Submitted: 12-13-2007, 15:30:47

MIT Application for Graduate Admission 2008

Please read instructions carefully before you complete this form. Please print clearly or type.

1 Proposed date of entrance: ☐ February ☐ June ☒ September   Year: **2008**

2 Department **Health Sciences and Technology**   Area of research or interdisciplinary program **Bioinformatics and Integrative Genomics**
consult department listings in Book I

3 Initial degree objective at MIT **Ph.D.**   Final degree objective *(if different)* **Ph.D.**

4 Are you applying to more than one department? ☒ Yes ☐ No   If yes, indicate departments **Biology**

5 Full legal name _____   **6** Date of birth _____
last/family/surname   first   middle   month   day   year

Former name (if any) _____

7 Female ☐   Male ☒

8 Ethnicity *(optional)*:   **US citizens and permanent residents only**
- ☐ African-American/Black
- ☐ Afro-Caribbean
- ☐ African parentage
- ☐ Asian-American
- ☒ Caucasian/White
- ☐ Chicano or Mexican-American
- ☐ Puerto Rican
- ☐ Other Hispanic
- ☐ Native American _____ Tribal affiliation
- ☐ Other _____ Please describe

9 Reply address _____
number   street   city

_____
state or province   country   zip or postal code

10 Permanent address _____
number   street   city

_____
state or province   country   zip or postal code

11 Daytime phone _____   Evening phone _____
country code   area code/city code   number   country code   area code/city code   number

12 Fax number _____   Email address _____
country code   area code/city code   number

13 City, state and country of birth _____ United States of America __ Citizen of **United States of America**   US Social Security # *(if any)* _____

If a foreign citizen in the US, give date of entry _____   Type of visa _____   I-20 ID Number _____
month   day   year

If an Exchange Visitor (J), give program number and name of sponsor _____

Permanent resident of **United States of America**   If a permanent resident (immigrant) of the US, give alien registration number _____

14 **Have you previously applied for admission to MIT?** ☐ Yes ☒ No   MIT ID _____
if assigned one as a former student

If yes, what status? ☐ Freshman ☐ Transfer ☐ Special ☐ Graduate   Date: _____   Department: _____

15 List all colleges and universities attended, major field, dates of attendance and name of degrees received or expected *(list most recent first)*:

College/University	Location	Major field	Dates attended	Actual name of degree/diploma	Date degree awarded/expected
RUTGERS-UNIV COLL-NB	NEW BRNSWCK, NJ	Computer Science / Biology	09-2001 05-2006	SB / AB	05-2006

16 Other graduate schools to which you are applying _____

For department use: ○ Admitted ○ Cond. Admitted Degree _____ Term _____ By _____ Date _____ ○ Not approved
○ Admitted ○ Cond. Admitted Degree _____ Term _____ By _____ Date _____ ○ Not approved

25

17 Entrance tests: GRE: Date taken or to be taken: 10-2007 / 11-2007   Scores: verbal 510 / 500   quantitative 640 / 720   analytic 4.5 / 4.0

GRE Subject: Date taken or to be taken: _____ Scores: _____ Subject: _____

GMAT: Date taken or to be taken: _____ Scores: _____

TOEFL: Date taken or to be taken: _____ Scores: _____

18 List language of instruction in: primary school; English   ;   secondary school English

university English   ;   graduate school _____ Native language if other than English: _____

19 Names of three persons to whom you have given evaluation forms. *(Request those persons to return the completed forms to you in time to meet the appropriate deadline.)*

Dr. Joel Hirschhorn	Assistant Professor	Harvard Medical School
name	title	institution/company
Dr. Charles Roth	Associate Professor	Rutgers Dept.of Biomedical Eng
name	title	institution/company
Dr. Tara Matise	Associate Professor	Rutgers Dept. of Genetics
name	title	institution/company

20 Please give the names, years of graduation, department affiliation, and relationships of any close relatives who have attended MIT:

_____

_____

21 Your honors, prizes, or major publications: _____

Please see page 9

_____

22 Your extracurricular activities and accomplishments: _____

Rutgers Jiu-Jitsu Club, Association for Undergraduate Geneticists

_____

23 Your teaching or professional experience including summer and term-time work. Give name of employer, dates, and nature of work:

Please see page 9

_____

24 Other experience, including military, volunteer work, travel. Give dates and nature of work: _____

_____

_____

International students (non-immigrant visa holders) please complete the following:

25 Your marital status: ☐ Single ☐ Married   Number of children _____

If single, do you intend to marry before you come here? ☐ Yes ☐ No   Will your spouse come with you? ☐ Yes ☐ No

26 Signature: _____ Date: 12-13-2007

Record of Courses Taken in Preparation for Graduate Study

Please carefully read the instructions below before you complete this form.

Based on your transcript(s), please complete the following summary of your college and university classes.

General instructions:

- Important: some departments do not require this form; other departments require only some of the fields to be completed—check the requirements for the department to which you are applying before completing this form. See pages 4–16 of this booklet.
- This form is **not** required for courses taken at MIT (except for the Department of Physics).
- If the department to which you are applying requires this form, a transcript will not be accepted as a substitute for this information.
- If your university system does not fit with the categories below—for example, if your courses do not have numbers or you did not receive course grades—leave those fields blank.
- Do not try to convert your university grading scale or GPA to MIT's scale. Indicate the grades/GPA as granted by your school and give us a brief explanation of your school's grading system.
- If the space provided is not sufficient, you may attach additional sheets.

Why we ask you to complete this form:

- We see transcripts from thousands of schools from all over the world. It is extremely helpful for us to review applicants' coursework and grades in a standard format.
- Transcripts show courses by semester or year. However, the best way for us to evaluate your preparation is to see your courses grouped by subject area, with the most relevant courses at the top.
- Transcripts do not list textbooks used; many departments find that information especially helpful.

Grading System:

Please describe the grading system(s) used at all colleges and universities you have attended. Explain the specific meaning of any numeric values, letter grades, and rankings. _____

_____

Cumulative GPA as listed on transcript (if available) _____

COURSES MOST RELEVANT TO THE PROGRAM TO WHICH YOU ARE APPLYING

Please list below the college/university courses you have taken that are most relevant to the graduate program to which you are applying. Group courses by subject area, for example, group all math courses together and group all science courses together, etc. Use the next section, if you need more room.

Course no. (if applicable)	Course name	Principal textbook used (author and title)	Year in which course was taken	Official course grade (if applicable)
119-101	General Biology	Eldra Solomon, Linda Berg, Diana W. Martin -Biology	2001	C+
119-102	General Biology	Eldra Solomon, Linda Berg, Diana W. Martin -Biology	2002	B
160-161	General Chemistry	"Chemistry," Sixth Edition by S. Zumdah	2002	B
160-162	General Chemistry	"Chemistry," Sixth Edition by S. Zumdah	2003	B
160-171	Intro to Experimentation		2003	B
160-307	Organic Chemistry	"Organic Chemistry" - Bruice	2003	C
160-308	Organic Chemistry	"Organic Chemistry" - Bruice	2004	C+
694-407	Molec. Bio & Biochem	Lehninger, Nelson, Cox [2005] Principles of Biochemistry	2004	C+
694-408	Molec. Bio & Biochem	Lehninger, Nelson, Cox [2005] Principles of Biochemistry	2005	C
447-380	Genetics		2003	A
160-311	Organic Chem Lab		2004	B
447-404	Seminar in Genetics		2005-0	A
447-407	Research in Genetics		03-05	A
447-315	Intr. Reserach in Genetics		2005	A

ADDITIONAL COURSES

Please list below other college/university courses you have taken. Group courses by subject area (science, math, engineering, humanities, social sciences, etc.). You may also use this section for any courses that you could not fit in the section above.

Course no. (if applicable)	Course name	Principal textbook used (author and title)	Year in which course was-taken	Official course grade (if applicable)
447-495	Cancer		2005	A
447-481	Topics in Human Genetics		2006	A
198-111	Intro to Comp Sci		2001	C+
198-112	Data Structures		2002	C
640-151	Calculus I	Jon Rogawski, Calculus [Early Transcendentals]	2001	B
640-152	Calculus II	Jon Rogawski, Calculus [Early Transcendentals]	2002	C+
750-203	Physics		2002	B
198-205	Intr. Discreet Structures I		2002	B
198-206	Intr. Discreet Structures II		2003	A
750-204	Physics		2003	B+
198-211	Computer Architecture	Principles of Computer Architecture, Miles J. Murdocca and Vincent P. Heuring,	2003	C+
198-344	Design and Analysis of Computer Algorithms		2003	B
640-250	Intro Linear Algebra		2003	B
198-314	Principles of Programming Languages		2004	C
198-323	Numerical Analysis in Computing		2004	C
198-336	Principles of Database Management Systems	Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems"	2004	B+
198-416	Operating System Design		2005	C
750-206	General Physics Lab		2005	B+
198-417	Distributed Systems		2005	B
640-354	Linear Optimization		2006	C

TITLE	SCH	DEPT	CRS	SEC	CREDITS	PR	GRADE
RUTGERS COLLEGE							
ECIFIED (MATRICULATING)							
OLOGY	01	119	101	G2	4.0		C+
PUTER SCI	01	198	111	12	4.0		C+
WRITING I	01	355	101	BS	3.0		B+
TH/PHYS	01	640	151	O4	4.0		B

TS: 15.0   TERM AVG: 2.833   CUMULATIVE AVG: 2.833

TITLE	SCH	DEPT	CRS	SEC	CREDITS	PR	GRADE
RUTGERS COLLEGE							
ECIFIED (MATRICULATING)							
IOLOGY	01	119	102	D4	4.0		B
CTURES	01	198	112	O5	4.0		C
ATH/PHYS	01	640	152	28	4.0		C+
SON PERSUAS	01	730	101	O5	3.0		B

TS: 30.0   TERM AVG: 2.600   CUMULATIVE AVG: 2.717

TITLE	SCH	DEPT	CRS	SEC	CREDITS	PR	GRADE
RUTGERS COLLEGE							
ECIFIED (MATRICULATING)							
HYSICS	01	750	203	B2	3.0		B
HYSICS	01	750	204	H2	3.0		W

TS: 33.0   TERM AVG: 3.000   CUMULATIVE AVG: 2.742

TITLE	SCH	DEPT	CRS	SEC	CREDITS	PR	GRADE
RUTGERS COLLEGE							
ECIFIED (MATRICULATING)							
& DEV BIO	01	146	270	O2	3.0		C
HEMISTRY	01	160	161	O2	4.0		B
RET STRCT I	01	198	205	O2	4.0		B
	01	450	334	O1	3.0		B+

TS: 47.0   TERM AVG: 2.893   CUMULATIVE AVG: 2.787

SPRING 2003 RUTGERS COLLEGE
MAJOR: UNSPECIFIED (MATRICULATING)

TITLE	SCH	DEPT	CRS	SEC	CREDITS
GENERAL CHEMISTRY	01	160	162	06	4.0
INTR EXPERIMENTATION	01	160	171	23	1.0
INTR DISCRT STRCT II	01	198	206	06	4.0
GENERAL PHYSICS	01	750	204	08	3.0
GENERAL PSYCHOLOGY	01	830	101	02	3.0

DEGREE CREDITS: 62.0   TERM AVG: 3.467   CUMULATIVE A

SUMMER 2003 RUTGERS COLLEGE
MAJOR: UNSPECIFIED (MATRICULATING)

TITLE	SCH	DEPT	CRS	SEC	CREDITS
COMPUTER ARCHITECTUR	01	198	211	C6	4.0

DEGREE CREDITS: 66.0   TERM AVG: 2.500   CUMULATIVE A

FALL 2003   RUTGERS COLLEGE
MAJOR: UNSPECIFIED (MATRICULATING)

TITLE	SCH	DEPT	CRS	SEC	CREDITS
ORGANIC CHEMISTRY	01	160	307	31	4.0
DSGN&ANAL COMP ALGOR	01	198	344	10	4.0
RESEARCH IN GENETICS	01	447	307	O1	3.0
GENETICS	01	447	380	O1	4.0
INTRO LINEAR ALGEBRA	01	640	250	C1	3.0

DEGREE CREDITS: 84.0   TERM AVG: 3.167   CUMULATIVE A

SPRING 2004 RUTGERS COLLEGE
MAJOR: GENETICS
MAJOR: COMPUTER SCIENCE

TITLE	SCH	DEPT	CRS	SEC	CREDITS
ORGANIC CHEMISTRY	01	160	308	O2	4.0
ORGANIC CHEM LAB	01	160	311	16	2.0
PRIN PROG LANGUAGES	01	198	314	O5	4.0
NUMER ANAL COMPUTING	01	198	323	O7	4.0
RESEARCH IN GENETICS	01	447	308	95	3.0

DEGREE CREDITS: 101.0   TERM AVG: 2.588   CUMULATIVE A

** CONTINUED ON NEXT PAGE **
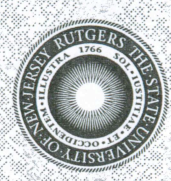
RAISED SEAL NOT REQUIRED

University Registrar

Rutgers, the State University of New J

RUTGERS

THE STATE UNIVERSITY OF NEW JERSEY

THIS IS A RED SECURITY SHEET. IF COPIED, "VOID" WILL APPEAR

TITLE	SCH	DEPT	CRS	SEC	CREDITS	PR	GRADE
FALL 2004 RUTGERS COLLEGE							
MAJOR: GENETICS							
MAJOR: COMPUTER SCIENCE							
PRINCIPLES OF DBMS	01	198	336	02	4.0		B+
RESEARCH IN GENETICS	01	447	406	01	3.0		A
MOLEC BIO & BIOCHEM	01	694	407	01	3.0		C+
PHIL IDEAS SCI FICT	01	730	261	01	3.0		B+
GENERAL PHYSICS LAB	01	750	205	12	1.0		B+
PERSONALITY PSYCH	01	830	338	01	3.0		W
DEGREE CREDITS: 115.0 TERM AVG: 3.393 CUMULATIVE AVG: 2.970							

TITLE	SCH	DEPT	CRS	SEC	CREDITS	PR	GRADE
SPRING 2005 RUTGERS COLLEGE							
MAJOR: GENETICS							
MAJOR: COMPUTER SCIENCE							
OPER SYSTEM DESIGN	01	198	416	01	4.0		C
INT RESEARCH GENETIC	01	447	315	04	3.0		A
SEMINAR IN GENETICS	01	447	404	02	1.0		A
RESEARCH IN GENETICS	01	447	407	01	3.0		A
MOLEC BIO & BIOCHEM	01	694	408	01	3.0		C
GENERAL PHYSICS LAB	01	750	206	02	1.0		B+
DEGREE CREDITS: 130.0 TERM AVG: 3.033 CUMULATIVE AVG: 2.977							

TITLE	SCH	DEPT	CRS	SEC	CREDITS	PR	GRADE
FALL 2005 RUTGERS COLLEGE							
MAJOR: COMPUTER SCIENCE							
MAJOR: GENETICS							
DISTRIBUTED SYSTEMS	01	198	417	01	4.0		B
CANCER	01	447	495	01	3.0		A
JEWISH SOC&CULTURE I	01	563	201	01	3.0		C+
PHYSIOLOGICAL PSYCH	01	830	313	07	3.0		B
H RUTGERS SCHOLARS	12	090	497	01	6.0		A
DEGREE CREDITS: 149.0 TERM AVG: 3.395 CUMULATIVE AVG: 3.030							

TITLE	SCH	DEPT	CRS	SEC	CREDITS	PR	GRADE
SPRING 2006 RUTGERS COLLEGE							DEAN'S LIST
MAJOR: COMPUTER SCIENCE							
MAJOR: GENETICS							
SEMINAR IN GENETICS	01	447	404	03	1.0		A
TPCS HUMAN GENETICS	01	447	481	01	3.0		A
LINEAR OPTIMIZATION	01	640	354	01	3.0		C
TPCS:WINE INSIGHTS	11	015	273	01	1.0		B+
H RUTGERS SCHOLARS	12	090	498	01	6.0		A
DEGREE CREDITS: 163.0 TERM AVG: 3.536 CUMULATIVE AVG: 3.074							*HENRY RUTGERS SCHOLAR

DEGREE: BACHELOR OF SCIENCE   MAY 2006
MAJOR: COMPUTER SCIENCE
MAJOR: GENETICS
HONORS
DEPT GENETICS AWARD EXCLLNC RSRCH PRSNTN

*** END OF TRANSCRIPT ***

RAISED SEAL NOT REQUIRED

University Registrar

Rutgers, the State University of New Jersey

EXPLANATION OF GRADING SYSTEM

A. Standard (Exception: School of Law - Newark, School of Law - Camden, Livingston College, and Rutgers Business School Newark/New Brunswick (Grad)

			Grade Points				Grade Points
A	-	Distinguished	4.00	F	-	Failing	0.00
B+	-	Intermediate grade	3.50	Pass	-	(A thru C)	
B	-	Good	3.00	NOCR	-	No credit (D & F)	
C+	-	Intermediate grade	2.50	IN	-	Incomplete	
C	-	Satisfactory	2.00	PIN	-	Permanent incomplete	
D	-	Poor	1.00	TNC	-	Temporary no credit	

B. School of Law - Camden & Newark

			Grade Points				Grade Points
A+	-		4.33	C	-	Satisfactory	2.00
A	-	Distinguished	4.00	C-	-	Intermediate grade	1.67
A-	-	Intermediate grade	3.67	D+	-	Intermediate grade	1.33 (Camden only)
B+	-	Intermediate grade	3.33	D	-	Poor	1.00
B	-	Good	3.00	F	-	Failing	0.00
B-	-	Intermediate grade	2.67	PASS	-	Credit awarded	
C+	-	Intermediate grade	2.33	NOCR	-	No credit	0.00
				IN	-	Incomplete	

C. School of Law - Camden (through Summer Session 2001)

			Grade Points				Grade Points
A+	-		4.50	C+	-	Intermediate grade	2.50
A	-	Distinguished	4.00	C	-	Satisfactory	2.00
B+	-	Intermediate grade	3.50	D+	-	Intermediate grade	1.50
B	-	Good	3.00	D	-	Poor	1.00
				F	-	Failing	0.00

D. Rutgers Business School Newark/New Brunswick (Grad)

			Grade Points				Grade Points
A	-	Distinguished	4.00	C+	-	Intermediate grade	2.33
A-	-	Intermediate grade	3.67	C	-	Satisfactory	2.00
B+	-	Intermediate grade	3.33	C-	-	Intermediate grade	1.67
B	-	Good	3.00	D	-	Poor	1.00
B-	-	Intermediate grade	2.67	F	-	Failing	0.00
				INC	-	Incomplete	

E. Livingston College

			Grade Points				Grade Points
A	-	Distinguished	4.00	D	-	Poor	1.00
B+	-	Intermediate grade	3.50	NOCR	-	Failed (no credit)	0.00
B	-	Good	3.00	TNC	-	Temporary no credit	0.00
C+	-	Intermediate grade	2.50	H	-	Honors (A)	
C	-	Satisfactory	2.00	CR	-	Credit (B & C)	
				F	-	Failing	0.00

F. OTHER GRADE SYMBOLS

DF	Disciplinary failure	S	Satisfactory	W	Withdrew or dropped
IN	Incomplete	TZ	Grade not submitted	WF	Withdrew failing
NG	No grade given	X	Examination not taken	U	Unsatisfactory
WP	Withdrew passing	H	Honors grade		

REGULATIONS GOVERNING USAGE of above grade symbols are determined by each college of the University. Complete explanations are found in appropriate college bulletins of the general catalog of Rutgers University.

CREDIT HOUR PREFIXES

E	Credits do not count toward degree
N	Noncredit course - Credits do not count toward degree
G	Undergraduate course taken for graduate credit
PN	Course undertaken on pass/no credit basis
R	Repeated course
J	Counts as degree credit but is not in the CUM GPA
K	Does not count as degree credit but is in the CUM GPA

TERMS AND CUMULATIVE AVERAGES

$$\frac{\text{Total grade points}}{\text{Total credit hours}} = \text{Weighted average}$$

GRADE PREFIXES
R - Re-examination permitted
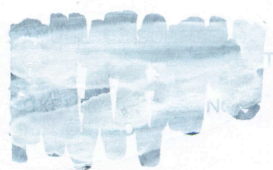T - Term work incomplete

CREDIT HOURS

One credit is given for 800 minutes of class (lec. or rec.) or for three times this amount of laboratory time.

Issued By:

☐ Newark
249 University Avenue
Newark, NJ 07102
973-353-5324

☐ Camden
311 North 5th Street
Camden, NJ 08102
856-225-6053

☐ New Brunswick
ASB, Room 200L
65 Davidson Rd.
Piscataway, NJ 08854-8096
732-445-3146

Statement of Objectives

Please read instructions carefully before you complete this form.

Please give your reasons for wishing to do graduate work in the field you have chosen. Prepare your statement of objectives and goals in whatever form clearly presents your views. Include as far as you can, your particular interests, be they experimental, theoretical, or issue-oriented, and show how your background and MIT's programs support these interests. The statement could be much like a proposal for graduate studies, in the more specific context of your professional objectives. You should set forth the issues and problems you wish to address. Explain your longer-term professional goals. The Admissions Committee will welcome any factors you wish to bring to its attention concerning your academic and work experience to date.

- Type or print using black ink.
- Use reverse side if necessary or separate form.
- Keep a copy for your file. You may also wish to provide copies to your evaluators before they complete their forms.
- Return this form with the completed application to the appropriate MIT department (see pages 4–16).

The methods by which complex human diseases are studied have changed tremendously through advances in technology and computers. New ways of studying disease rely heavily on computational methods coupled with basic wet lab skills. Interested in both genetics and computer science and wanting a strong background in each, I completed a double major in college. Before my senior year, I participated in two different labs which approached human disease differently, either purely computationally or by molecular biology wet lab techniques. My goal is to integrate these two fields to study human genetics, in an effort to better understand how diseases arise and how they might be reversed or prevented.

Drawing upon my previous research experience, interest in bioinformatics, and my desire to complete a Henry Rutgers Honors Thesis, I joined the lab of Dr. Charles Roth in the Rutgers Biomedical Engineering Department. The lab group was interested in analyzing metabolic pathways in rat hepatocytes, a project that would enable me to utilize my computer science and molecular biology background. I proposed a multipart project which first involved correlating putative transcription factor binding sites in cytochrome P450 [CYP450] genes with their hepatic expression levels. I used a motif search tool [Possum] to identify putative transcription factor binding sites in all CYP450 genes, and then I ascertained expression levels for these genes using previously published microarray data on hepatocytes. I wrote software which ran Possum on every rat gene published in genome databases and cataloged the results. I determined by statistical methods which transcription factor binding sites occurred more frequently in CYP450 genes versus the rest of the rat genome. I then wrote clustering algorithms to group genes with similar expression values and finally identified transcription factor binding sites unique to each cluster. The next part of my proposal involved experimentally verifying transcription factor binding sites by chromatin immunoprecipitation in primary hepatocytes that I surgically isolated from rats. However, because of my impending graduation, I was unable to finish this aspect of the project. This work was awarded the Genetics Department "Award for an Outstanding Research Presentation" and was also presented at the American Institute for Chemical Engineering in a poster entitled "A Bioinformatics Approach to Modeling Cytochrome P450 Gene Regulation in Hepatocytes."

After graduating, I joined Dr. Joel Hirschhorn's lab at Children's Hospital Boston/Broad Insitutute. I was intrigued by the state of the art genomics being done in this lab and it gave me the opportunity to live near my two brothers, one an undergraduate at Harvard and the other a neuroscience graduate student at Harvard Medical School. My first project involved the generation of a 50,000 SNP array [IBC chip] to capture more evenly [than commercial products] common variation in nearly 2,100 candidate genes related to heart, lung, blood, and sleep phenotypes. I was responsible for the design and programming of a strategy to efficiently capture variants while guaranteeing complete coverage of candidate genes. My algorithm used the publically available Tagger software to choose SNPs that captured common variation either individually or in multimarker combinations for the 1808 highest priority genes in a large set of samples from several ethnicities. The chip was produced commercially by Illumina, and currently over 200,000 chips have been purchased by academic research labs. After finishing the IBC chip, I began evaluating its performance versus that of commercially available arrays from Illumina and Affymetrix. Since I designed the IBC chip to capture variation in the CEPH [European ancestry], Yoruba, Japanese and Chinese [JPT+CHB] populations, performance between these three populations was evaluated independently. I was not surprised to find that in the CEPH and JPT+CHB populations, coverage by two widely used arrays, the Affymetrix 6.0 and the Illumina 650, was above 90% for the highest priority genes on the IBC chip. However, at maximum multimarker efficiency [$r^2 > 0.8$] in the Yoruba population, the Affymetrix 6.0 and Illumina 650 coverage dropped to 86% and 85%, respectively, while the IBC chip's coverage was an expected 99%. For large studies containing populations of African ancestry, such as African American, a substantial amount of common variation

Statement of Objectives (Cont.)

would not be covered by commercial whole genome products. Thus, the IBC array is particularly well suited for use in multiethnic panels to detect gene - gene and gene - environment interactions, including those with drugs. Also, because the IBC chip contains very rare SNP variants identified through resequencing efforts by the SeattleSNP project, use of the IBC chip will allow detection of positive associations that may otherwise be lost in commercial whole genome scans. This is important because studies often lack the power to detect association between multiple loci and a trait, which can lead researchers to prematurely conclude a negative finding. Because the IBC chip is less costly than most commercial products, groups will now have the ability to investigate larger sample sizes and avoid this potential problem. The IBC chip will also be valuable for determining if the genetic basis of a trait differs between various populations. Ultimately, I believe this technology will provide new insight into the pathogenesis of heart, lung, blood, and sleep disorders, and likely will elucidate the molecular underpinnings of the diseases. This is fundamental for the design of drug treatments to potentially treat or cure these disorders. Also, understanding the complex genetic basis of these diseases will also allow physicians to recognize high risk patients and begin prevention at an early age.

My research experiences have led to my appreciation of the many ways in which computers can power biological discovery. My graduate ambitions are to continue research with a group that has a strong interest in combining computer science and genetics in the effort to better understand human disease. The B.I.G program at MIT offers an unparalleled intellectual culture where I can benefit from the tutelage of leading researchers who share my passion for bioinformatics research. The balanced curriculum and wide-range of faculty expertise incorporate a variety of disciplines that promote an education rich in fundamentals from which I can expand in post-doctoral study.

Use this space for additional information or comments, if needed.

EDUCATION
2001-2006   Rutgers College   New Brunswick, NJ
B.S. Computer Science
B.A. Genetics, Honors

WORK EXPERIENCE
August 2006-Present   Children's Hospital Boston   Boston, MA
Research Assistant, Laboratory of Joel H. Hirschhorn, M.D., Ph.D
Informatics - design algorithms and software for statistical analysis of complex human diseases. Maintain and develop databases and lab computer hardware.
Laboratory technician in genotyping core facility
Designed 50k IBC chip for studying heart, lung, blood and sleep candidate genes. [manuscript in preparation, see poster abstract]
Performed bench work and statistical analysis for whole genome analysis for the identification of in vitro cell susceptibility factors to HIV-1.

RESEARCH EXPERIENCE
June 2005-July 2006   Rutgers University   Department of Chemical and Biochemical Engineering
New Brunswick, NJ
Undergraduate Research Assistant, Advisors: Drs. Charles Roth and Marianthi G. Ierapetritou
Completed Henry Rutgers Honors Thesis
Thesis Title: A Bioinformatics Approach to Modeling Cytochrome P450 Gene Regulation in Hepatocytes

July 2003-May 2005   Center for Advanced Biotechnology and Medicine, The University of Medicine and Dentistry of New Jersey   Piscataway, NJ
Undergraduate Student Researcher, Advisor: Dr. James Millonig
Participated in family based association studies that identified an autism susceptibility gene.
Studied a PvuII polymorphism in the EN2 promoter as an autism risk factor, work included in American Journal for Human Genetics publication, see publications.
Work involved lab bench work as well as the statistical analysis of data.

June 2001-July 2003   Laboratory for Computer Science Research[LCSR]   Rutgers University Department of Computer Science   Piscataway, NJ
Student Research Programmer, Advisor: Dr. Don Smith
Extensively tested bioinformatics software on Unix platform
Wrote software in Perl and Java, including a clustering algorithm used in data analysis

Fall 2002-Spring 2003   Rutgers University Residential Networking   New Brunswick, NJ
Student Technical Support
Worked as a field technician fixing computer hardware, software, and network problems

Summer 2000   National University of Singapore   Singapore

Bioinformatics Summer Intern, Advisor : Dr. Prasanna Kolatkar
Tested and debugged Java Programs on Mac and UNIX Systems.
Wrote a Java program to compile a database of organic molecules

PUBLICATIONS
Benayed R, Gharani N, Rossman I, Mancuso V, Lazar G, Kamdar S, Bruse SE, Tischfield S, Smith BJ, Zimmerman RA, Dicicco-Bloom E, Brzustowicz LM, Millonig JH. [2005]. Support for the homeobox transcription factor gene ENGRAILED 2 as an autism spectrum disorder susceptibility locus. Am J Hum Genet. 77[5]:851-68

DQ054784 Caenorhabditis remanei PRP8 mRNA, partial cds. [2005]. Tischfield, S.E. and Nemeroff,M.E.
http://www.ncbi.nlm.nih.gov/entrez/viewer.fcgi?db=nucleotide&val=66734175

AWARDS
Henry Rutgers Honors Student
Genetics Department Excellence in a Research Presentation

Use this space for additional information or comments, if needed.

Genetics Honors

PRESENTATIONS
Poster: "Design issues related to the generation of a 50,000 SNP array for studying heart, lung, blood and sleep candidate genes" Annual American Society of Human Genetics, San Deigo, CA, October 2007.

Poster: "A Bioinformatics Approach to Modeling Cytochrome P450 Gene Regulation In Hepatocytes" Annual American Institute of Chemical Engineers Conference, Cincinnati, OH, October 2005.

TEACHING EXPERIENCE
Teaching Assistant, Introduction to Genomics BT4606, Northeastern University,   Boston, MA,   Spring 2007;
Instructor: Dr. Jigar Desai

COURSEWORK
Harvard School of Public Health: Introduction to BioStatistics

ACTIVITIES
Rutgers Jiu-Jitsu Club, Association for Undergraduate Geneticists

PROFESSIONAL MEMBERSHIPS
American Institute of Chemical Engineers
American Society of Human Genetics

MIT Evaluation for Graduate Admission

Please read instructions carefully before you complete this form.

Part 1 | To be completed by | **all applicants**

Please type or print using black ink.
Important: In the upper right of this form, fill in the return address department name and room number (as indicated on pages 4–16 of this booklet).

Name: _____
last/family   first   middle

Applying for admission in the department of Health Sciences and Technology _____

for the ultimate degree of Ph.D. _____ area of research BIG _____

for the term beginning in September 2008 _____ email _____

Under the Family Educational Rights and Privacy Act of 1974, a student enrolled at MIT has access to his or her education records. We intend to comply with both the letter and the spirit of this law, while still allowing the student the option of waiving the right to access. If you wish to waive the right to examine this evaluation at a later date, please sign here.

Applicant's signature: _____
                                                                                                    date

Part 2 | To be completed by | **evaluator**

An application for admission to MIT requires evaluations from three teachers or people capable of judging the professional and academic promise of the applicant. A separate letter of evaluation may be attached to this form if necessary.

Please return in time for her/him to meet the following deadlines: January 15 for June or September admissions for applicants except as follows: December 15 for Aeronautics and Astronautics, Architecture, Biology, Brain and Cognitive Science, Chemistry, Electrical Engineering and Computer Science, Health Sciences and Technology, Leaders for Manufacturing (see http://lfm.mit.edu for additional details), Mechanical Engineering, Media Arts and Sciences; December 15 for Operations Research; December 31 for Biological/Engineering and Political Science; January 1 for Physics and Science, Technology and Society; January 2 for Chemical Engineering, Civil and Environmental Engineering, Economics, Linguistics and Philosophy, Mathematics; January 3 for Urban Studies and Planning; January 5 for Earth, Atmospheric and Planetary Sciences; January 7 for Nuclear Science and Engineering; January 10 for Computation for Design and Optimization, Engineering Systems Division and Technology and Policy Program; and February 15 for Center for Real Estate. November 1 is the deadline for the February term. January 12 and April 6 are the deadlines for Round 1 and Round 2, respectively, for the Master of Engineering in Logistics (MLOG) Program. For the Evaluation Form, please go to http://www.mit.edu/mlog/. For the Systems Design and Management Evaluation Form, please go to http://sdm.mit.edu.

Evaluator's name: Charles Roth _____ Title Associate Professor _____

Address 599 Taylor Road _____ Piscataway _____ NJ ____ 08854 _____ USA _____

email cmroth@rci.rutgers.edu _____ Date 12-13-2007 _____

School or company Rutgers University _____ Telephone number 732-445-4500x6205 _____

In what capacity do you know the applicant? research advisor _____

How long have you known the applicant? 2.5 years _____

How does this applicant compare with his or her peer group in academic ability?

| ☐ Truly exceptional *equivalent to the very best you have known – a person who, in your experience, appears only every few years* | ☐ Outstanding *comparable to the best student in a current class* | ☒ Well above average *top 25%* | ☐ Above average *demonstrated high ability* | ☐ Average *able to complete work to the Ph.D.* | ☐ Below average *lower 50%* | ☐ Inadequate opportunity *to observe* |

In your opinion, how would this student compare to other students in the graduate program at MIT?

| ☐ Truly exceptional | ☐ Outstanding | ☐ Well above average | ☐ Above average | ☒ Average | ☐ Below average | ☐ Inadequate opportunity *to observe* |

Please give the applicant's relative standing in your department (e.g., 7th in 89) not in my department _____

(continue on reverse side)

Personal evaluation of the applicant. What particularly qualifies this student for study at MIT? Information about accomplishments in research or independent projects will be particularly helpful. If you know of other students who have entered MIT from your institution, a comparison will be especially valuable. If you have any reason to believe that the applicant should not be considered, please explain.

_____ is well trained in interdisciplinary science and research and responds well to fast-paced, challenging environments.

For further details, see letter below.

If the applicant's first language is not English, please evaluate her/his proficiency to read, write, and speak English. _____

Evaluator's signature Charles Roth   12-13-2007

Evaluators: Please feel free to add information about your own educational and professional background if you feel that such information will enhance our understanding of your evaluation.

I have known a number of HST students, mostly when I was a postdoc at MGH then subsequently an Instructor at

Harvard Medical School. There is also a Rutgers graduate in the program now [Biju P.].

Please seal and sign the envelope.

RUTGERS
School of Engineering

Department of Biomedical Engineering
Department of Chemical and Biochemical
  Engineering
Rutgers, The State University of New Jersey
599 Taylor Road, Room 205
Piscataway, NJ 08854

cmroth@rci.rutgers.edu
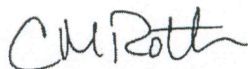
P: 732-445-4500, Ext. 6205
F: 732-445-3753

December 14, 2007

To Whom It May Concern:

I am writing in support of _____ 's application for graduate school admission. ___ was an undergraduate researcher in my laboratory. He came to me in summer 2005 and expressed an interest in finding and executing a research project, as a Henry Rutgers Honors Thesis, that integrated his skills as a dual major in Genetics and Computer Science. He distinctly expressed a desire to have both a computational and experimental component. I was quite impressed with his knowledge base, ambition and zeal and set him to work with one of my graduate students who is interested in understanding gene regulation in the culture of hepatocytes (primary liver cells) for use in bioartificial liver or in vitro toxicology. He successfully completed his Honors Thesis and degrees in May, 2006.

___ brought unique coding skills to our group and developed a tool, which we call TFAlyze, that sends a series of small jobs to a bioinformatics server, assembles the results, performs statistical analysis, and provides an output of transcription factor binding sites overexpressed on a set of genes of interest, relative to a large set of background genes. Not only did he do all of the scripting on his own, but he helped to find and evaluate various servers and packages to find those that could perform the task in which we were interested. ___ completed development of the package and made predictions regarding transcription factors regulating cytochrome P450 loss of expression in cultured hepatocyte by applying our approach to a gene expression dataset from the literature. Although he graduated before having the chance to perform the experimental validation, his graduate student is currently working on that. ___ did assist with various experimental tasks "in his spare time" because of his genuine interest in learning how they were done.

I remember seeing ___ 's transcript as an undergraduate and noting that he was only a good, not great, student in terms of course grades. However, he is very strong in research. He is bright and personable, full of ideas, and unafraid to express his opinions about what may be the best approach to a problem. He had the vision to acquire an ideal skill set for this age of bioinformatics and systems biology, and he is more than willing to work long hours when he is trying to get something to work. He was an excellent citizen of the lab, always willing to help out where needed, and a pleasure to have in the group. I am confident that ___ will be a very successful and productive graduate student, and I endorse his application whole-heartedly and without reservation.

Sincerely,

Charles M. Roth, Ph.D.
Associate Professor
Undergraduate Director, Biomedical Engineering

MIT Evaluation for Graduate Admission

Please read instructions carefully before you complete this form.

Return to:
Department of _____
Massachusetts Institute of Technology
77 Massachusetts Avenue, Room _____
Cambridge, MA 02139-4307

Part 1 To be completed by **all applicants**

Please type or print using black ink.
Important: In the upper right of this form, fill in the return address department name and room number (as indicated on pages 4–16 of this booklet).

Name: _____
    last/family   first   middle

Applying for admission in the department of **Health Sciences and Technology**

for the ultimate degree of **Ph.D.**   area of research **BIG**

for the term beginning in **September 2008**   email _____

Under the Family Educational Rights and Privacy Act of 1974, a student enrolled at MIT has access to his or her education records. We intend to comply with both the letter and the spirit of this law, while still allowing the student the option of waiving the right to access. If you wish to waive the right to examine this evaluation at a later date, please sign here.

Applicant's signature: _____
                                             date

Part 2 To be completed by **evaluator**

An application for admission to MIT requires evaluations from three teachers or people capable of judging the professional and academic promise of the applicant. A separate letter of evaluation may be attached to this form if necessary.

Please return in time for her/him to meet the following deadlines: January 15 for June or September admissions for applicants except as follows: December 15 for Aeronautics and Astronautics, Architecture, Biology, Brain and Cognitive Science, Chemistry, Electrical Engineering and Computer Science, Health Sciences and Technology, Leaders for Manufacturing (see http://lfm.mit.edu for additional details), Mechanical Engineering, Media Arts and Sciences; December 15 for Operations Research; December 31 for Biological/Engineering and Political Science; January 1 for Physics and Science, Technology and Society; January 2 for Chemical Engineering, Civil and Environmental Engineering, Economics, Linguistics and Philosophy, Mathematics; January 3 for Urban Studies and Planning; January 5 for Earth, Atmospheric and Planetary Sciences; January 7 for Nuclear Science and Engineering; January 10 for Computation for Design and Optimization, Engineering Systems Division and Technology and Policy Program; and February 15 for Center for Real Estate. November 1 is the deadline for the February term. January 12 and April 6 are the deadlines for Round 1 and Round 2, respectively, for the Master of Engineering in Logistics (MLOG) Program. For the Evaluation Form, please go to http://www.mit.edu/mlog/. For the Systems Design and Management Evaluation Form, please go to http://sdm.mit.edu.

Evaluator's name: **Tara Matise**   Title **Associate Professor**

Address **145 Bevier Road**   **Piscataway**   **NJ**   **08854**   **USa**

email **matise@biology.rutgers.edu**   Date **12-17-2007**

School or company **Rutgers University**   Telephone number **732-445-3125**

In what capacity do you know the applicant? **instructor/advisor**

How long have you known the applicant? **6 years**

How does this applicant compare with his or her peer group in academic ability?

☐ Truly exceptional equivalent to the very best you have known – a person who, in your experience, appears only every few years	☒ Outstanding comparable to the best student in a current class	☐ Well above average top 25%	☐ Above average demonstrated high ability	☐ Average able to complete work to the Ph.D.	☐ Below average lower 50%	☐ Inadequate opportunity to observe

In your opinion, how would this student compare to other students in the graduate program at MIT?

☐ Truly exceptional	☐ Outstanding	☐ Well above average	☐ Above average	☐ Average	☐ Below average	☒ Inadequate opportunity to observe

Please give the applicant's relative standing in your department (e.g., 7th in 89) **N/A**

(continue on reverse side)

Personal evaluation of the applicant. What particularly qualifies this student for study at MIT? Information about accomplishments in research or independent projects will be particularly helpful. If you know of other students who have entered MIT from your institution, a comparison will be especially valuable. If you have any reason to believe that the applicant should not be considered, please explain.

Please see attached letter.

If the applicant's first language is not English, please evaluate her/his proficiency to read, write, and speak English.

Evaluator's signature _Tara Matise_   12-17-2007

Evaluators: Please feel free to add information about your own educational and professional background if you feel that such information will enhance our understanding of your evaluation.

Please seal and sign the envelope.

RUTGERS

Human Genetics Institute
Department of Genetics
Life Sciences Building
Rutgers, The State University of New Jersey
145 Bevier Road
Piscataway, NJ 08854-8082

www.rutgers.edu
http://lifesci.rutgers.edu/~genetics/
Phone: 732-445-1027
Fax: 732-445-1147

December 17, 2007

To Whom it May Concern:

Please accept my letter of recommendation for _____, who is applying to your graduate school program. I have known Sam since 2001 when, as a freshman, he was participating in a joint research project between myself in the Department of Genetics and scientists in the Computer Science department where he was working as a research programmer. We had frequent meetings where ____ had helpful and insightful input to our project. Two years later, ____ approached me to discuss possibilities for research experience. I did not have any available projects at that time, which in retrospect, was really unfortunate, since it is clear he would have been a real asset to my lab. I gave him suggestions of others to approach, and he obtained research positions first in the lab of Dr. James Millonig (Neuroscience, University of Medicine and Dentistry of New Jersey), and then in the lab of Dr. Charles Roth (Chemical and Biochemical Engineering, Rutgers University). His work in these two different labs nicely complemented his coursework from which he earned both a B.A. in Genetics and a B.S. in Computer Science. This cross-training put him in an excellent position to start a career in a very unique and important growing niche within the field of Computational Biology.

I taught ____ in my course Topics in Human Genetics during his last term at Rutgers, spring of 2006. This course is a very challenging senior level class in which multiple researchers lecture to the students in a seminar style. In addition each student is required to give two presentations to the class based on their own study of current scientific literature, and write a 10-page term paper on a genetics-related topic of their choice. ____ was a top student in this class of 77 students, and earned an A in the class. He received an A on both exams and all homeworks, as well as a 92% on his term paper, which was titled "The human genome - identification of cis-regulatory elements through bioinformatics." ____ met with me occasionally during the course to go over course material to ensure that he understood it and would be prepared for the exams. He always showed that he had carefully studied the material and demonstrated an outstanding understanding of the broad material we covered. He showed himself to be very conscientious and was clearly working hard to earn a good grade in this class. He was always very personable and I felt very comfortable meeting with him.

____'s first research experience was for two years in a molecular neuroscience/genetics lab with Dr. James Millonig. During this time ____ learned and applied a number of wet lab techniques, and also learned and applied several statistical genetics methods needed to analyze the lab data. He is co-author on a paper that resulted partially from this work.

During his last year at Rutgers, ____ performed his research for credit in the Henry Rutgers Honors program. Among other requirements, this honors program requires preparation of a significant thesis describing the research, as well as a thesis presentation before a thesis committee. I served on ____'s honors thesis committee. I was very impressed with the body of work he had performed, his 48-page thesis was

detailed and very well-written, and during his thesis presentation it became clear that he had an excellent understanding of the work he had done, including its relevance to other work both within and outside of his advisor's lab. The title of his thesis was: A Bioinformatics Approach to Modeling Cytochrome P450 Gene Regulation in Hepatocytes. _ received a terrific research experience during his time in Dr. Roth's group, learning a great deal and making a significant contribution to the work of the lab. He also presented his research to the Genetics department during its own Honors Day (i.e. separate from the Henry Rutgers Honors presentation requirements) and for this, he received the Genetics department's award for Outstanding Research Presentation. In addition he presented this work in a poster at an annual meeting of the American Institute for Chemical Engineering. These are very impressive achievements for an undergraduate student.

Since his graduation as a dual-major at Rutgers, , has been working in the lab of Dr. Joel Hirschhorn at Children's Hospital of Boston/Harvard University. Dr. Hirschhorn is a very highly regarded Genetics scientist and Sam was lucky to receive a position with this prestigious group. His work there is better described in 's personal statement (and presumably in a letter of recommendation from Dr. Hirschhorn), but in summary, in addition to other projects, he has helped to develop and evaluate an array of SNPs to assay 2,100 candidate genes related to heart, lung, blood, and sleep phenotypes. This array has been made commercially available in chip format through the Illumina company and over 200,000 chips have been sold to academic labs so far. This chip has proven to be considerably more useful than other related available products, and this has clearly been an excellent research project for .

Mr. 's training in computer science, bioinformatics, and molecular genetics laboratory techniques puts him in a very unique position to pursue graduate level training and a research career in these areas. His long-standing interest in research has me thoroughly convinced that he would make a very valuable addition to your program. I hope you will consider him very seriously. I would not hesitate to recommend him for admission to our own graduate program and I would be thrilled to have a student like in my own lab.

Sincerely,

Tara Matise, Ph.D.
Associate Professor
732-445-3125

MIT Evaluation for Graduate Admission

Please read instructions carefully before you complete this form.

Return to:
Department of _____
Massachusetts Institute of Technology
77 Massachusetts Avenue, Room _____
Cambridge, MA 02139-4307

Part 1 To be completed by **all applicants**

Please type or print using black ink.
Important: In the upper right of this form, fill in the return address department name and room number (as indicated on pages 4–16 of this booklet).

Name: _____
last/family   first   middle

Applying for admission in the department of __Health Sciences and Technology__

for the ultimate degree of __Ph.D.__   area of research __BIG__

for the term beginning in __September 2008__   _____ email _____

Under the Family Educational Rights and Privacy Act of 1974, a student enrolled at MIT has access to his or her education records. We intend to comply with both the letter and the spirit of this law, while still allowing the student the option of waiving the right to access. If you wish to waive the right to examine this evaluation at a later date, please sign here.

Applicant's signature: _____
                                                                                                                    date

Part 2 To be completed by **evaluator**

An application for admission to MIT requires evaluations from three teachers or people capable of judging the professional and academic promise of the applicant. A separate letter of evaluation may be attached to this form if necessary.

Please return in time for her/him to meet the following deadlines: January 15 for June or September admissions for applicants except as follows: December 15 for Aeronautics and Astronautics, Architecture, Biology, Brain and Cognitive Science, Chemistry, Electrical Engineering and Computer Science, Health Sciences and Technology, Leaders for Manufacturing (see http://lfm.mit.edu for additional details), Mechanical Engineering, Media Arts and Sciences; December 15 for Operations Research; December 31 for Biological/Engineering and Political Science; January 1 for Physics and Science, Technology and Society; January 2 for Chemical Engineering, Civil and Environmental Engineering, Economics, Linguistics and Philosophy, Mathematics; January 3 for Urban Studies and Planning; January 5 for Earth, Atmospheric and Planetary Sciences; January 7 for Nuclear Science and Engineering; January 10 for Computation for Design and Optimization, Engineering Systems Division and Technology and Policy Program; and February 15 for Center for Real Estate. November 1 is the deadline for the February term. January 12 and April 6 are the deadlines for Round 1 and Round 2, respectively, for the Master of Engineering in Logistics (MLOG) Program. For the Evaluation Form, please go to http://www.mit.edu/mlog/. For the Systems Design and Management Evaluation Form, please go to http://sdm.mit.edu.

Evaluator's name: __Joel Hirschhorn__   Title __Associate Professor of Genetics__

Address __Enders 561, 300 Longwood Avenue Boston__   MA   02115   USA

email __joelh@broad.mit.edu__   Date __01-01-2008__

School or company __Harvard Medical School/Children's Hospital__   Telephone number __617-919-2129__

In what capacity do you know the applicant? __Direct supervisor in the laboratory__

How long have you known the applicant? __1-1/2 years__

How does this applicant compare with his or her peer group in academic ability?

☐ Truly exceptional
equivalent to the very best you have known – a person who, in your experience, appears only every few years

☐ Outstanding
comparable to the best student in a current class

☒ Well above average
top 25%

☐ Above average
demonstrated high ability

☐ Average
able to complete work to the Ph.D.

☐ Below average
lower 50%

☐ Inadequate opportunity to observe

In your opinion, how would this student compare to other students in the graduate program at MIT?

☐ Truly exceptional   ☐ Outstanding   ☒ Well above average   ☐ Above average   ☐ Average   ☐ Below average   ☐ Inadequate opportunity to observe

Please give the applicant's relative standing in your department (e.g., 7th in 89) __N/A__

(continue on reverse side)

31

Personal evaluation of the applicant. What particularly qualifies this student for study at MIT? Information about accomplishments in research or independent projects will be particularly helpful. If you know of other students who have entered MIT from your institution, a comparison will be especially valuable. If you have any reason to believe that the applicant should not be considered, please explain.

See attached letter

If the applicant's first language is not English, please evaluate her/his proficiency to read, write, and speak English. _____

Evaluator's signature Joel Hirschhorn   01-01-2008

Evaluators: Please feel free to add information about your own educational and professional background if you feel that such information will enhance our understanding of your evaluation.

Please seal and sign the envelope.

December 31, 2007

To the members of the Admissions Committee:

I am writing this recommendation in strong support of _____'s application to the graduate program at HST. He has worked in my lab as a technician and doing informatics and analysis work for the past year and a half.

_____ was interested in coming to Boston and heard about my lab because his brother was a highly successful graduate student in Elizabeth Engle's lab next door. Because of his undergraduate background and experience in computer science and genetics _____ was a good fit for my lab, which focus on the genetics of complex traits and deals with analysis of large data sets.

_____ has been involved in several projects, reflecting his ability to contribute both on the analysis/informatics side and at the lab bench. He has had two main projects, but has contributed to most of the projects in the lab. His first project was the SNP selection for a 50,000 SNP genotyping array, now a commercial product from Illumina. The array was designed to use "tag SNPs" to survey common variation in 2,000 genes, with different genes being covered at several different levels of completeness. At the beginning of the project, _____ needed to learn about linkage disequilibrium, population genetics, and the implications for selection of tag SNPs that could serve as proxies for other nearby but ungenotyped common variants. Specifically, the array was being designed for a multiethnic set of samples, so _____ needed to understand how different patterns of genetic variation in different populations influenced the selection of tag SNPs for the chip. With the help of Paul DeBakker, he wrote and implemented an automated script based on the *tagger* software package that selects tag SNPs using different criteria and efficiently captures common genetic variation in multiple ethnic groups. Using this script, he evaluated different parameters for SNP selection, to balance the completeness of coverage with the space available on the microarray. Completing this effort for Illumina's deadline required a great deal of late night work, which _____ performed without complaint. _____ s contribution will be reflected in coauthorship on a manuscript describing the product (manuscript in late stages of preparation) and hopefully in a first author manuscript comparing this product with genome-wide genotyping products (manuscript in very early stages of preparation).

_____'s other project has been a mix of lab work and analysis. Briefly, we collaborated with Norm Letvin's lab to measure in vitro susceptibility to HIV infection in a panel of cell lines in which extensive genotype information had been collected (HapMap). _____ grew up many of the cell lines himself (which necessitated both tissue culture skills and attention to details including tracking the growth rate of each of 270 cell lines). The goal of the project was to identify genetic variants that could influence in vitro (and hopefully in vivo) susceptibility to HIV. _____ performed a genome-wide association study between the genotype data and the susceptibility to

HIV infection. In the process of performing this analysis, ⟨ ⟩ got some apparently very exciting results, but after some careful discussion and further review, he suspected that these arose from a bug in a popular software package. He was able to confirm this suspicion by contacting the author of the software. He also implemented other analysis packages to compare the HIV infection results with expression data collected in these same cell lines, and got some intriguing initial results. This initial work has sparked the Letvin lab to scale up this initial experiment, and they have asked ⟨ ⟩ to perform the analysis once the new data are available.

Finally, over the last year, ⟨ ⟩ has been of great help to the lab in numerous other ways. He has been the "go-to" informatics person in the lab, and has written numerous scripts to help lab members analyze and handle large data sets. These contributions will no doubt yield coauthorship in manuscripts in the future. In addition, he has served as the systems manager for the lab, maintaining our server and computer equipment. Finally, he has been a lab technician for a genotyping core, producing very high quality SNP genotype data.

In summary, ⟨ ⟩ has an unusual mix of excellent laboratory and programming skills. As large scale data analysis and computation becomes more widespread in biology, this mix of skills will become increasingly valuable. ⟨ ⟩ has been a very hard worker (although his hours are quite "phase-shifted," as is not uncommon for computer programmers – I not infrequently get emails from him at 3 AM, but it is unusual to see him in the lab before noon). He has matured as a scientist, as illustrated by the recognition of the artifactual results in his HIV project. He has begun to acquire statistical expertise to go along with his computational skills, which will help him in future computational biology projects.

I have spoken with him about his planned career in research, and he seems quite motivated and eager to move on to graduate school. He understands well the research world both from his own experiences and that of his family. Graduate school will be a superb next step for ⟨ ⟩ to provide him with rigorous training in designing and planning experiments and projects. He will bring his own strong blend of talents and will no doubt be a strong asset, particularly to any computationally oriented labs he might join. I think ⟨ ⟩'s motivation, intelligence, capacity for hard work, and natural talents will provide a recipe for success in graduate school and beyond. He has been a valuable contributor to my lab, and based on a comparison with dozens of graduate students at top programs, I believe he will be a valuable member of whatever lab he chooses for his thesis work. I personally would be glad to take him as a graduate student in my lab. I recommend him strongly for admission at any program in the country.

Sincerely,

Joel Hirschhorn, MD, PhD

Associate Professor of Genetics
Children's Hospital/Harvard Medical School

Senior Associate Member and Coordinator, Metabolism Initiative
Broad Institute of Harvard and MIT