADDRESSING CHAIR OF CHEMISTRY CONCERNS:**

AT THIS TIME ALL DIFFERENCES WITH ART BULL WITH REGARDS TO THE PROPOSAL HAVE BEEN RESOLVED. WE HAVE CLARIFIED OUR POSITION ABOUT THE BUDGET AND AGREED TO PROVIDE ACCESS TO THE NEW PROGRAM WITH SOME OF THE COURSES OFFERED BY THE CHEMISTRY DEPARTMENT

ART AUTHORIZED ME TO REPORT TO THE SENATE TODAY THAT HE IS IN FULL SUPPORT OF OUR PROPOSAL.

## (2<sup>nd</sup> PART BY ANNE HITT)

## **AAMC COMPETENCIES**

Competency	Core Courses
<b>Quantitative Reasoning</b>	MTH 154, 155 and STA 228
Scientific Inquiry	BIO 206, 308, 322,492, 493, 499, PSY 250
<b>Basic Physical Processes</b>	PHY 151, 152, 158
<b>Basic Chemical Principles</b>	CHM 157, 158, 234,235, 237
Molecular Biochemistry	BIO 111, 325, 473, BCM 453, BCM454
Molecular Cell Biology	BIO 111, 307, 309
Physiology and Immunology	BIO 207, 322, 423
Genetics and Evolution	BIO 341, 445

## CURRICULUM – BIOLOGY COURSES

BIO 111 Biology I

BIO 205-206 Human Anatomy and Lab

BIO 307-308 Human Microbiology and Lab

BIO 309 Biology of the Cell

BIO 322 Physiology Lab

BIO 325/BCM 453 Biochemistry I

BIO 423 Immunology

BIO 445 Principles of Evolutionary Medicine

BIO 473/BCM 454 Biochemistry of Metabolism and Disease /Biochemistry II

BIO 475 Human Genetics

BIO 492 Scientific Inquiry

BIO 493 Integrative Pharmacology

BIO 499 Integrative Biomedicine and Disease

# CURRICULUM – COGNATE COURSES

MTH 154-155 Calculus I and II

STA 228 Biological Statistics

PHY 151-152, 158 Introductory Physics I, II and lab

CHM 157-158 General Chemistry I and I

CHM 234-235, 237 Organic Chemistry I, II and lab

PHL 103 Introduction to Ethics

PSY 100 Foundations of Contemporary Psychology

PSY 250 Introduction to Research Design

## **ELECTIVE COURSES**

**Medical Anthropology** 

**Gross Human Anatomy** 

**Neuroanatomy** 

**Ecology** 

**Advanced Human Physiology** 

Medical Parasitology and

Mycology

**Histology** 

**Advanced Human Anatomy** 

**Science of Vision** 

**Histology lab** 

**Cellular Biochemistry** 

**Independent Research** 

Vertebrate Zoology

**Endocrinology** 

**Physiological Psychology** 

**Physiology** 

**Advanced Cell Topics** 

**Social Cognition** 

**Developmental Biology** 

**Molecular Biology** 

**Health Psychology** 

**Developmental lab** 

**Advanced Genetics** 

**Abnormal Psychology** 

**Biochemistry lab** 

**Medical Microbiology** 

**Psychopathology of Childhood** 

**Genetics lab** 

**Cell Biology of Cancer** 

**Sociology of Mental Illness** 

**Neurobiology** 

Virology

Sociology of Health and

ieurobiology vii

Medicine

Animal Behavior
Neuropharmacology

Functional Genomics

Functional Genomics Lab

Sociological Perspectives on Aging

# HALLMARK OF BMS - INTEGRATIVE COURSES

Require a broad knowledge base Biological, Chemical, Physical, and Social Sciences

- Identification and application of information from
  - Scientific literature, Bioinformatics Databases, etc.
- SYNTHESIS
  - Critical thinking
- TEAMWORK and COMMUNICATION
  - + Required real world skills

# INTEGRATIVE COURSES - UNIQUE TO BMS

#### **Scientific Inquiry Laboratory**

Focused on a single medically relevant topic (Example diabetes)

Molecular → Biochemistry → Cell → Organs → Organism → Societal Impact

#### **Integrative Pharmacology**

**Human Pharmacology** 

Clinical application

Physiological functions

Pharmacological principles

**Biochemistry of actions** 

#### **Integrative Biomedicine and Disease (capstone)**

Student based investigation of multiple aspects of clinically relevant diseases

Molecular  $\rightarrow$  Biochemistry $\rightarrow$  Cell  $\rightarrow$  Organs  $\rightarrow$  Organism  $\rightarrow$  Societal Impact  $\rightarrow$  Ethics of Disease Management

Tools – Scientific and Popular Literature, Bioinformatics Databases,



# ACTIVE LEARNING ENVIRONMENT

# ACTIVE EARNING CLASSROOM FOR INTEGRATIVE COURSES

Modeled on University of Minnesota Active Learning Classrooms (<a href="http://www.classroom.umn.edu/projects/ALCOverview.html">http://www.classroom.umn.edu/projects/ALCOverview.html</a>)

"Furniture and technology allow students to work in small groups

- Creates a cooperative learning environment encourages students to collaboration with peers questioning and teaching one another
- Allows instructors to coach students during activities by assisting them in answering their own questions
- Allows students to present their results to the class for review by peers and instructors"

## **ADMISSION CRITERIA**

**BIO 111 - 3.6** 

CHM 157 - 3.6

Minimum 3.0 GPA in core program courses

## **AAMC 2010 APPLICANT REPORT**

Table 18: MCAT and GPAs for Applicants and Matriculants to U.S. Medical Schools by Primary Undergraduate Major, 2010



Average MCAT scores and GPAs for year 2010 applicants and matriculants to U.S. Medical Schools by primary undergraduate major are displayed below. Please e-mail us at facts@aamc.org if you need further assistance or have additional inquiries.

Applicants, 2010	MCAT VR		MCAT PS		MCAT BS		Total MCAT		MCAT WS			GPA science		GPA non-science		GPA total		Total	
Applicants, 2010	Mean	SD*	Mean	SD	Mean	SD	Mean	SD	25th%ile	Median	75th %ile	Mean	SD	Mean	SD	Mean	SD	Applicants	
Biological Sciences	8.9	2.1	9.2	2.3	9.9	2.1	28.1	5.4	М	Р	Q	3.44	0.42	3.67	0.29	3.53	0.35	22,327	
Humanities	10.0	1.9	9.6	2.1	10.0	2.0	29.6	4.9	0	Q	R	3.41	0.43	3.65	0.28	3.54	0.31	1,950	
Math and Statistics	9.7	2.1	10.6	2.3	10.3	2.2	30.5	5.6	M	P	Q	3.50	0.40	3.62	0.33	3.54	0.35	386	
Other	9.0	2.2	9.1	2.3	9.6	2.2	27.7	5.7	M	P	Q	3.43	0.44	3.66	0.30	3.53	0.34	7,229	
Physical Sciences	9.3	2.1	10.4	2.3	10.1	2.1	29.8	5.5	M	P	Q	3.48	0.42	3.61	0.33	3.53	0.35	4,672	
Social Sciences	9.5	2.0	9.3	2.2	9.7	2.1	28.5	5.2	N	P	Q	3.36	0.46	3.59	0.33	3.49	0.34	4,997	
Specialized Health Sciences	8.4	2.3	8.4	2.3	8.9	2.3	25.7	6.0	M	0	Q	3.40	0.44	3.63	0.31	3.51	0.34	1,181	
All Applicants	9.1	2.1	9.4	2.3	9.8	2.1	28.3	5.5	M	P	Q	3.43	0.43	3.65	0.30	3.53	0.34	42,742	

SD = standard deviation

Matriculants, 2010	MCAT VR		MCAT PS		MCAT BS		Total MCAT		MCAT WS			GPA science		GPA non-science		GPA total		Total
Matriculants, 2010	Mean	SD*	Mean	SD	Mean	SD	Mean	SD	25th%ile	Median	75th %ile	Mean	SD	Mean	SD	Mean	SD	Matriculants
Biological Sciences	9.8	1.7	10.3	1.9	10.8	1.6	30.8	4.1	N	P	Q	3.63	0.31	3.77	0.23	3.69	0.26	9,559
Humanities	10.6	1.5	10.5	1.8	10.9	1.6	32.0	3.6	0	Q	R	3.58	0.33	3.74	0.23	3.66	0.24	991
Math and Statistics	10.3	1.6	11.3	1.8	11.2	1.6	32.8	3.9	N	Q	R	3.63	0.30	3.72	0.25	3.66	0.26	183
Other	9.9	1.7	10.2	2.0	10.6	1.7	30.7	4.2	N	Q	Q	3.60	0.33	3.75	0.23	3.67	0.25	3,057
Physical Sciences	10.0	1.7	11.3	1.9	11.0	1.7	32.2	4.1	N	Q	Q	3.65	0.31	3.71	0.26	3.67	0.26	2,201
Social Sciences	10.2	1.5	10.4	1.8	10.6	1.5	31.2	3.7	0	Q	R	3.56	0.33	3.69	0.26	3.63	0.26	2,268
Specialized Health Sciences	9.5	1.6	9.8	1.9	10.3	1.6	29.5	4.0	N	P	Q	3.60	0.34	3.74	0.24	3.67	0.26	406
All Matriculants	9.9	1.7	10.4	1.9	10.8	1.7	31.1	4.1	N	Q	R	3.61	0.32	3.75	0.24	3.67	0.26	18,665

Applicants - ~52 % Biological Sciences, ~80% CAS Matriculants - ~ 52 % Biological Sciences, ~82 % CAS

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Specialized Health Sciences	9.5	1.6	9.8	1.9	10.3	1.6	29.5	4.0	N	P	Q	3.60	0.34	3.74	0.24	3.67	0.26	406
All Matriculants	9.9	1.7	10.4	1.9	10.8	1.7	31.1	4.1	N	Q	K	3.61	0.32	3.75	0.24	3.67	0.26	18,665

**Applicants - 2.7 % Health Sciences Matriculants - 2.1 % Health Sciences**