RETURN ON INVESTMENT: USING NRC DATA WITH FACULTY MEMBERS, DEPARTMENTS, AND VISITING COMMITTEES

Convocation of the Assessment of Research Doctorate Programs
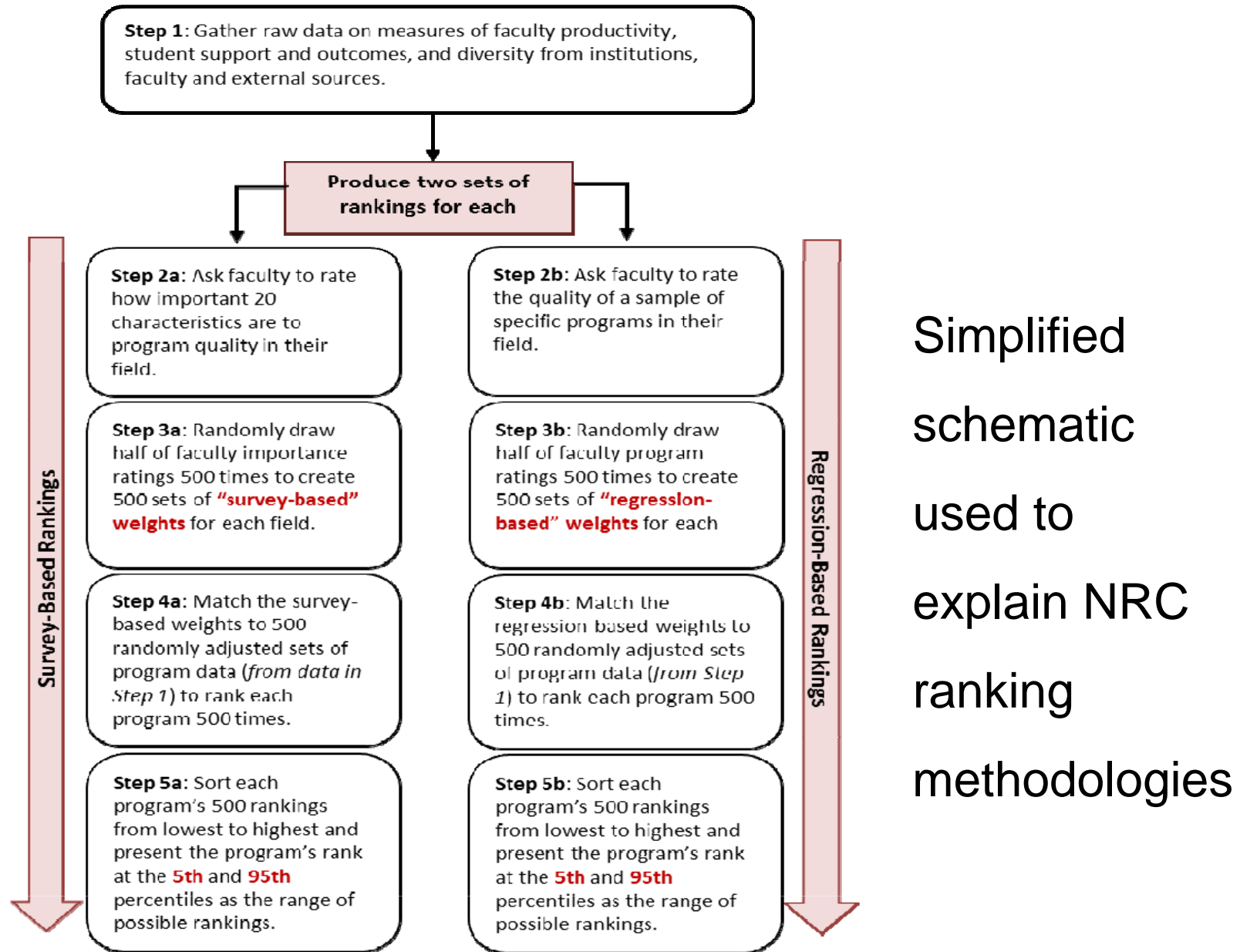
March 4, 2011

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- MIT needed to share our results internally and externally

  - Prepared briefing materials *prior* to the rankings' release
  - Focused on communicating with non-statistical users

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Research Doctorate Programs

Step 1: Gather raw data on measures of faculty productivity, student support and outcomes, and diversity from institutions, faculty and external sources.

Produce two sets of rankings for each

Survey-Based Rankings

Step 2a: Ask faculty to rate how important 20 characteristics are to program quality in their field.

Step 3a: Randomly draw half of faculty importance ratings 500 times to create 500 sets of "survey-based" weights for each field.

Step 4a: Match the survey-based weights to 500 randomly adjusted sets of program data (*from data in Step 1*) to rank each program 500 times.

Step 5a: Sort each program's 500 rankings from lowest to highest and present the program's rank at the **5th** and **95th** percentiles as the range of possible rankings.

Regression-Based Rankings

Step 2b: Ask faculty to rate the quality of a sample of specific programs in their field.

Step 3b: Randomly draw half of faculty program ratings 500 times to create 500 sets of "regression-based" weights for each

Step 4b: Match the regression based weights to 500 randomly adjusted sets of program data (*from Step 1*) to rank each program 500 times.

Step 5b: Sort each program's 500 rankings from lowest to highest and present the program's rank at the **5th** and **95th** percentiles as the range of possible rankings.

Simplified schematic used to explain NRC ranking methodologies

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Explaining the 20 quantitative indicators or measures

- Source of the data (internal, NRC, survey)
- MIT and field values

Table 1. Program values for each indicator plus overall summary statistics for the field.

Indicator	Source of Data	MIT Value		All Cell and Developmental Biology Programs (n=122)					
				Mean	Min	5th %tile	95th %tile	Max	Std. Dev.
Publications per Allocated Faculty	NRC	4.725		1.658	0.286	0.679	2.829	4.936	0.742
Cites per Publication	NRC	8.785		4.364	1.122	1.824	8.609	11.256	2.008
Percent of Faculty with Grants	Survey	98.01%		85.94%	33.33%	60.37%	100.00%	100.00%	13.82%
Percent Faculty Interdisciplinary	IR	0.00%		25.66%	0.00%	0.00%	66.67%	85.71%	21.76%
Percent Non-Asian Minority Faculty	IR	0.00%		2.87%	0.00%	0.00%	10.00%	16.67%	3.48%
Percent Female Faculty	IR	24.44%		26.88%	0.00%	13.79%	39.39%	63.64%	8.83%
Awards per allocated faculty	NRC	7.696		0.635	0.000	0.000	2.155	7.696	1.004
Average GRE-Q	IR	763		702	571	632	761	787	40
Percent 1st yr. students w/ full support	IR	100.00%		96.08%	0.00%	83.30%	100.00%	100.00%	16.07%
Percent 1st yr students with portable fellowshi	IR	71.43%		17.26%	0.00%	0.00%	85.71%	100.00%	28.31%
Percent Non-Asian Minority Students	IR	10.17%		11.02%	0.00%	0.00%	28.57%	45.46%	9.78%
Percent Female Students	IR	58.23%		53.40%	25.00%	37.04%	71.88%	92.86%	11.16%
Percent International Students	IR	17.72%		32.36%	0.00%	5.00%	70.83%	88.24%	20.21%
Average PhDs 2002 to 2006	IR	14.0		5.2	1.0	1.4	11.6	49.0	5.1
Percent Completing within 6 years	IR	55.71%		50.02%	2.27%	12.67%	83.33%	100.00%	19.54%
Time to Degree Full and Part Time	IR	6.1		5.6	3.5	4.7	6.8	8.0	0.7
Percent students in Academic Positions	NRC	n.a.		22.64%	0.00%	0.00%	45.46%	62.50%	14.32%
Student Work Space	IR	1		1	-1	-1	1	1	1
Health Insurance	IR	1		1	-1	-1	1	1	0
Number of student activities offered	IR	16		17	10	14	18	18	2

Indicator definitions are available in Appendix 1 of this report (click on indicators for link to definitions)

Green = MIT Value > Mean for Field

Red = MIT Value < Mean for Field

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Common Faculty Questions

- Source, Verifiability, and Calculations
- Frequently-questioned Measures
  - GRE scores (when imputed)
  - Academic careers
  - Per-capita publications and citations
  - Percent of faculty with research
- Alignment of NRC fields with MIT and peer programs
  - Multiple fields per program
  - Some institutions had multiple programs per field

Common Questions Regarding Weights

Table 2. Indicators and indicator weights used to calculate MIT's 5th and 95th percentile ranks for regression-based and

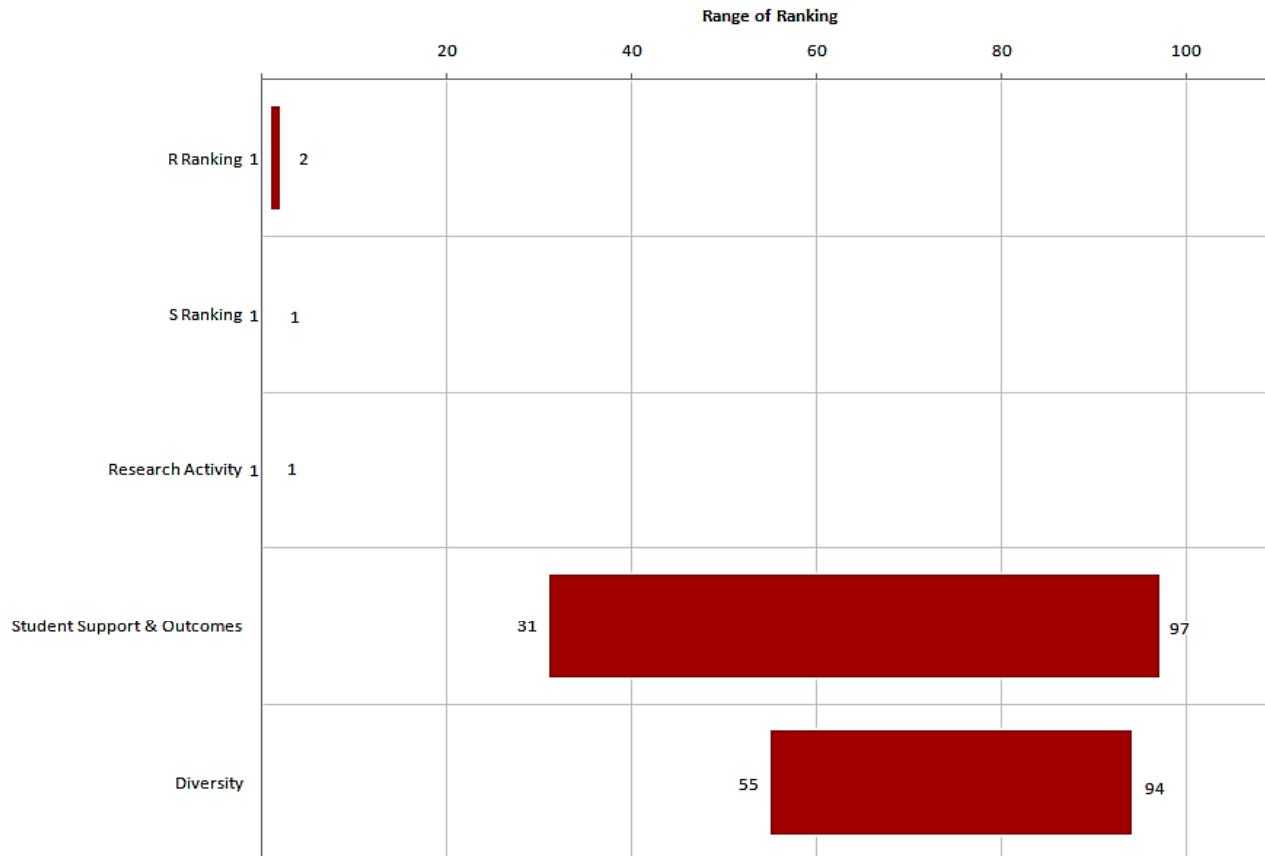| Indicator	Source of Data	R Weights (Regression-Based)		S Weights (Survey-Based)	
		5th	95th	5th	95th
Publications per Allocated Faculty	NRC	0.042	0.000	0.130	0.131
Cites per Publication	NRC	0.109	0.063	0.099	0.105
Percent of Faculty with Grants	Survey	0.055	0.091	0.172	0.168
Percent Faculty Interdisciplinary	IR	0.075	0.024	0.041	0.040
Percent Non-Asian Minority Faculty	IR	0.032	-0.013	0.010	0.011
Percent Female Faculty	IR	-0.060	-0.031	0.018	0.018
Awards per allocated faculty	NRC	0.148	0.055	0.059	0.059
Average GRE-Q	IR	0.044	0.107	0.081	0.077
Percent 1st yr. students w/ full support	IR	-0.021	0.025	0.058	0.060
Percent 1st yr students with portable fellowshi	IR	0.016	0.055	0.039	0.042
Percent Non-Asian Minority Students	IR	-0.044	0.023	0.023	0.023
Percent Female Students	IR	-0.013	0.048	0.020	0.020
Percent International Students	IR	0.070	-0.005	0.008	0.008
Average PhDs 2002 to 2006	IR	0.094	0.160	0.023	0.022
Percent Completing within 6 years	IR	0.066	0.079	0.060	0.060
Time to Degree Full and Part Time	IR	0.012	0.048	-0.033	-0.032
Percent students in Academic Positions	NRC	0.028	0.056	0.078	0.079
Student Work Space	IR	-0.006	0.032	0.005	0.005
Health Insurance	IR	-0.037	-0.071	0.004	0.005
Number of student activities offered	IR	0.028	-0.014	0.037	0.034

Indicator definitions are available in Appendix 1 of this report (click on indicators for definitions in electronic files)

- Institution specific or same for peers?
- How to interpret negative weights?

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MIT

- # R, S, and dimensional for a specific program

MIT Biology/Cell and Developmental

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R, S, and dimensional for a specific program

Table 3. Ranges of rankings for MIT's program compared to other participating programs; R, S, and dimensional rankings (N=122).

Institution	R Ranking (Regression-)		S Ranking (Survey-Based)		Best/Worst of R and S Rankings		Research Activity		Student Support & Outcomes		Diversity	
	5th	95th	5th	95th	5th	95th	5th	95th	5th	95th	5th	95th
MIT	1	2	1	1	1	2	1	1	31	97	55	94
HARVARD UNIVERSITY	1	2	2	7	1	7	2	18	22	79	60	99
STANFORD UNIVERSITY - developmental biology	3	7	2	10	2	10	2	7	60	117	69	104
JOHNS HOPKINS UNIVERSITY	3	11	2	15	2	15	3	32	14	74	27	70
UNIVERSITY OF TEXAS HLTH SCI CNTR. AT HOUSTON\UNIV. OF TEXAS M.D. ANDERSON CANCER CNTR.(UTHSCH\UTMDACC)	11	53	2	9	2	53	2	10	5	50	7	25
UNIVERSITY OF CALIFORNIA-SAN FRANCISCO	4	13	3	18	3	18	2	8	87	118	93	115
STANFORD UNIVERSITY - cancer biology	4	16	5	27	4	27	6	55	20	85	29	72
DUKE UNIVERSITY	6	25	4	32	4	32	4	41	5	64	73	107
UNIVERSITY OF PENNSYLVANIA	4	19	5	38	4	38	6	57	9	61	68	103
WASHINGTON UNIVERSITY IN ST. LOUIS	4	16	7	48	4	48	8	71	23	90	82	112
NEW YORK UNIVERSITY - developmental genetics	4	49	4	27	4	49	7	53	3	64	4	16

Various ways of visually presenting the rankings (2)

Range of rankings as compared to peers

Biology/Cell and Developmental (MIT compared to nearest peers)
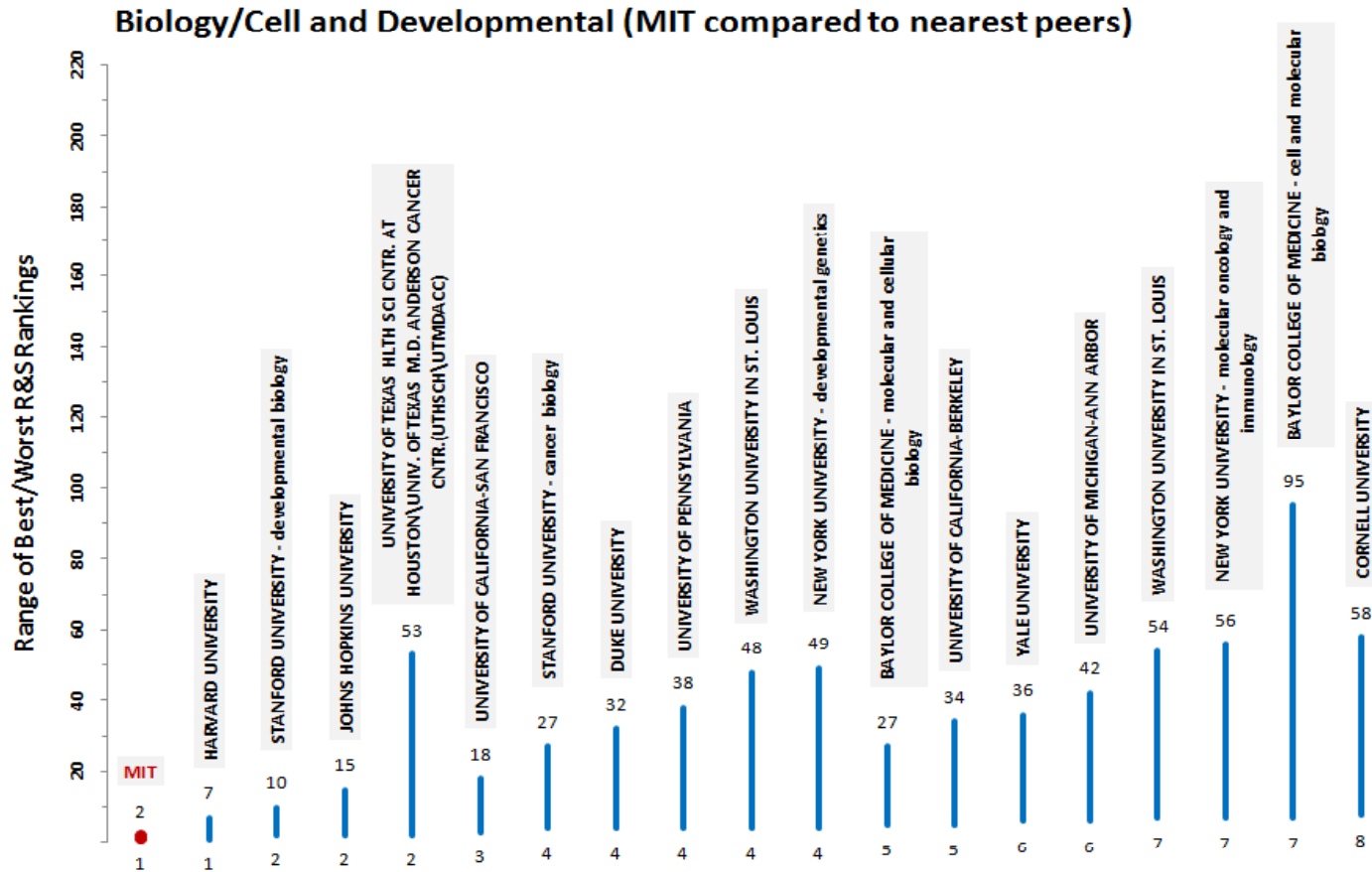
MIT and nearest peers based on sorting scheme described in Table 3.

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Various ways of visually presenting the rankings (3)

- # Range of rankings for all MIT programs
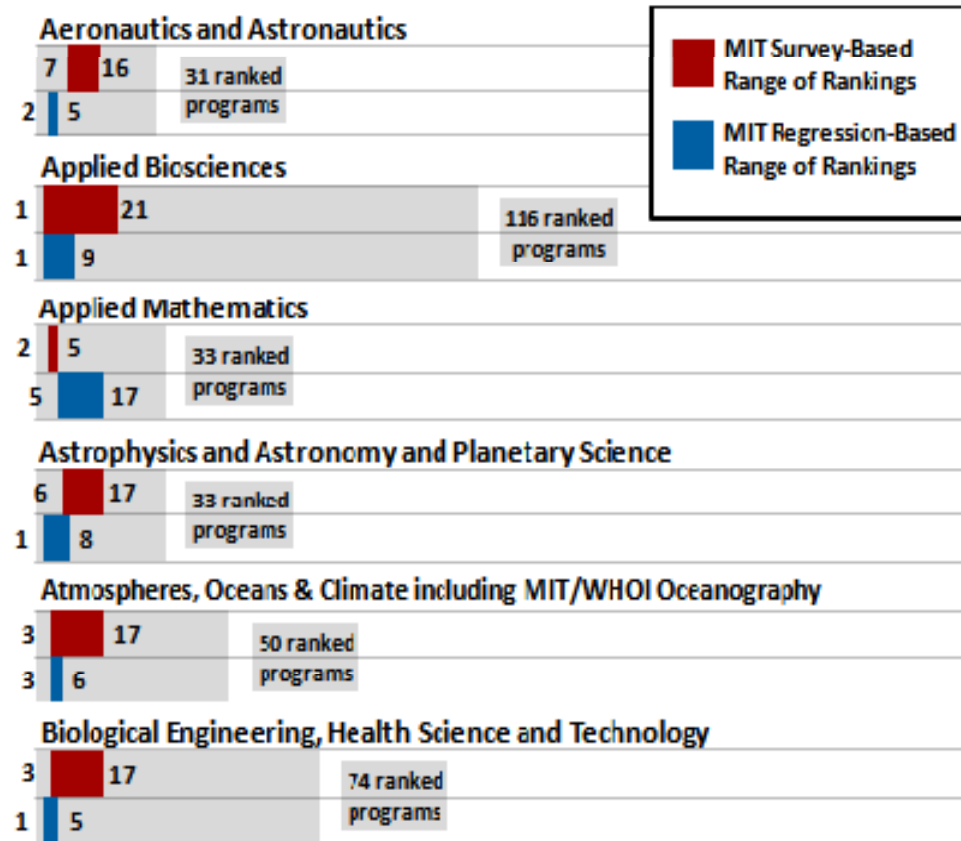
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■ *Z*-scores with weights and MIT values

MIT Biology/Cell and Developmental Indicator Values and Weights

Field: Cell and Developmental Biology

					Program Rank:	1	2	1	1
			Indicators				Weights		
Indicator	MIT Value	Field Mean	Field St. Dev.	MIT Above (green) or Below (red)(Z-Score)		R @ 5th	R @ 95th	S @ 5th	S @ 95th
Publications per Allocated Faculty	4.7245	1.65802	0.741828	4.13		0.04	0.00	0.13	0.13
Cites per Publication	8.785	4.36445	2.007733	2.20		0.11	0.06	0.10	0.11
Percent of Faculty with Grants	98.0%	0.85942	0.138204	0.87		0.06	0.09	0.17	0.17
Percent Faculty Interdisciplinary	0.0%	0.25656	0.217621	-1.18		0.08	0.02	0.04	0.04
Percent Non-Asian Minority Faculty	0.0%	0.02866	0.03482	-0.82		0.03	-0.01	0.01	0.01
Percent Female Faculty	24.4%	0.26879	0.088262	-0.28		-0.06	-0.03	0.02	0.02
Awards per allocated faculty	7.6957	0.63495	1.004412	7.03		0.15	0.06	0.06	0.06
Average GRE-Q	763.226	702.299	39.63468	1.54		0.04	0.11	0.08	0.08
Percent 1st yr. students w/ full support	100.0%	0.96084	0.160686	0.24		-0.02	0.03	0.06	0.06
Percent 1st yr students with portable fellowshi	71.4%	0.17259	0.283073	1.91		0.02	0.06	0.04	0.04
Percent Non-Asian Minority Students	10.2%	0.11018	0.097775	-0.09		-0.04	0.02	0.02	0.02
Percent Female Students	58.2%	0.53401	0.111574	0.43		-0.01	0.05	0.02	0.02
Percent International Students	17.7%	0.32365	0.202144	-0.72		0.07	-0.01	0.01	0.01
Average PhDs 2002 to 2006	14	5.24426	5.145777	1.70		0.09	0.16	0.02	0.02
Percent Completing within 6 years	55.7%	0.50016	0.195373	0.29		0.07	0.08	0.06	0.06
Time to Degree Full and Part Time	6.1	5.6483	0.724867	0.62		0.01	0.05	-0.03	-0.03
Percent students in Academic Positions	n.a.	0.22639	0.143167			0.03	0.06	0.08	0.08
Student Work Space	1	0.68852	0.728204	0.43		-0.01	0.03	0.01	0.01
Health Insurance	1	0.86885	0.497113	0.26		-0.04	-0.07	0.00	0.01
Number of student activities offered	16	16.6311	1.65245	-0.38		0.03	-0.01	0.04	0.03

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- Difference between regression and survey approaches
  - MIT tended to do better on R rankings
  - Individual programs focus on different ranking combinations.
- Role of Peer Review in assessing quality
  - Difficult to discern role of reputation in the NRC methodology
  - Faculty respect peer-review and are open to a more reputational measure
  - Absence of well-regarded programs at top diminished credibility of rankings

- Interdisciplinarity
  - Mechanism used by NRC for measuring Interdisciplinarity of programs was not easily understood
- Faculty lists caused the most angst even though the department approved their list at the time of the study
- Puzzling indicators
  - Student work space
  - Health insurance
  - Number of student activities offered
  - International students: quality vs. quantity
  - Percent of faculty with grants

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The Visiting Committee

MIT has a well established and well accepted program review process that has been in place since 1875. Thirty one committees primarily focused on individual academic departments meet biennially and operate as advisory groups to the Corporation and Administration. Prior to each meeting, three reports are prepared as reference materials: Ten Year Profile of Programs, Strategic Indicators and Student Assessment and Outcomes.

- Faculty demographics and productivity
- Student outcomes
- Instructional and research indicators
- Financial indicators
- Admissions
- Time to degree and Doctoral cohort analysis
- Graduate program rankings
- Summary responses to selected student survey questions

Data from Other Sources

Data type	Alternate Source	Rationale
Faculty Productivity	Academic Analytics	• Detailed publication and citation data • Timely publication of data
Student and Faculty Diversity	AAU Data Exchange, IPEDS	• Timely publication of data • Flexibility afforded through use of CIP taxonomy
PhD Cohort Analysis and Time-to-Degree	AAU Data Exchange	• Timely publication of data • Flexibility afforded through use of CIP taxonomy

- Faculty members are both drawn to and skeptical of the rankings
- Catalyst for internal conversations about availability and usefulness of program-level data
- Advanced local understanding of appropriate measures of quality, data collection, and metrics used for program support
- Great variation in faculty response, from deep interest to disassociation