

MAKING THE MOST OF WHAT YOU HAVE: Data to Optimize Space and Achieve Research Goals



AGENDA

Introductions

The Competitive Landscape of Research and Rankings

The Case for Space

Foundational Data

Dashboards & Opportunities

SMITHGROUP: INTERDISCIPLINARY. INTEGRATED.

LEADERS IN CAMPUS PLANNING AND DESIGN

1,400
MULTI-DISCIPLINARY
PROFESSIONALS

#3
TOP UNIVERSITY
ARCHITECTURE
FIRMS, BD+C 2020

700+
CAMPUSES
GLOBALLY

40M
SF OF SCIENCE +
TECHNOLOGY
SPACES

#6
MASTER PLANNING,
WORLD
ARCHITECTURE TOP
100, 2019

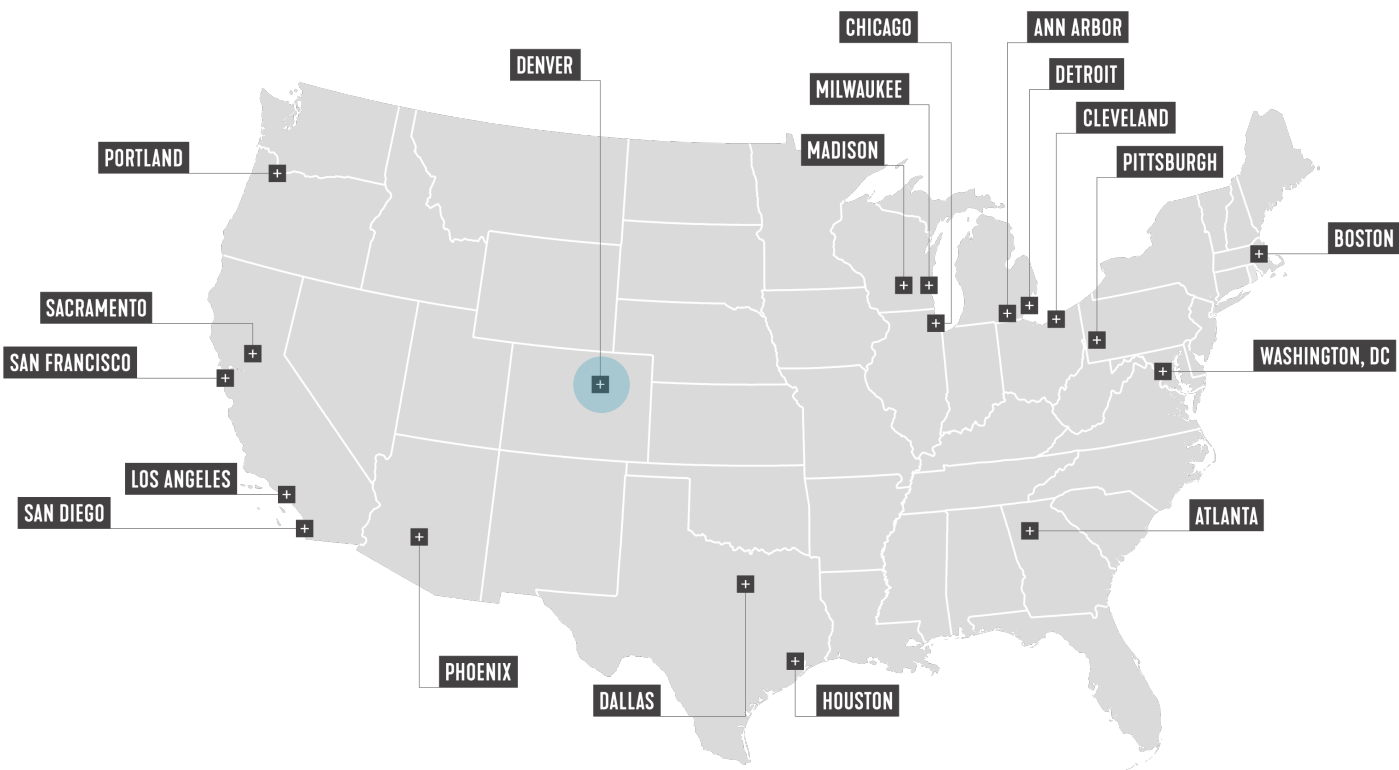
11
LAB OF THE YEAR
HONORS
R&D MAGAZINE



Anne Arundel Community College
Health and Life Sciences Building

CAMPUS STRATEGY AND ANALYTICS STUDIO

MEET OUR FIRM – INTERDISCIPLINARY, INTEGRATED



ARCHITECTS, PLANNERS, PHDs, & DATA ANALYSTS

- Understanding of the academy from the inside
- worked on your side of the table
- Breadth & depth of higher education experience
- Expertise in data management and visualization

40+
YEARS IN HIGHER EDUCATION PLANNING

700+
COLLEGE & UNIVERSITY CLIENT PROJECTS

240
COMMUNITY COLLEGE CAMPUSES

10+
STATE SYSTEMS



WHAT DOES CS&A DO?

SPACE EFFICIENCY STUDIES	
	Utilization Studies for Classrooms and Teaching Labs
	Utilization Studies for Non-Credit Activity Space
	Utilization Studies for Office Space
	Space Needs Analysis
	Space Reallocation and Migration Studies
	Multi-Campus Program Migration Studies
	Classroom Mix Analysis
	Research Lab Analysis
FACILITY PROGRAMMING/PLANNING	
	Program Planning
	Educational Adequacy Studies
	Facilities Inventory Verification
	Feasibility Studies
	New Campus Planning
BENCHMARKING	
	Comparative Analysis
	Peer Surveys on Best Practices

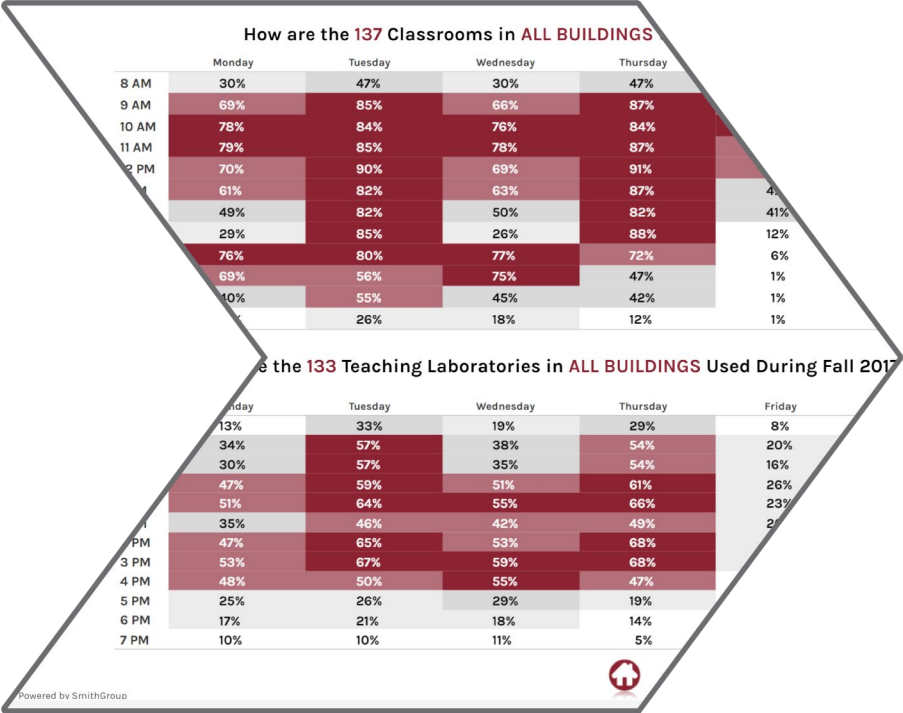
ACADEMIC PLANNING	
	Strategic Planning
	Environmental Scanning
	Occupational Demand/Workforce Analysis
	Career/Guided Pathway Modeling
	Program Gap Analysis
	New Program Feasibility Studies
	New Teaching/Learning Strategies
	Demographic and Participation Rate Studies
	Educational Master Planning
	Workforce Development
POLICY DEVELOPMENT	
	Space Policy Recommendations
	Capital Planning Procedures
ADDITIONAL DASHBOARD TOPICS	
	Internal Survey Responses
	Scheduling Blocks
	Classroom Assessment
	Instructional Space Use

HOW DO WE WORK?

STEP 1. GATHER & ALIGN DATA

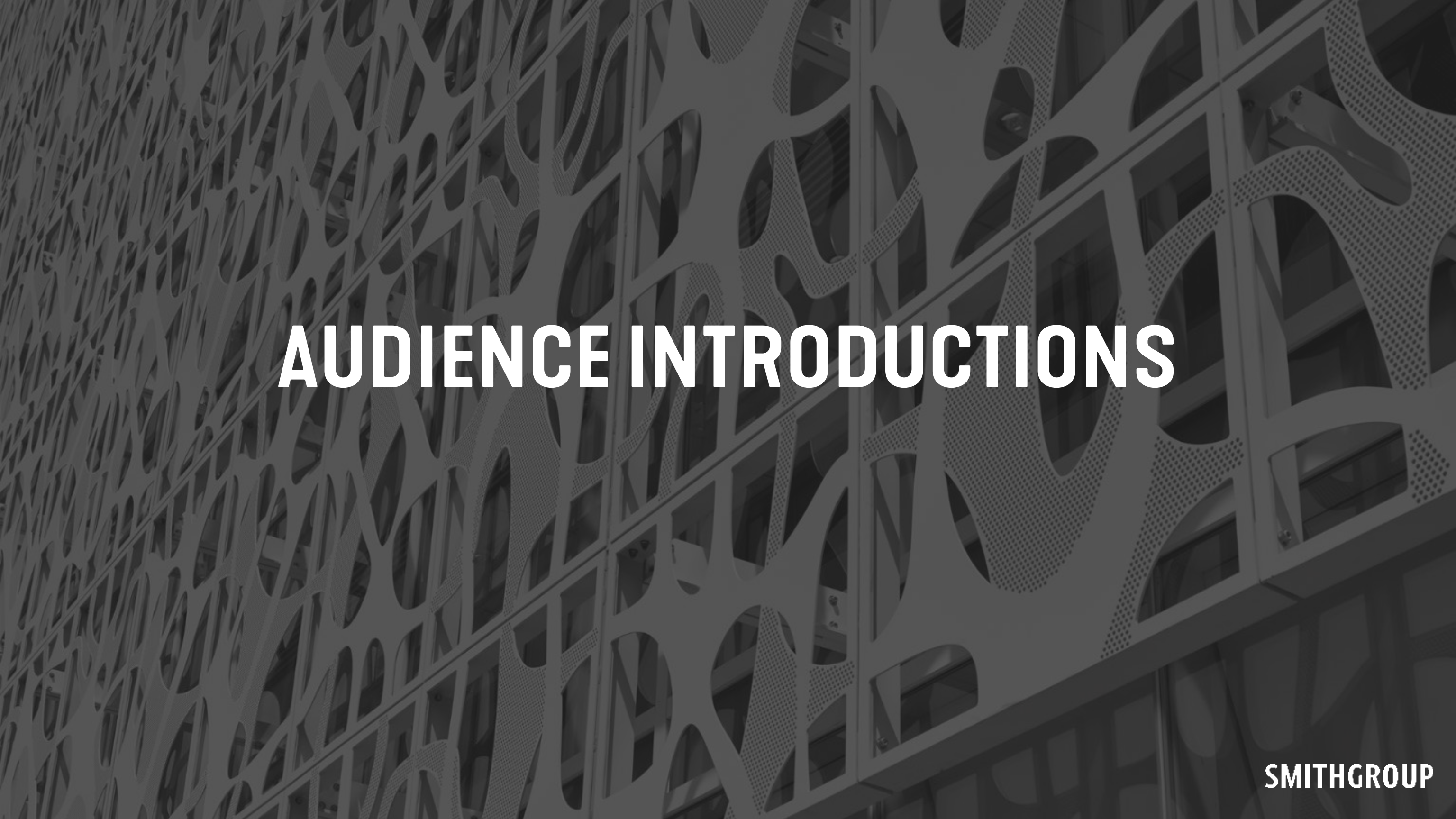
BldgID	RoomID	HEGIS Discipline		Space Type		Instl	Assignabl	Stat
		Code	Description	Code	Description			
103		19021	Physics	0029	Spec Instruction	0	629	0
		19021	Physics	0011	Tch Lab Serv	1/2	1,272	0
		19021	Physics	0011	Tch Lab Serv	1/2	310	0
		19021	Physics	0035	Prf Fac/Admn	0	120	1
		19021	Physics	0030	Profsnl-Fac	0	1,151	14
		19021	Physics	0036	Clr Fac/Admn	0	140	1
		19021	Physics	0037	Svc Fac/Admn	0	560	0
		19021	Physics	0051	Conf Room	0	101	4
		Science Education	0010	Tch Lab	1	1,295	24	12.48
		Science Education	0010	Tch Lab	1	1,296	24	12.48
		Science Education	0029	Spec Instruction	0	308	4	0
		Science Education	0029	Spec Instruction	0	646	8	0
		Science Education	0011	Tch Lab Serv	1/2	538	0	0
		Science Education	0035	Prf Fac/Admn	0	120	1	0
		Science Education	0030	Profsnl-Fac	0	596	6	0
		Science Education	0036	Clr Fac/Admn	0	140	1	0
		Science Education	0037	Svc Fac/Admn	0	172	0	0
		Interdiscipline	0001	Lecture	0	3,916	150	349.50
		Interdiscipline	0002	Lecture Serv	0	570	0	0
		Geology	0010	Tch Lab	1	1,832	48	24.96
		Science Education	0010	Tch Lab	2	1,306	36	14.04
		Science Education	0011	Tch Lab Serv	2	274	0	0
		Interdiscipline	0001	Lecture	0	1,240	60	139.80
		Interdiscipline	0001	Lecture	0	1,226	60	139.80
		19021	Physics	0010	Tch Lab	1	648	24
		19141	Geology	0016	Rsrch Lab	3	935	9
		49021	Natural Science	0010	Tch Lab	1	313	3
		49021	Natural Science	0010	Tch Lab	1	320	3
		49021	Natural Science	0010	Tch Lab	2	291	3
		49021	Natural Science	0030	Profsnl-Fac	0	484	6
		49021	Natural Science	0037	Svc Fac/Admn	0	334	0
		49021	Natural Science	0056	Gen Storage	0	65	0
		49021	Natural Science	0035	Prf Fac/Admn	0	200	0

STEP 2. ANALYZE & VISUALIZE



STEP 3. STRATEGIZE & DELIVER SOLUTIONS





AUDIENCE INTRODUCTIONS

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THE COMPETITIVE RESEARCH LANDSCAPE

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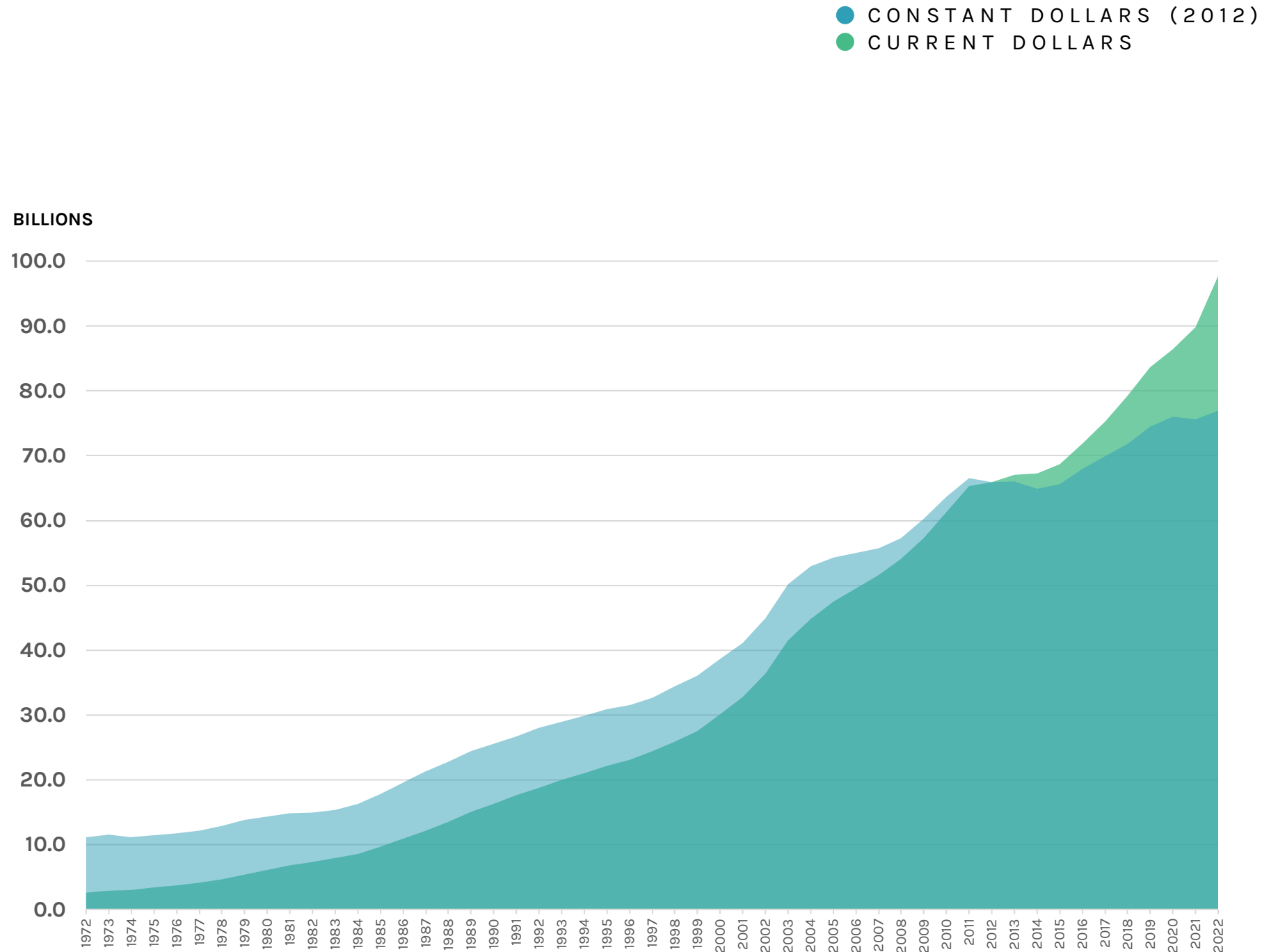
ENTERPRISE VIEW

PURCHASING POWER

- Over the past decade, research expenditures have increased more than \$30B in current dollars
 - Gains have been modest in constant dollars—just over \$11B
- The FED is approaching 3/2 target—3% GDP growth with 2% inflation

Note(s):
Gross domestic product deflators come from the Bureau of Economic Analysis and are available in Table 1.1.9 "Implicit Price Deflators for Gross Domestic Product" at https://www.bea.gov/iTable/index_nipa.cfm (accessed September 2023).

Source(s):
National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.



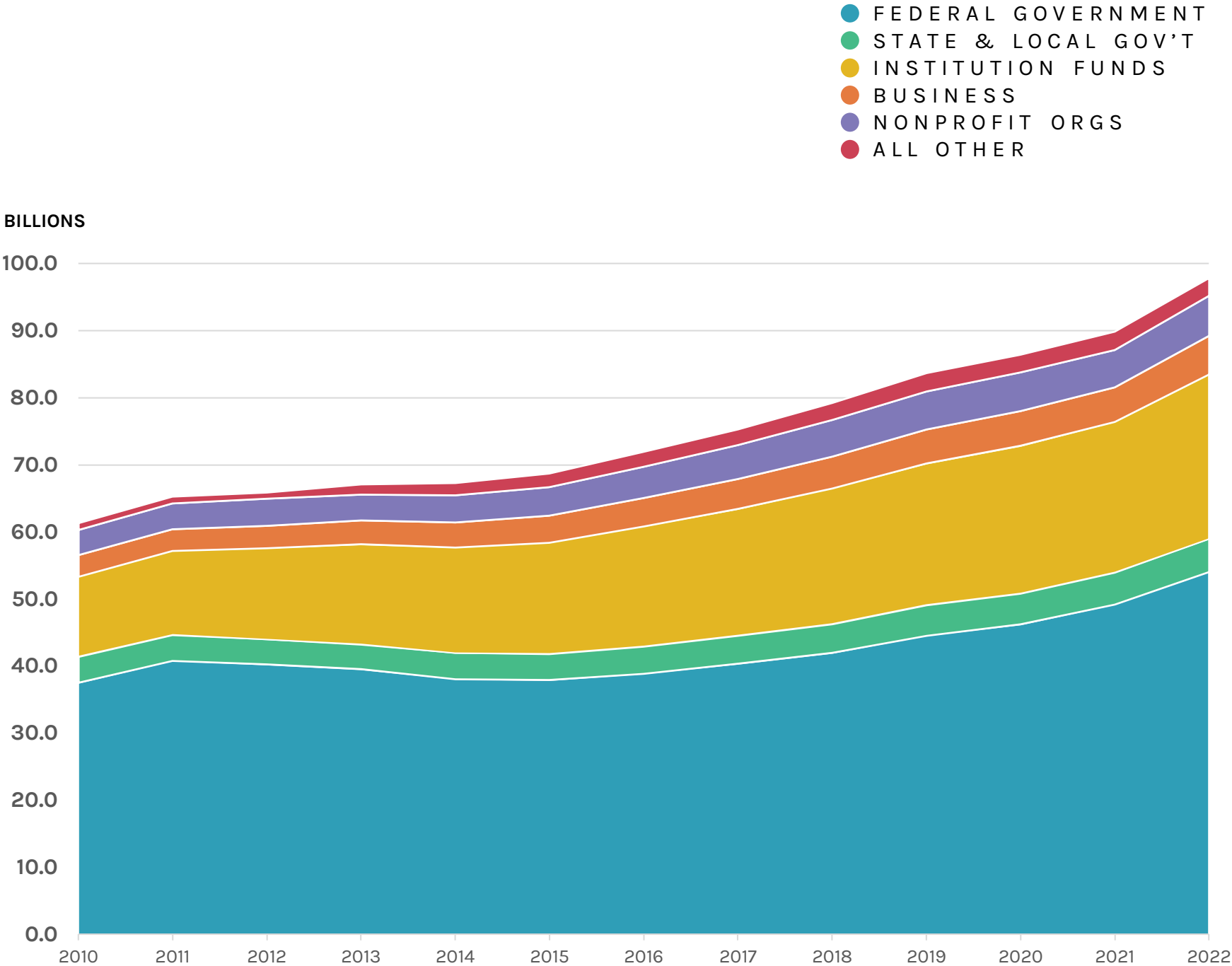
ENTERPRISE VIEW

FUNDING SOURCES

- The federal government provides the largest percentage of research funding—55%
- Institution Funds account for nearly a quarter of all research expenditures
 - Increasingly important as seed funding for junior faculty & new programs
- Industry funding is not expanding at the rate presumed by most universities

Note(s):
Because of rounding, detail may not add to total. Includes all institutions surveyed in the fiscal years shown.

Source(s):
National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.



ENTERPRISE VIEW

CROWDED ROOM

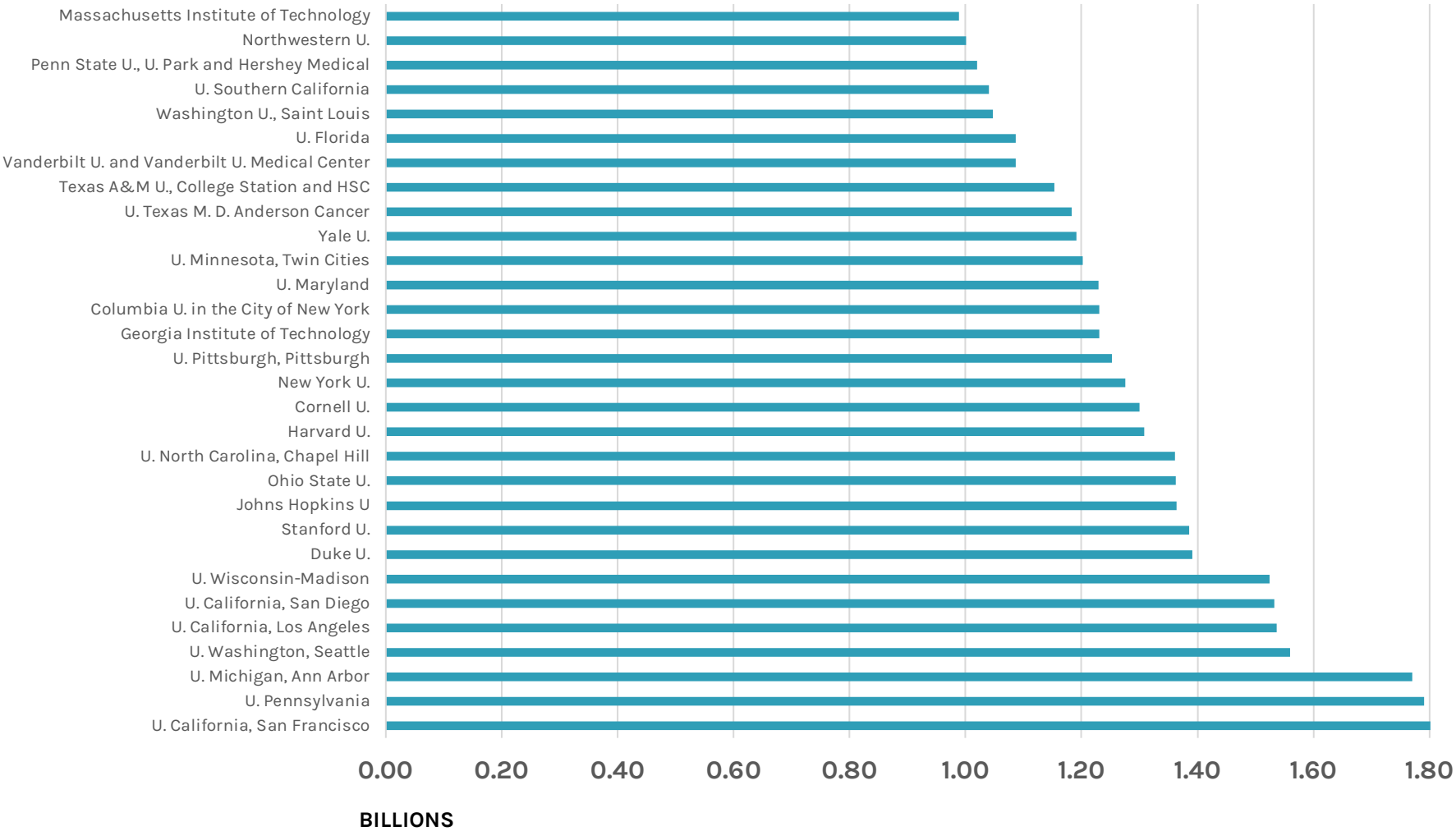
- For the past five years, the top 30 research universities have combined for more than 40% of all expenditures
- Half public universities, half private
- Research is growing most rapidly among this peer group
 - Informed, deliberate competition

Note(s):

- Johns Hopkins University Applied Physics Laboratory excluded, with \$2,056 million in total R&D expenditures in FY 2022.
- University of Maryland includes expenditures from University of Maryland, Baltimore and University of Maryland, College Park campuses.
- Because of rounding, detail may not add to total. Rankings are based on unrounded totals. This table reflects the leading 30 institutions for FY 2022; the institutions listed may not be in the top 30 of prior fiscal years.

Source(s):

National Center for Science and Engineering Statistics, Higher Education Research and Development Survey.





CARNEGIE BASIC CLASSIFICATION

SMITHGROUP

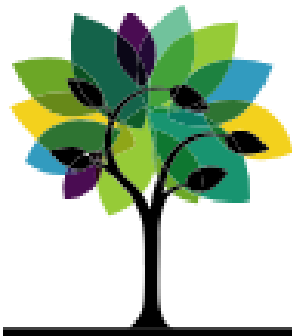
INTRODUCTION

CARNEGIE BASIC CLASSIFICATION

1973

Carnegie Classification is established

The leading framework for recognizing and describing institutional diversity in U.S. higher education

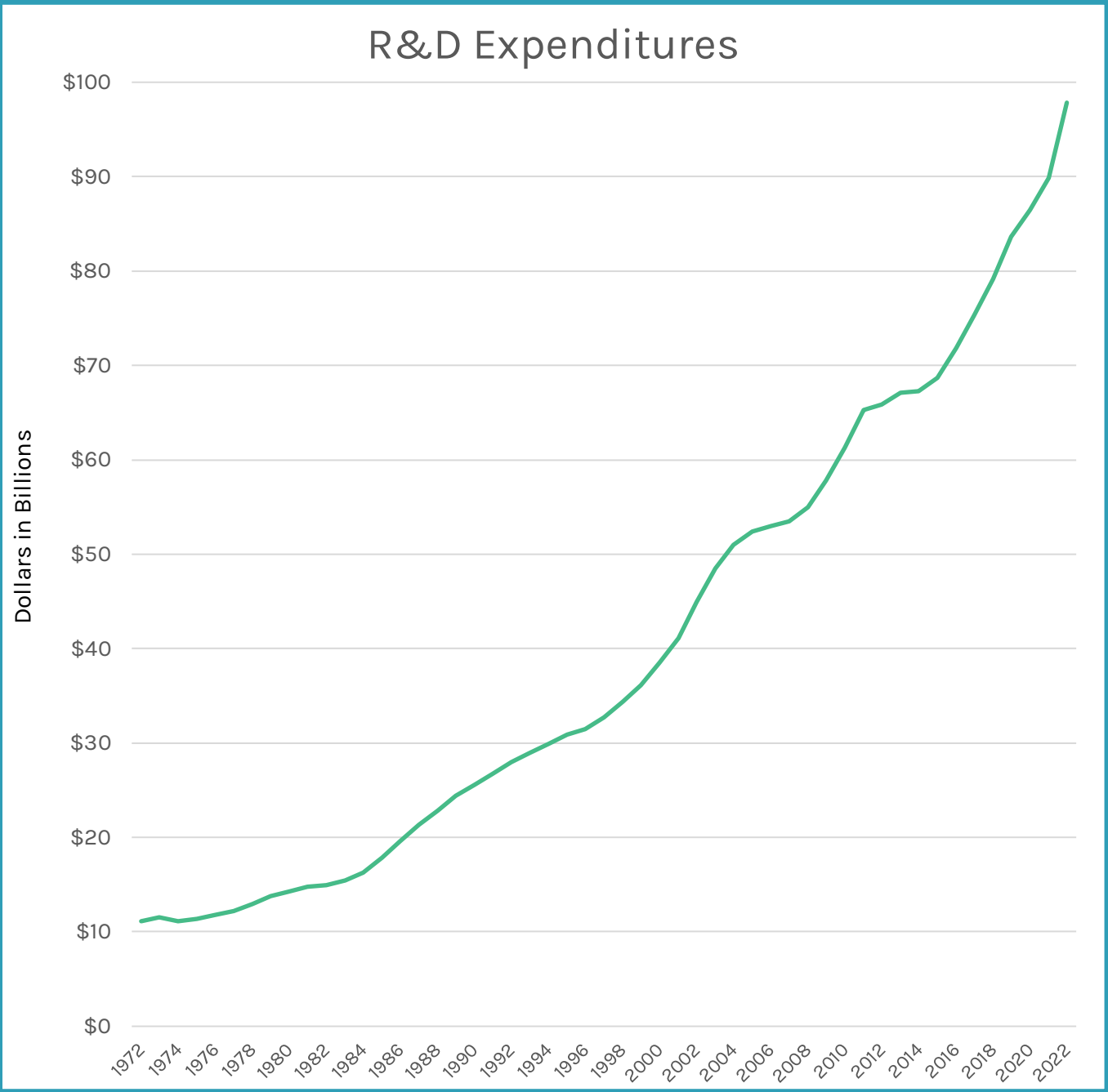


Carnegie Foundation
for the Advancement of Teaching



OVERVIEW & BACKGROUND

HISTORICAL TRENDS



1973 &
1976

R1: Top 50 by federal research grants (if awarded 50+ PhDs)

R2: Top 100 by federal research grants (if awarded 50+ PhDs)

1987 &
1994

R1: Receive at least \$33.5 (1987) or \$40M (1994) in federal research grants and awarded 50+ PhDs

R2: Receive \$12.5-\$33.5M (1987) or \$12.5-\$40M (1994) in federal research grants and awarded 50+ PhDs

2000

Research - Extensive: Awarded 50+ PhDs across 15+ disciplines

Research - Intensive: Awarded 10 PhDs across 3+ disciplines or 20+ overall

2005 to
2021

Very High - very high-level research activity; awarded **70 PhDs** (spent **\$50+ million** starting in 2018)

High - high level research activity; awarded 20+ PhDs (spent \$5+ million starting in 2018)

OVERVIEW & BACKGROUND

CARNEGIE BASIC CLASSIFICATION

NSF Data

Higher Education & Development (HERD) Survey

Graduate Students and Post-doctorates in Science and Engineering (GSS) Survey

IPEDS Data

Research Doctorates by Field

Calculated Metrics

- Per-Capita:
- S&E R&D Expenditures
 - Non-S&E R&D Expenditures
 - S&E Research Staff

- **2021 Carnegie Doctoral Universities**
 - 20 research/scholarship doctoral degrees or at least 30 professional practice doctoral degrees in at least 2 programs
 - \$5 million in research expenditures
- **R1** – Doctoral University – Very High Research Activity
- **R2** – Doctoral University – High Research Activity
- **D/PU** – Doctoral/Professional Universities

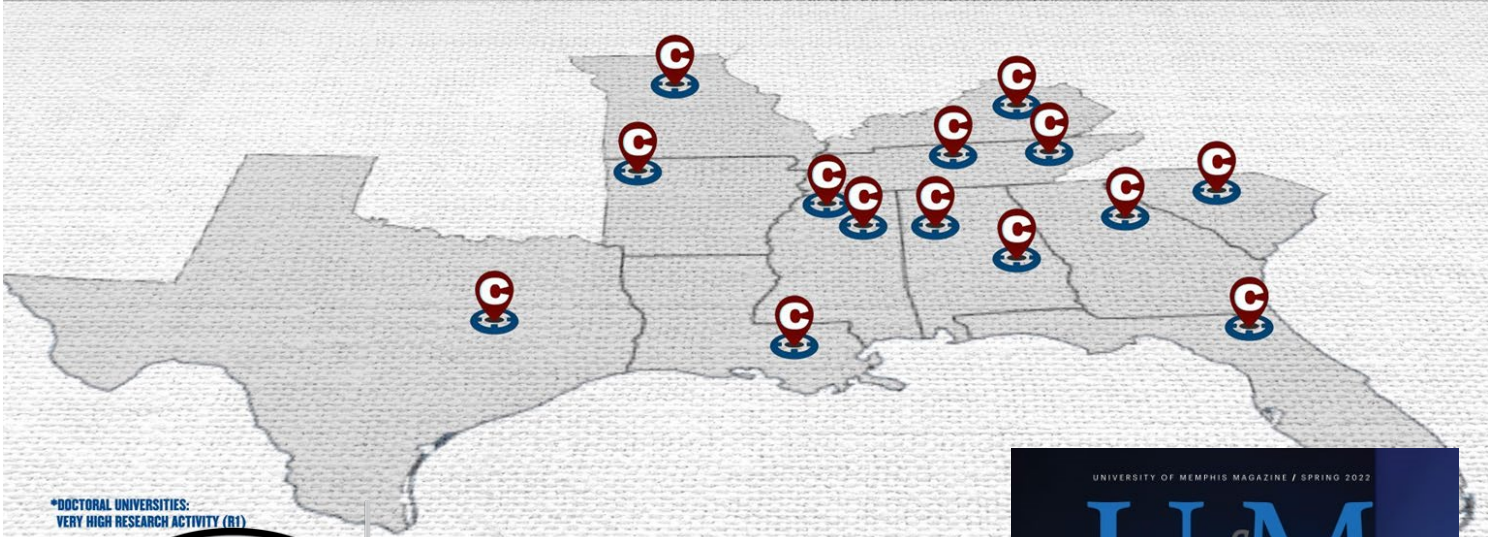
OVERVIEW & BACKGROUND

BENEFITS AND PRIDE OF VERY HIGH RESEARCH INSTITUTIONS



**RECOGNIZED AMONG NATION'S
ELITE RESEARCH* CONFERENCES**

CARNEGIE CLASSIFICATION® OF INSTITUTIONS OF HIGHER EDUCATION

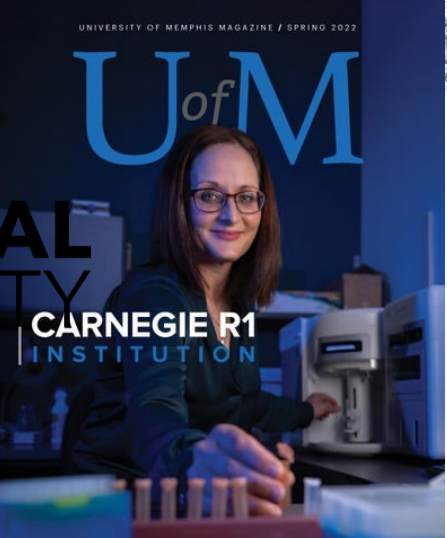


*DOCTORAL UNIVERSITIES:
VERY HIGH RESEARCH ACTIVITY (R1)



UMBC

**R1 DOCTORAL
UNIVERSITY**





**WE
R1**

*Achieving R1 status is an
incredible accomplishment.
This is a great day for DU!*

—JEREMY HAEFNER





OVERVIEW & BACKGROUND

BENEFITS AND PRIDE OF VERY HIGH RESEARCH INSTITUTIONS



Research

Funding opportunity

Recruitment

Innovation and Technology advancements

Economic Impact

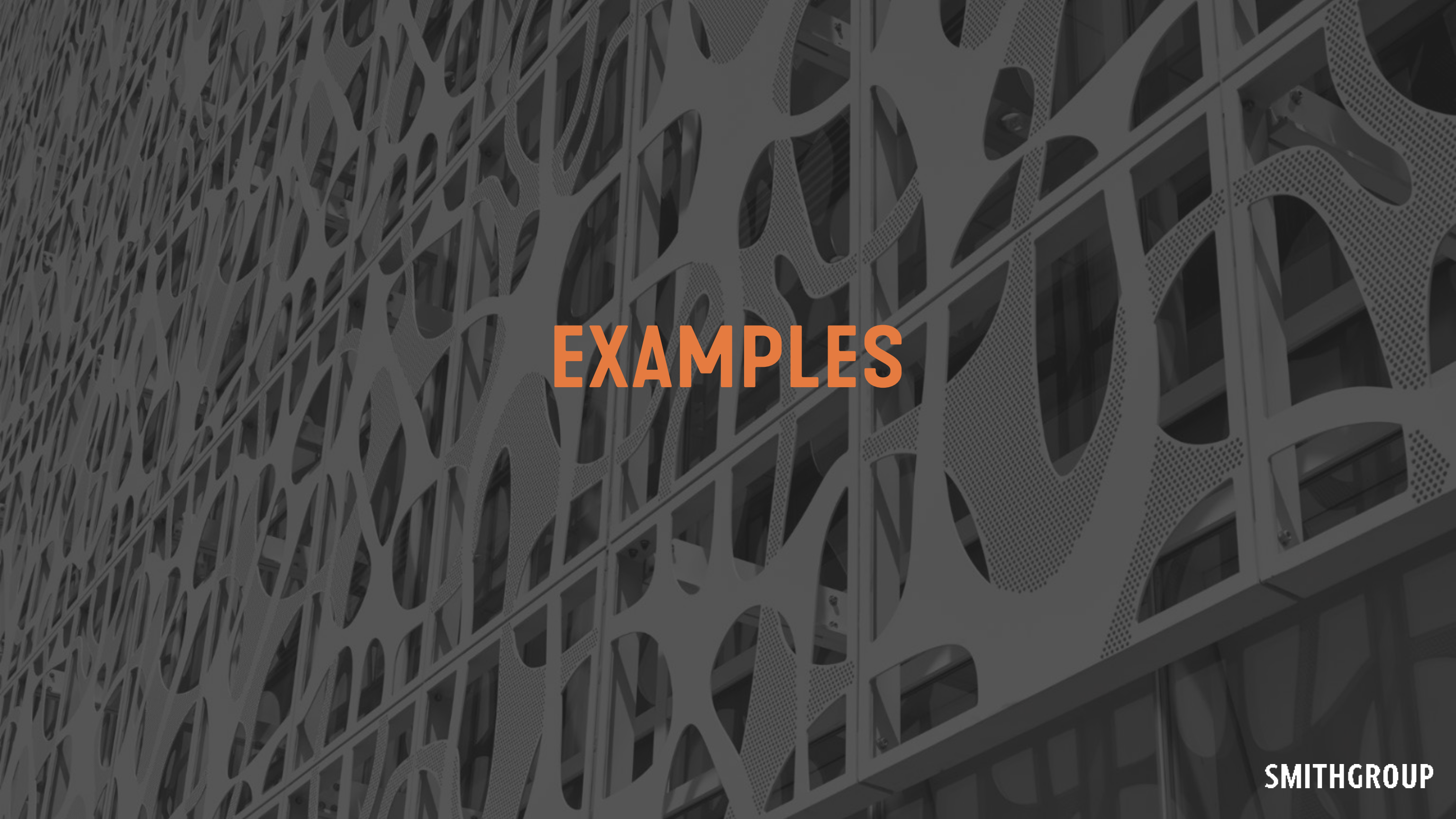
Transfer of Knowledge

Prestige

Achieving R1 status is an accomplishment. A great day for DU!

—JEREMY HAEFNER





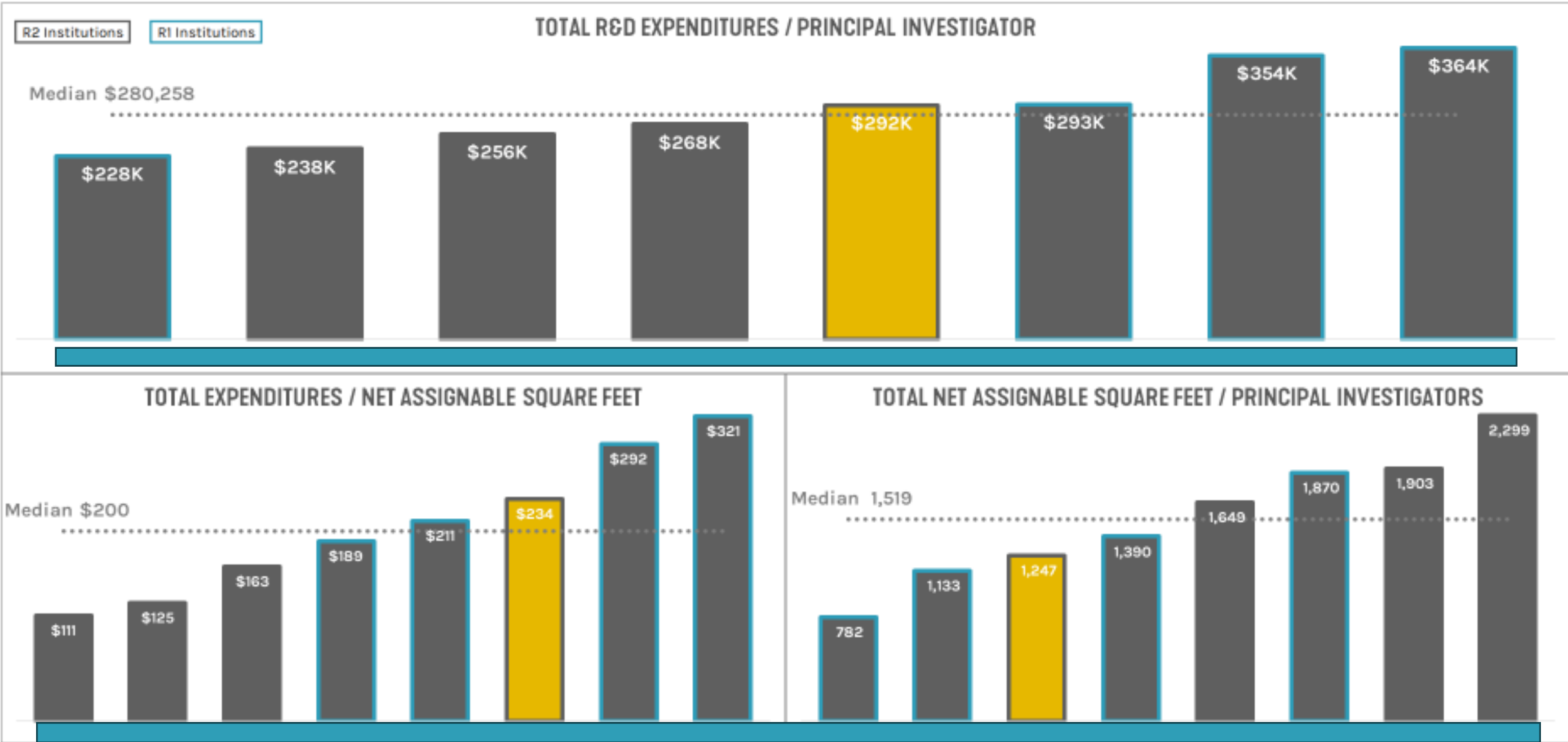
EXAMPLES

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USES & EXAMPLES

UNIVERSITY OF IDAHO – SPACE NEEDS STRATEGY

HERD AND RESEARCH FACILITIES – FY2019



SOURCE: National Center for Science and Engineering Statistics – Higher Education Research and Development Survey FY2019 and Survey of Science and Engineering Research Facilities FY2019

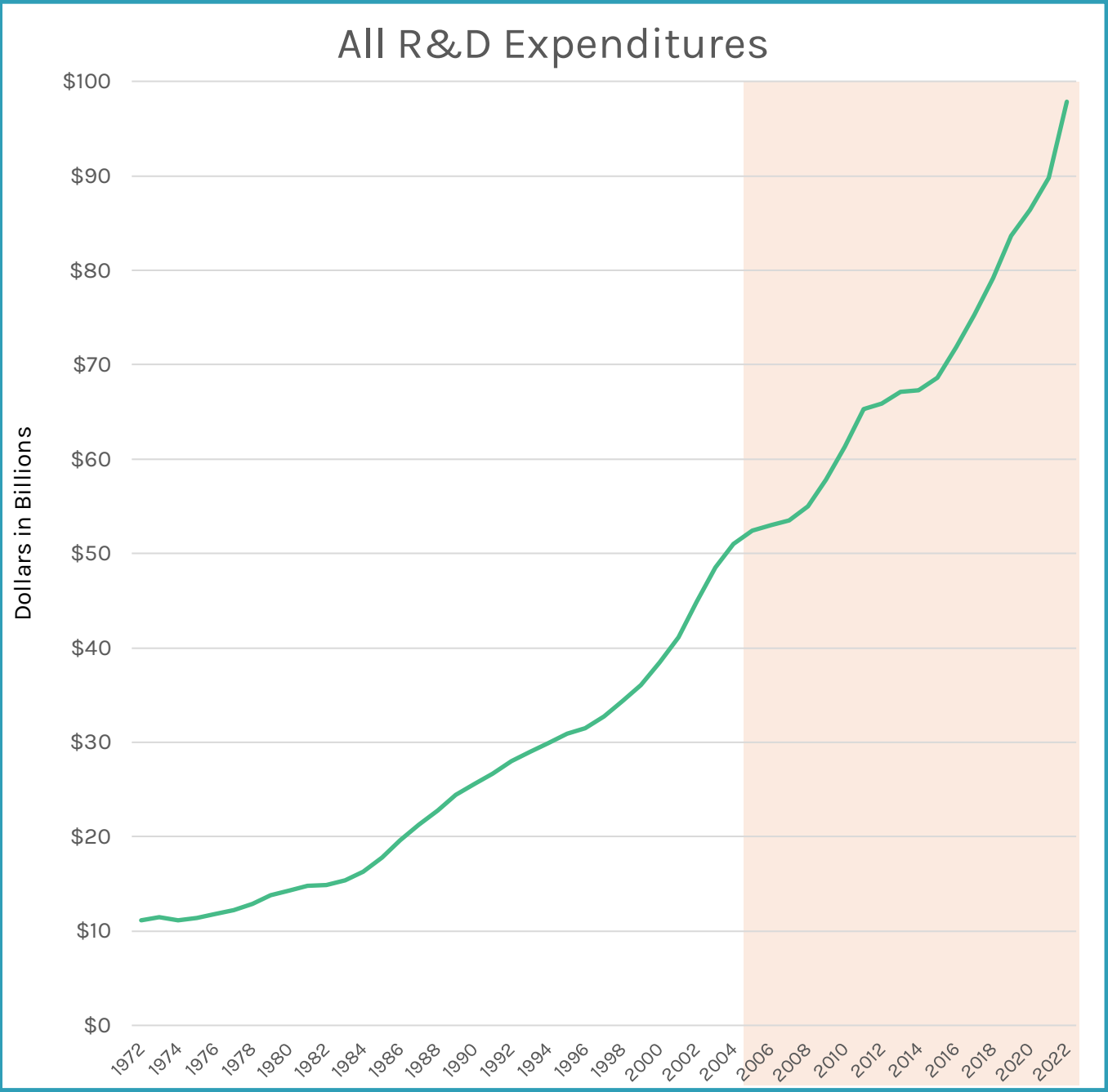


CLASSIFICATION UPDATE

SMITHGROUP

OVERVIEW & BACKGROUND

HISTORICAL TRENDS



1973 & 1976	1987 & 1994	2000	2005 to 2021
R1: Top 50 by federal research grants (if awarded 50+ PhDs) R2: Top 100 by federal research grants (if awarded 50+ PhDs)	R1: Receive at least \$33.5 (1987) or \$40M (1994) in federal research grants and awarded 50+ PhDs R2: Receive \$12.5-\$33.5M (1987) or \$12.5-\$40M (1994) in federal research grants and awarded 50+ PhDs	Research - Extensive: Awarded 50+ PhDs across 15+ disciplines Research - Intensive: Awarded 10 PhDs across 3+ disciplines or 20+ overall	Very High - very high-level research activity; awarded 70 PhDs (spent \$5+ million starting in 2018) High - high level research activity; awarded 20+ PhDs (spent \$5+ million starting in 2018)

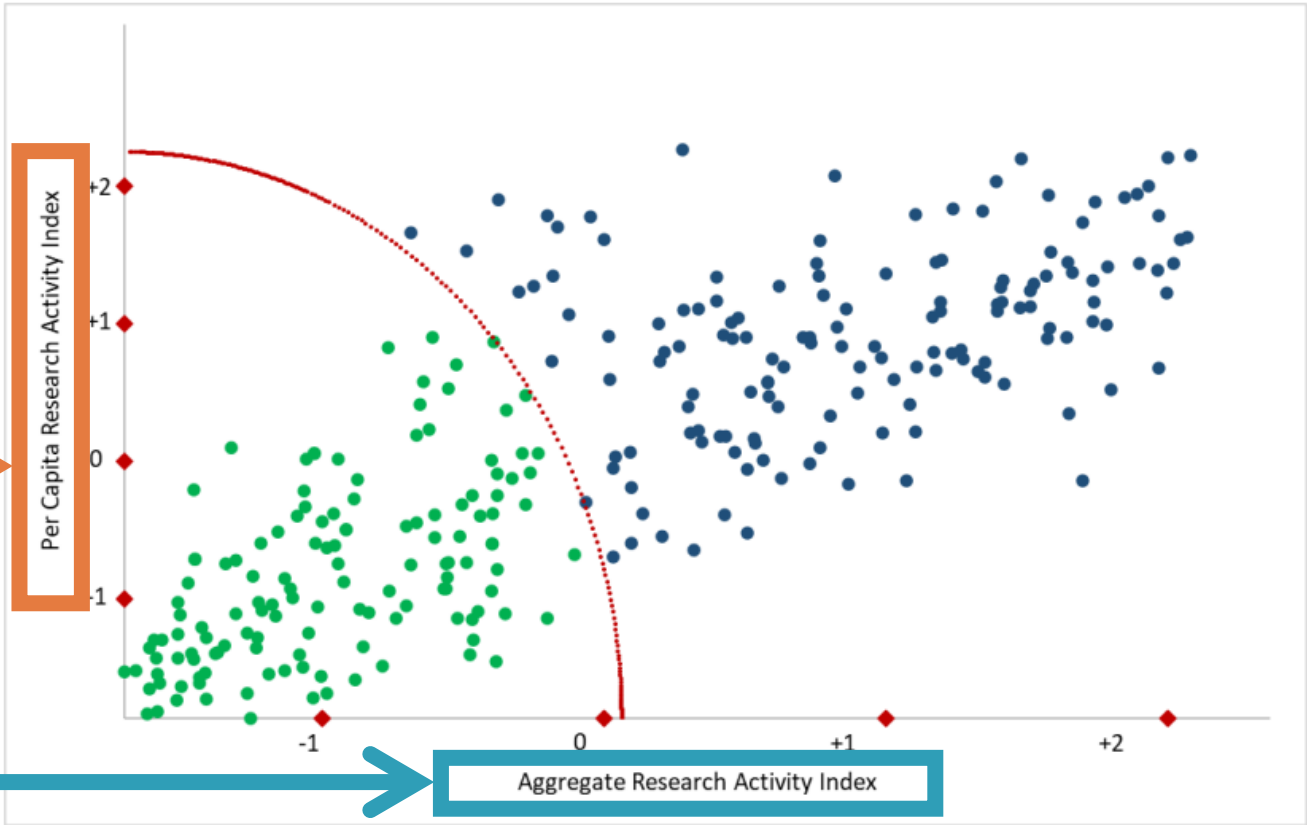
OVERVIEW & BACKGROUND

HISTORICAL TRENDS – 2021 CLASSIFICATION

Aggregate analysis (first principal component explained 70% of the total variance)	
S&E R&D Expenditures	0.905
Non-S&E R&D Expenditures	0.809
S&E Research Staff	0.913
Doctorates: Social Sciences	0.880
Doctorates: Humanities	0.846
Doctorates: STEM	0.920
Doctorates: Other Fields	0.597

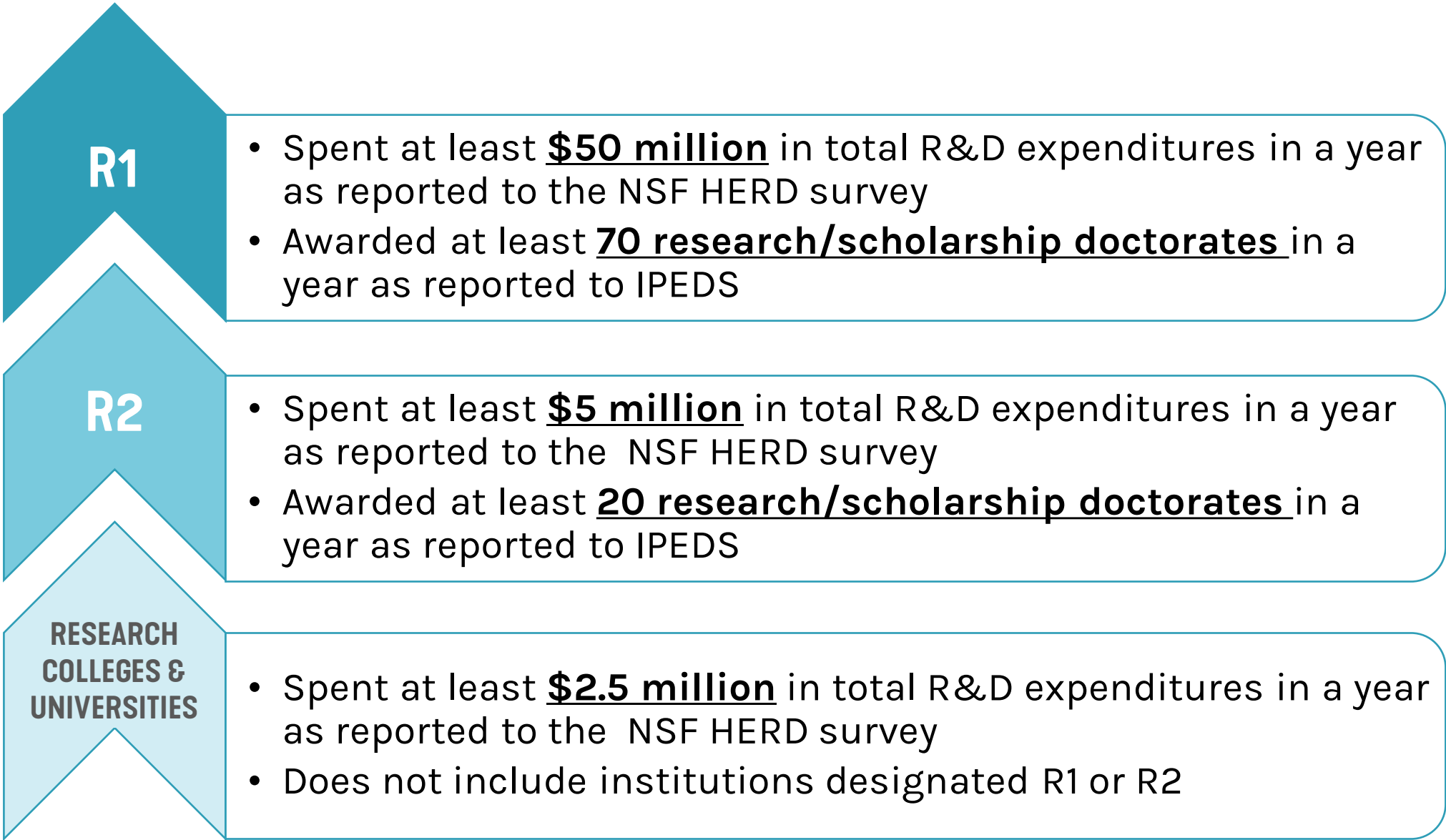
Per-capita analysis (first principal component explained 71% of the total variance)	
Per-capita S&E R&D Expenditures	0.931
Per-capita Non-S&E R&D Expenditures	0.643
Per-capita S&E Research Staff	0.939

WHAT THIS DISTRIBUTION LOOKS LIKE



NEWS & CHANGES – 2025 CARNEGIE RESEARCH DESIGNATIONS

NEW FORMULA AND METRICS; REVAMPED BASIC CLASSIFICATION



➤ 2025 basic classification will be based on most recent data OR most recent three-year average, whichever is higher

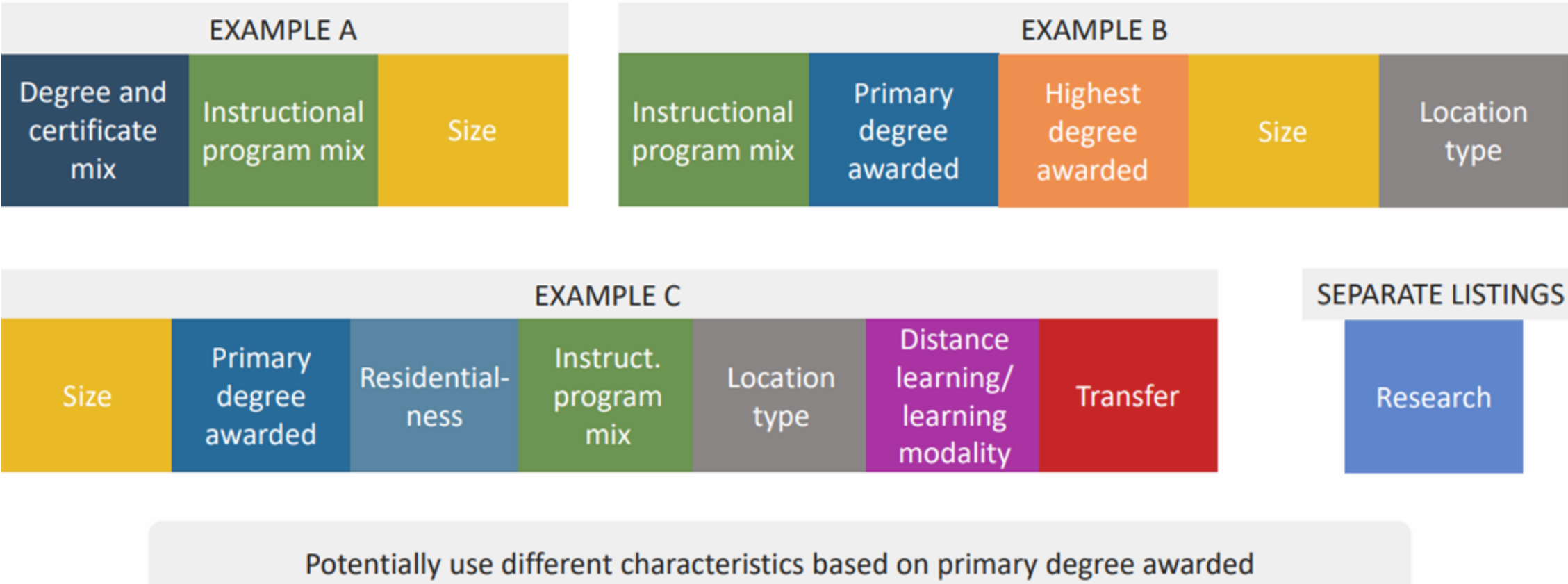
➤ Post 2025 basic classification will be determined on three-year average of the most recent three years of data

NEWS & CHANGES – 2025 CARNEGIE RESEARCH DESIGNATIONS

NEW FORMULA AND METRICS; REVAMPED BASIC CLASSIFICATION

➤ Other yet-to-be determined factors will also contribute to an institution's basic classification

POTENTIAL MULTI-DIMENSIONAL CLASSIFICATION FOR THE 2025 BASIC*



U.S. NEWS & WORLD REPORT COLLEGE RANKINGS



**EXPERT
ADVICE,
RANKINGS
& DATA**

U.S. News in one of the most popular sources for college rankings.

In addition to their four overall rankings, which encompass National Universities, Liberal Arts Colleges, Regional Universities and Regional Colleges, this platform also includes dozens of more-focused rankings and lists.

Best Undergraduate Engineering Programs Rankings

The undergraduate engineering programs rankings were based solely on peer assessment surveys. To appear on an undergraduate engineering survey, a school must have an undergraduate engineering program accredited by ABET. The programs below are schools whose highest engineering degree offered is a doctorate. [Read the methodology »](#)

To unlock full rankings, SAT/ACT scores and more, sign up for the [U.S. News College Compass!](#)

CARD VIEW
TABLE VIEW

208 results [Clear Filters](#) [Engineering \(Doctorate Offered\)](#) ✕

SORT BY: Rankings (high to low) ▼

School Name ^

Location ^

Rankings ⓘ ^

Tuition and Fees ^

<\$5,000 - \$50,000+

Enrollment ^

0 - 14,000+

Acceptance Rate ^

<10% - 90%+

School Name	Rankings	Description	Tuition And Fees	Undergraduate Enrollment	Reputation Score	SAT, GPA AND MORE
Massachusetts Institute of Technology Cambridge, MA #1 in Engineering Programs (doctorate) ★★★★★ 15 reviews ⓘ Though the Massachusetts Institute of Technology may be best known for its math, science and engineering education, this private research university also offers READ MORE »	View all 15 photos	Tuition And Fees \$60,156 Undergraduate Enrollment 4,657 (fall 2022) Reputation Score 4.8 SAT, GPA AND MORE Unlock with Compass				
Stanford University Stanford, CA #2 in Engineering Programs (doctorate) ★★★★★ 11 reviews ⓘ The sunny campus of Stanford University is located in California's Bay Area, about 30 miles from San Francisco. The private institution stresses a multidisciplinary READ MORE »	View all 23 photos	Tuition And Fees \$62,484 Undergraduate Enrollment 8,049 (fall 2022) Reputation Score 4.7 SAT, GPA AND MORE Unlock with Compass				

Choose Institution
University of Idaho

2021 Carnegie Basic Classification
Multiple values

Region code
Rocky Mountains CO ID MT UT WY

Stabbr
All

City
All

Size and Setting Classification
All

2021 Undergraduate Instructional Program Classification
All

Undergraduate Profile Classification
All

Level of institution
All

Sector of institution (control and level combined)
All

Enrollment Profile Classification
All

Institution grants a medical degree (MD, DDS, DMD, DO, DVM)
All

Selectivity Index (1=inclusive; 2=selective; 3=more selective)
All

Go To 2021 Results

Go To 3-Yr Avg (2019-2021) Results

Minority Serving Institution
All

Tribal College
All

Hispanic Serving Institution
All

Historically Black College or University
All

Women's College
All

Land-grant institution
All

Note: if multiple institutions are chosen, the target institution name will be the first institution listed in the filters.

Name

2021 Carnegie Basic Classifica..
Multiple values

Choose Institution
University of Idaho

Name

Go to 3-Yr Avg

Back to Filters

2021 Carnegie Basic Classifica..
Multiple values

Doctoral Universities: Hig..
Doctoral Universities: Ver..

2021 HERD Total R&D Expenditures

2021 IPEDS Total Research Doctorates Conferred

R1 R&D Min - \$50M

R2 R&D Min - \$5M

R2 Research PhD Min - 70

R2 Research PhD Min - 70

Box plot showing the distribution of 2021 IPEDS Total Research Doctorates Conferred for the selected institutions. The plot includes a median line, a box representing the interquartile range, and whiskers extending to the minimum and maximum values. The data points are represented by circles, with a larger purple circle indicating the target institution's value.

28 smithgroup.com



THE CASE FOR SPACE

SMITHGROUP

WHY SPACE?

MISSION CRITICAL



WHY SPACE?

MISSION CRITICAL



WHY SPACE?

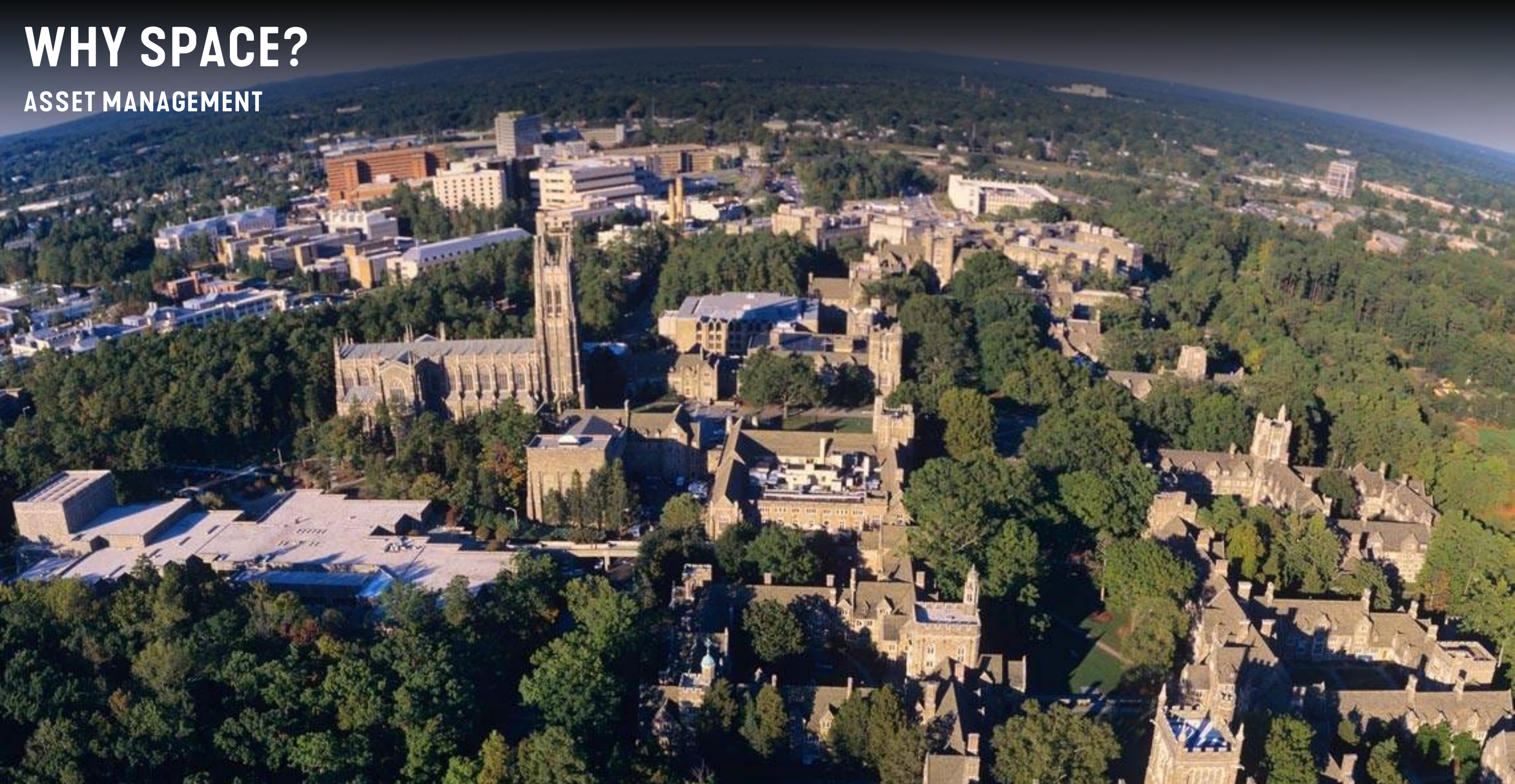
MISSION CRITICAL



WHY SPACE?

REVENUE & RECOGNITION





WHY SPACE?

ASSET MANAGEMENT



WHY SPACE?

ASSET MANAGEMENT

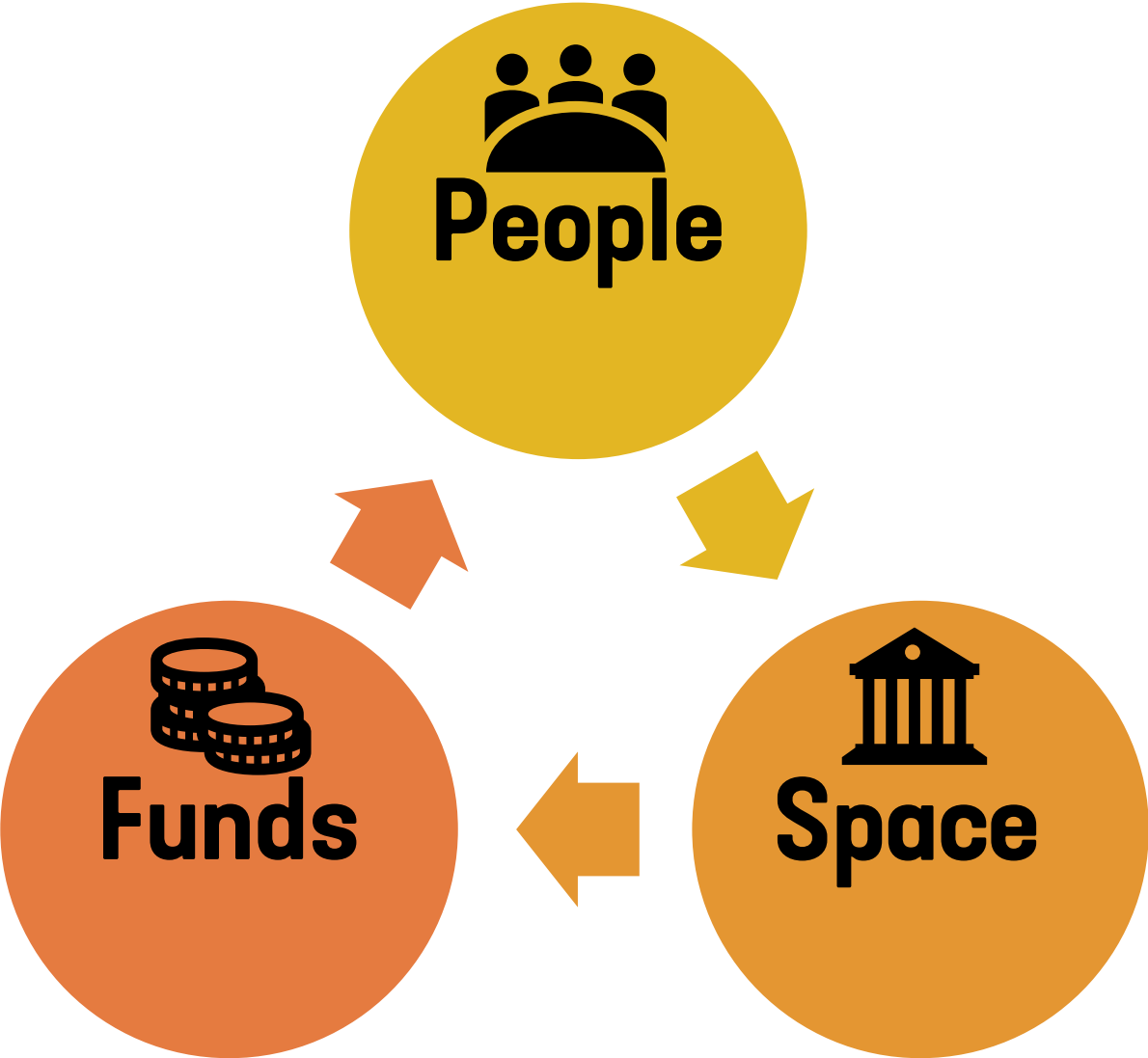


DATA IS OUR FRIEND

SMITHGROUP

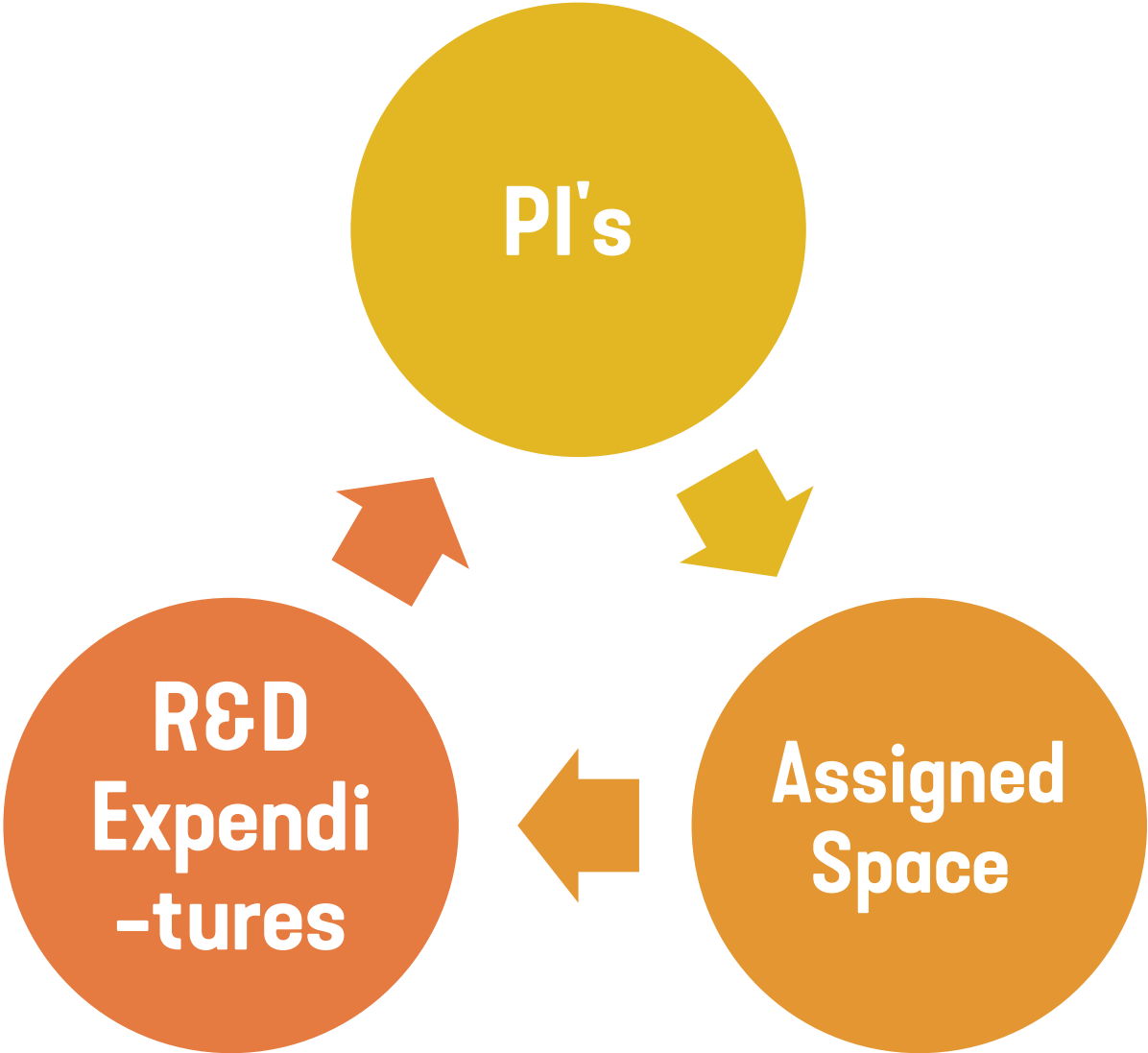
INSTITUTIONAL ASSETS

DATA MANAGEMENT AFFECTS SPACE ALLOCATION, GOVERNANCE, AND POLICIES



DATA NEEDS

DATA MANAGEMENT AFFECTS SPACE ALLOCATION, GOVERNANCE, AND POLICIES



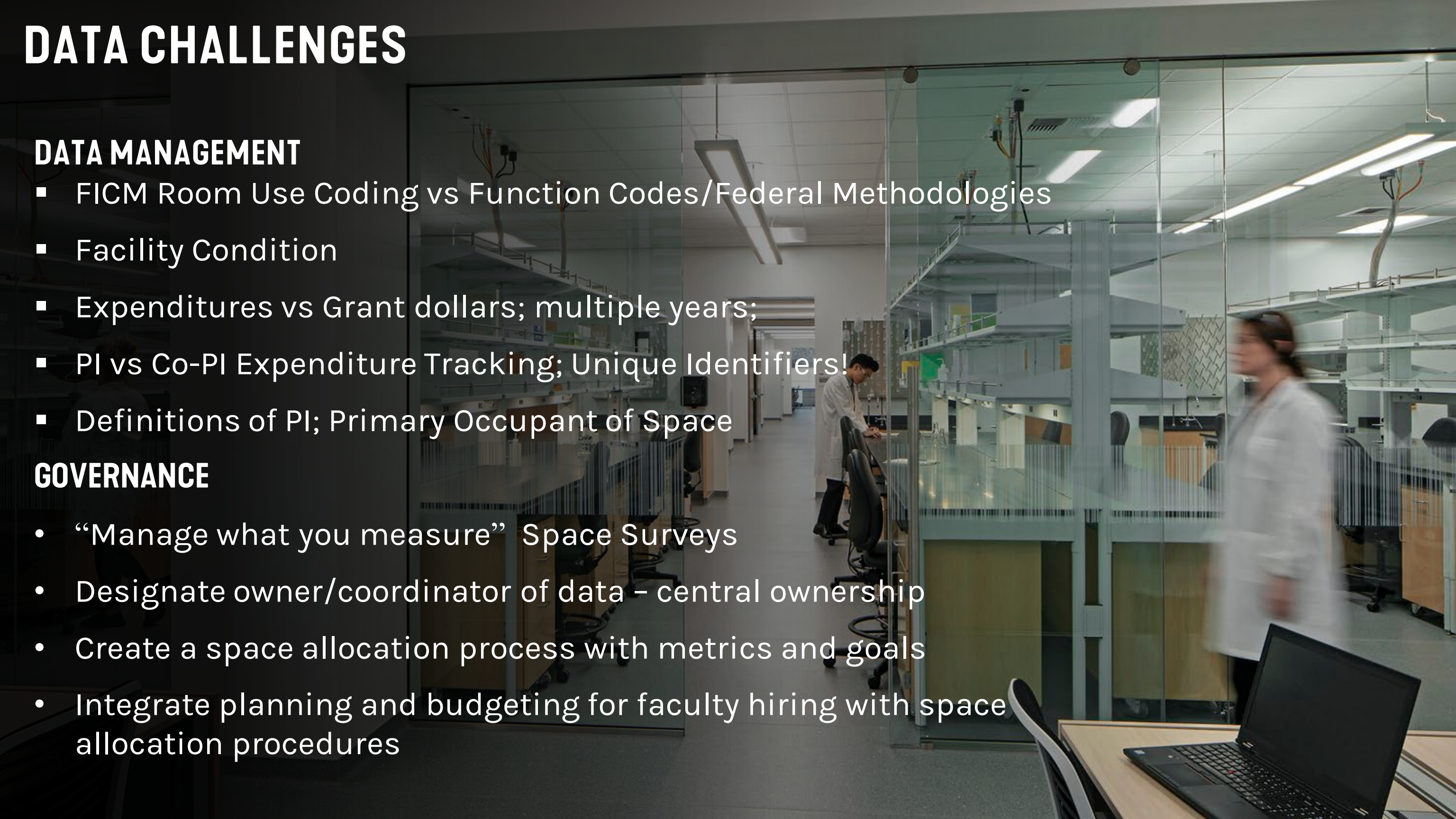
DATA COLLECTION

FACILITIES SURVEYS AND DATA COLLECTION



- Blend or connect data sets
 - PI's
 - Assignable Sq Feet
 - Expenditures
- Data Desired/Field
 - Group/Dept
 - Room Use Code
 - Condition
 - Other Metrics

DATA CHALLENGES



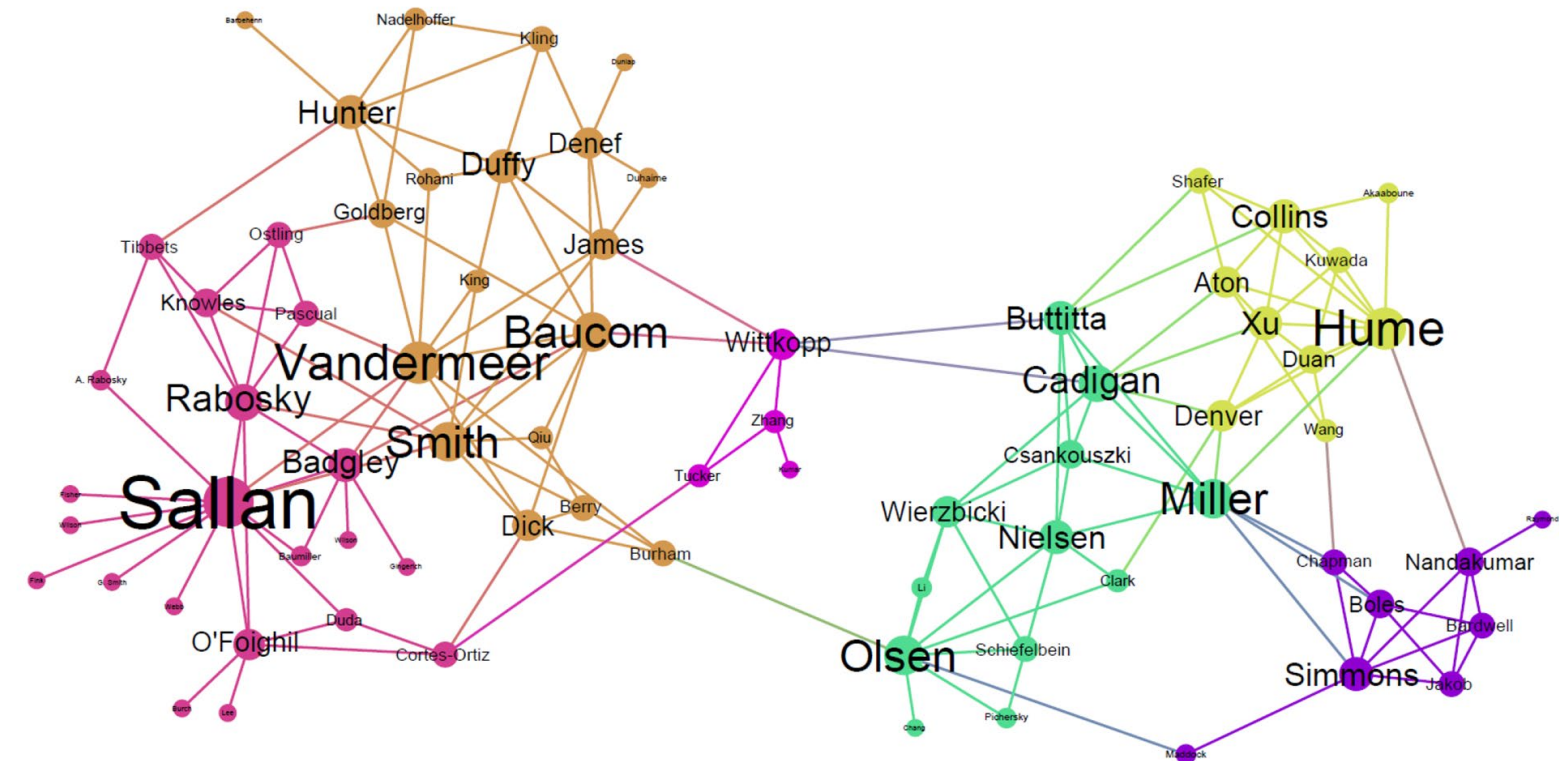
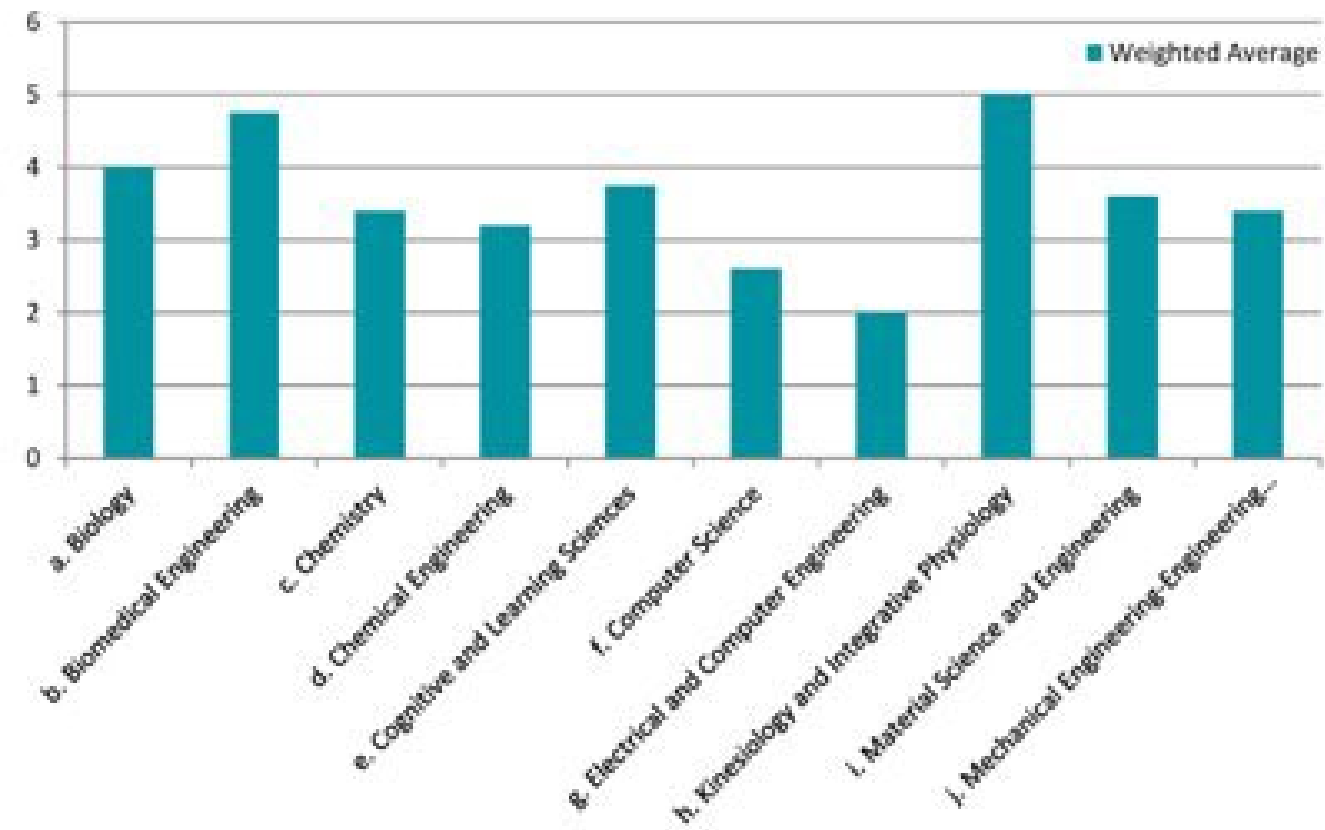
DATA MANAGEMENT

- FICM Room Use Coding vs Function Codes/Federal Methodologies
- Facility Condition
- Expenditures vs Grant dollars; multiple years;
- PI vs Co-PI Expenditure Tracking; Unique Identifiers!
- Definitions of PI; Primary Occupant of Space

GOVERNANCE

- “Manage what you measure” Space Surveys
- Designate owner/coordinator of data – central ownership
- Create a space allocation process with metrics and goals
- Integrate planning and budgeting for faculty hiring with space allocation procedures

MAPPING COLLABORATIONS

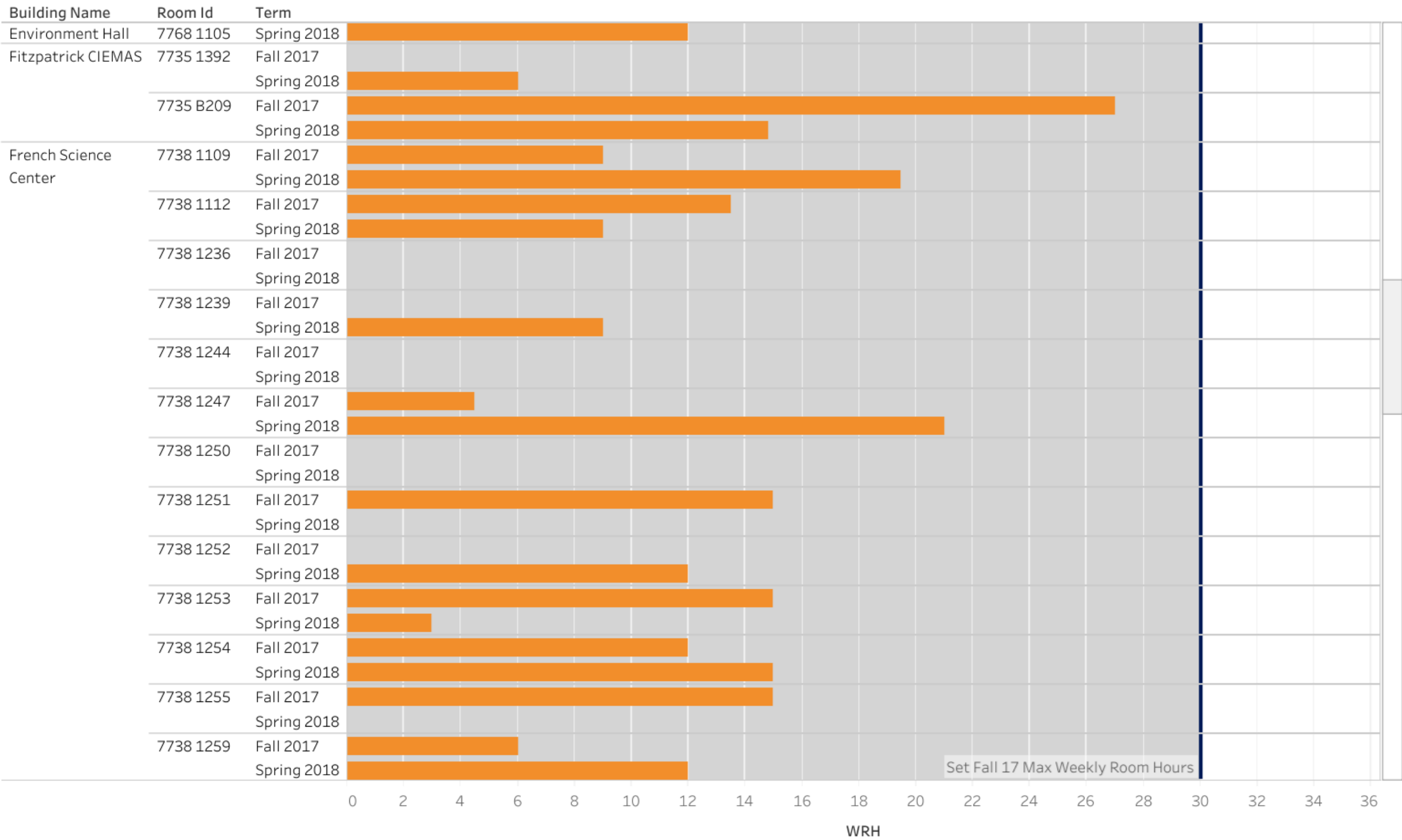


DASHBOARDS





Utilization for Space Type: Teaching Labs



Select Space Type

Teaching Labs

Use the selector above to choose between desired view.

Click on a building name, room id, or term to navigate to dashboard showing list of courses for your selection.

Classroom Filters

Set Fall 17 Max Weekly Room Ho..
30

Building Name

All

Above or Below Parameter

OK

Review

Set Fall 17 Max Weekly Room Hours

Expenditures and ASF per PI

Note:
Only PI's with minimum of 500 ASF of research space are represented.
Research ASF in TUNL and FELL for Champagne was excluded...

Choose View
Expenditures and ASF per ..

- PI Primary Dept Filter
- ☐ Art, Art History & Visu..
 - ☒ Biology
 - ☐ Biomedical Engineeri..
 - ☒ Chemistry
 - ☐ Civil & Environmental ..
 - ☐ Classical Studies
 - ☐ Computer Science
 - ☐ Division of Marine Sci..
 - ☐ Divisional Deane

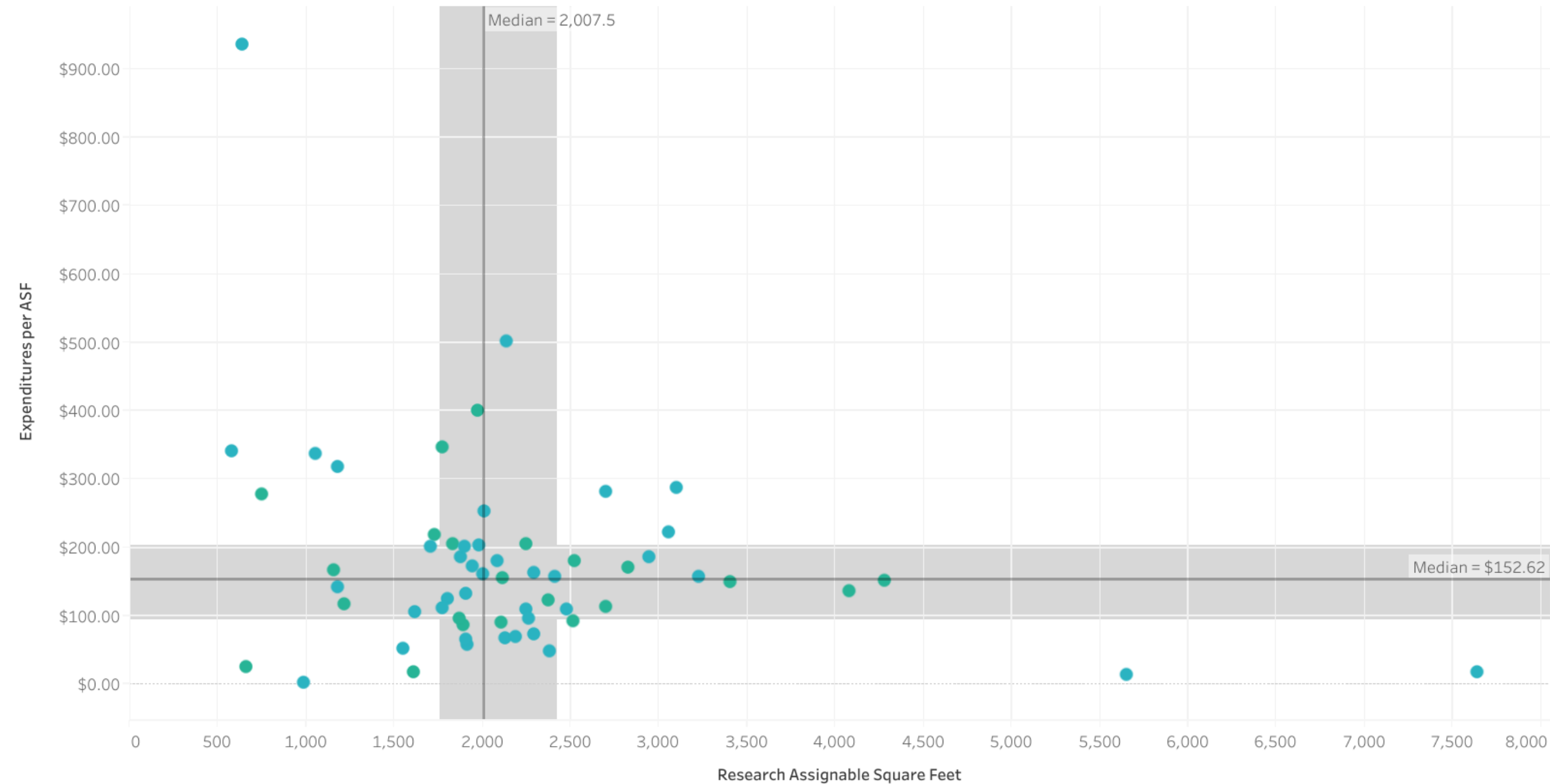
PI Primary Dept Legend

- Biology
- Chemistry

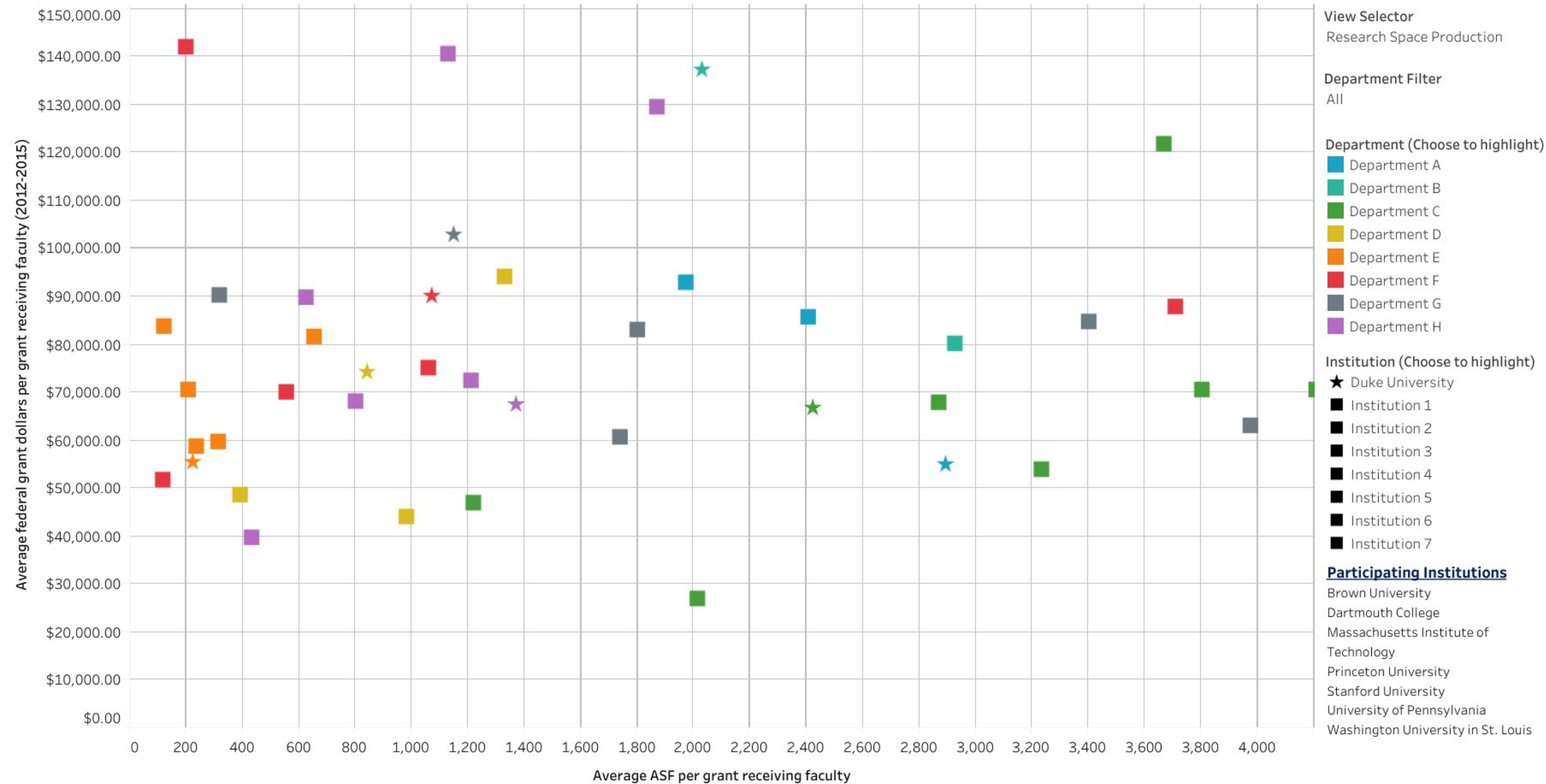
Highlight PI Last Name
No items highlighted

Highlight PI Last Name
No items highlighted

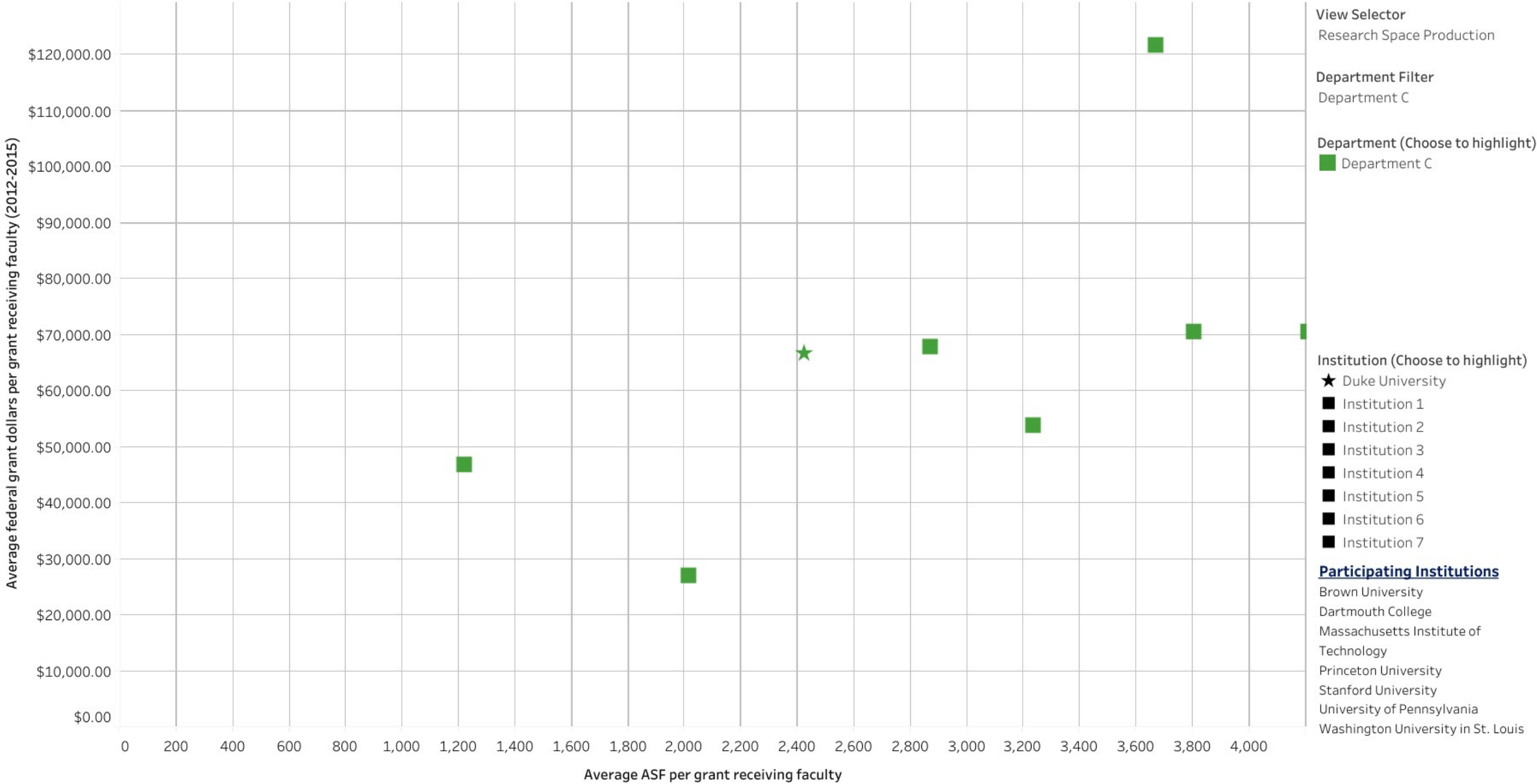
Highlight PI Last Name
No items highlighted



Duke and Peers Research Space Production

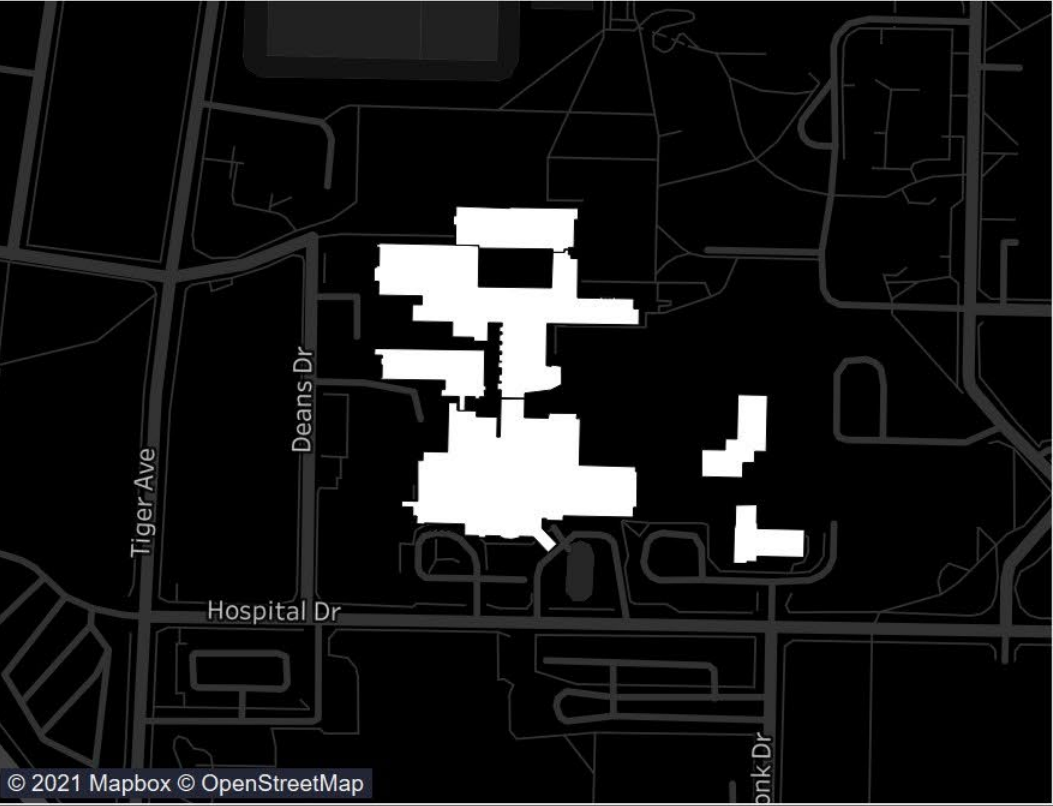


Duke and Peers Research Space Production



Research Space

(RUCs 250-XX, 255-XX, & 310-12)



Bldg & Room ID	Room Department	Type of Room	Room ASF
37060 M112	Dean of Medicine	Research/Nonclass Lab Ser	219
37060 M114	Ophthalmology	Research/Nonclass Lab	648
37060 M125A	Dean of Medicine	Research/Nonclass Lab Ser	122
37060 M126	Dean of Medicine	Research/Nonclass Lab Ser	91
37060 M128	Dean of Medicine	Research/Nonclass Lab Ser	99
37060 M132	Dean of Medicine	Research/Nonclass Lab Ser	238
37060 M134	Dean of Medicine	Research/Nonclass Lab	2,337
37060 M134A	Dean of Medicine	Research/Nonclass Lab Ser	152
37060 M134B	Dean of Medicine	Research/Nonclass Lab Ser	125
37060 M134C	Dean of Medicine	Research/Nonclass Lab Ser	140
37060 M148	Child Health	Research/Nonclass Lab	1,767
37060 M148A	Child Health	Research/Nonclass Lab Ser	170
37060 M148B	Child Health	Research/Nonclass Lab	110

NOTE: Some rooms have multiple occupants.

- Research/Nonclass Lab
- Research/Nonclass Lab Ser
- Office

Home Dept

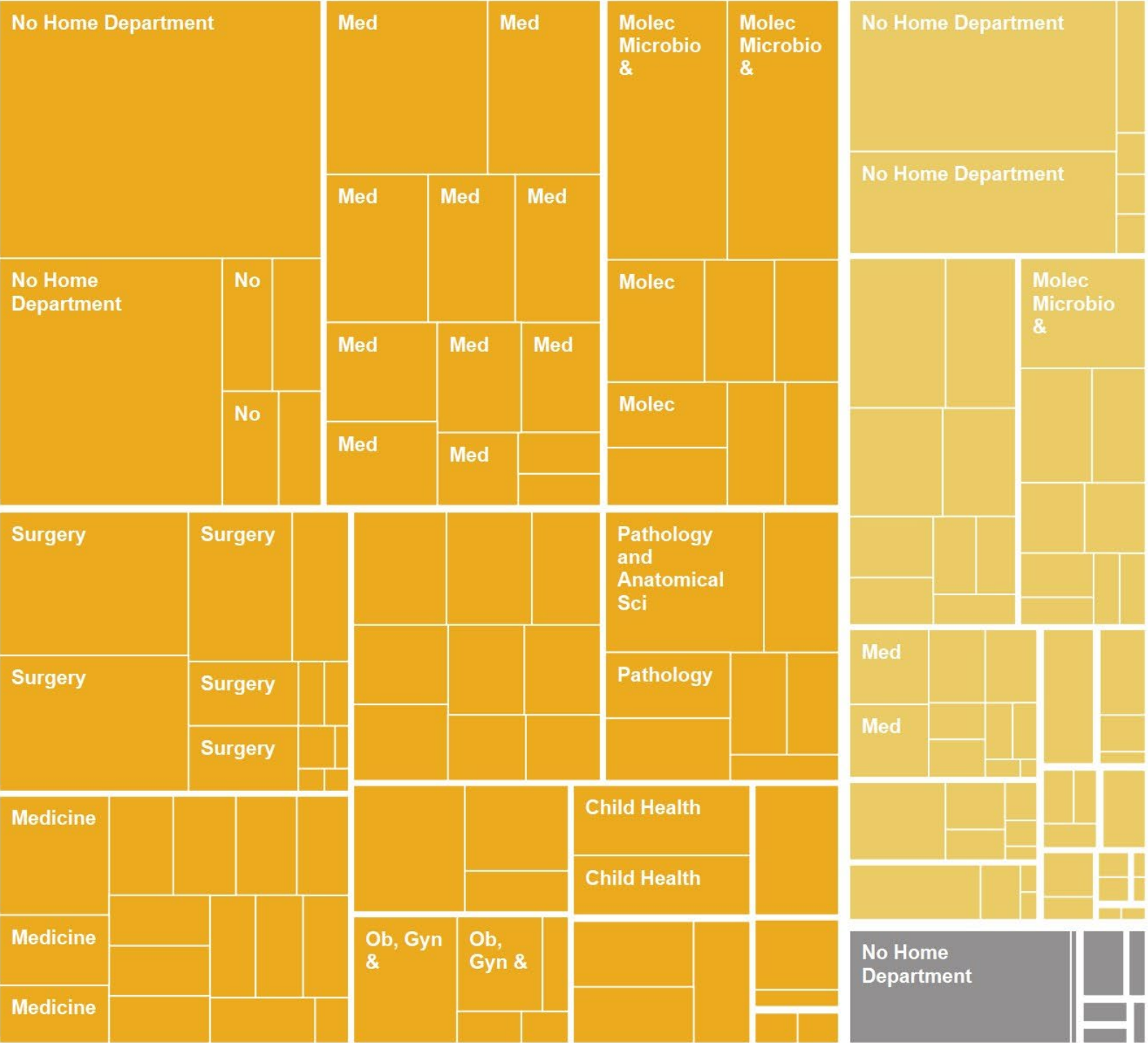
All

Building Name

All

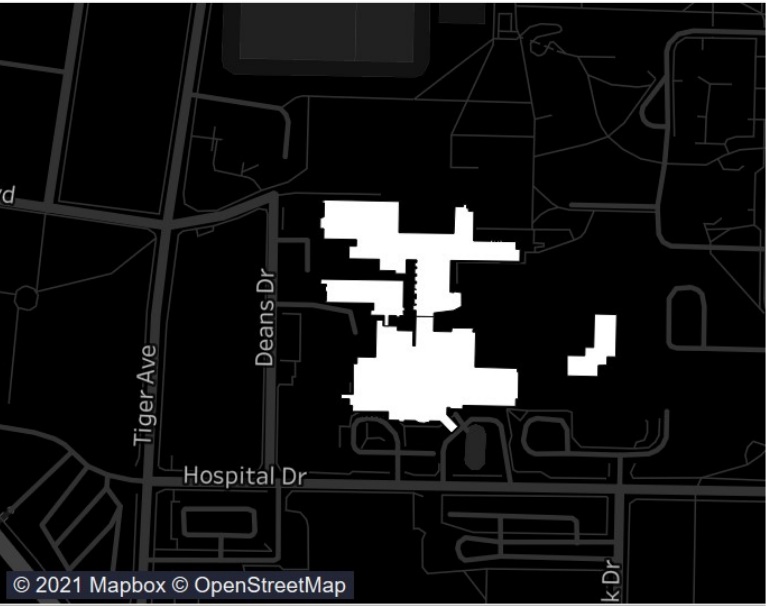
PI NAME

All



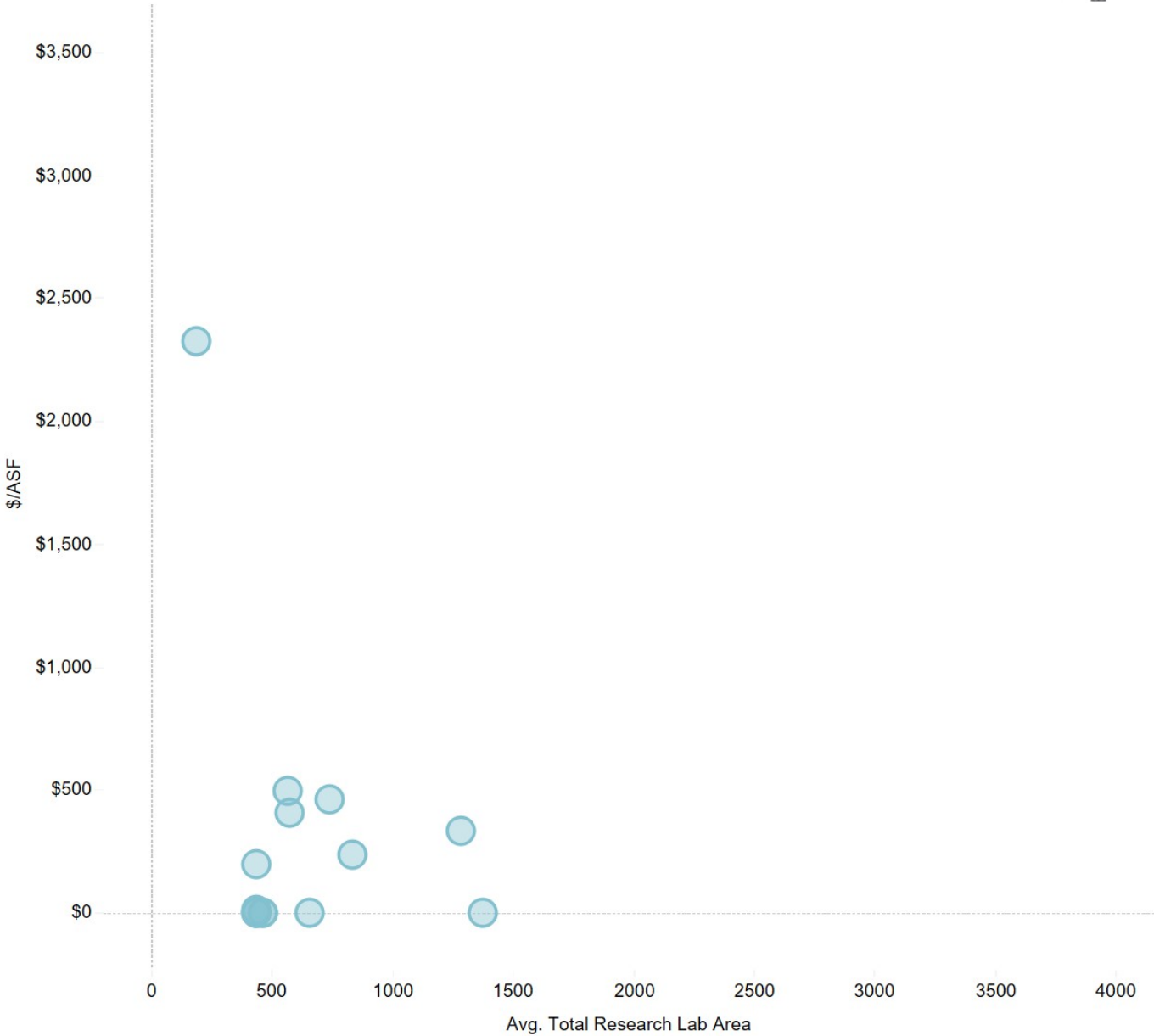
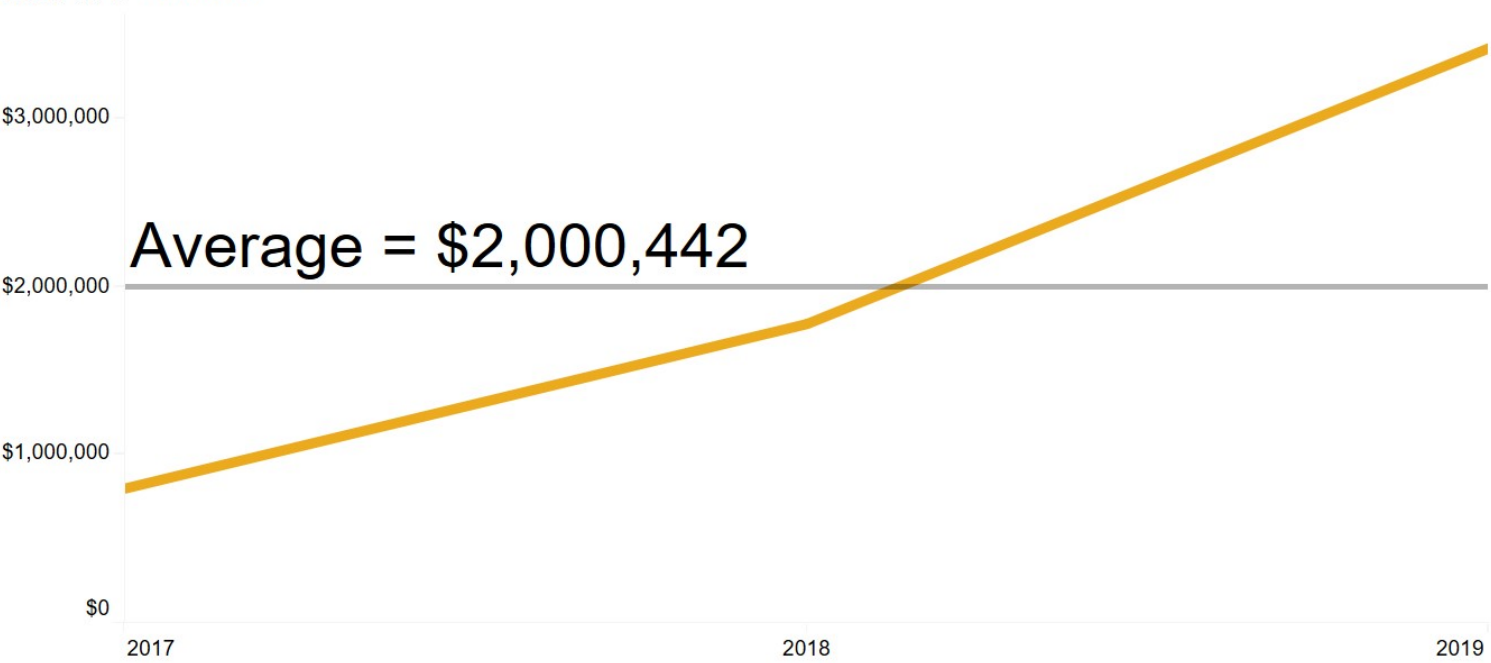
Principal Investigators

(Only RUCs 250-XX & 255-XX)



PI NAME All
HOME DEPT. Medicine
Medicine

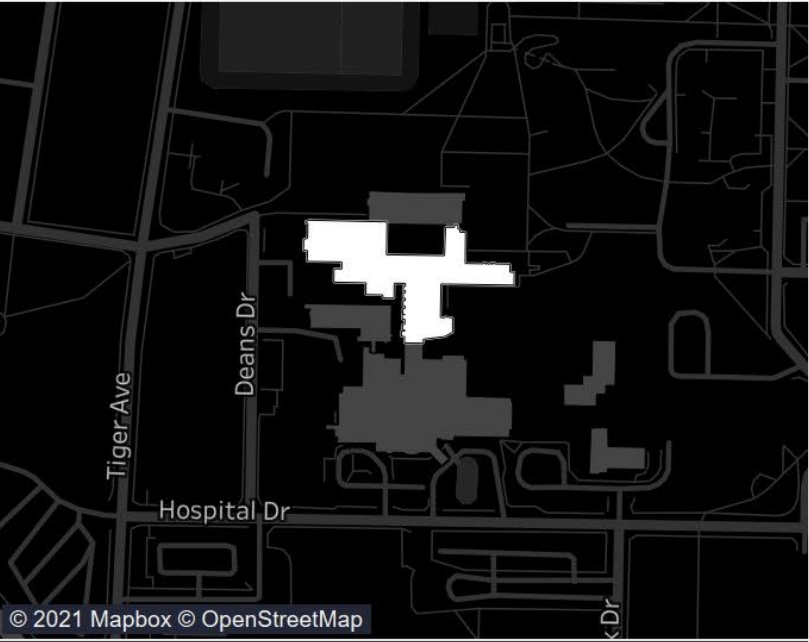
COST TYPE Total Costs



TOTAL ASF VALUES MAY NOT MATCH
ASF amounts on this dashboard exclude 310-12 Research Office space
which is shown on other dashboards in this workbook.

Research Labs & Service with Ratings

(RUCs 250-XX, 255-XX, & 310-12)



Building Name

All

Room Id

All

All

All Windows

BioSafety Cabinets - 0 to 4

Chemical Fume Hoods - 0 to 4

Sinks - 0 to 6

Snorkels - 0 to 2

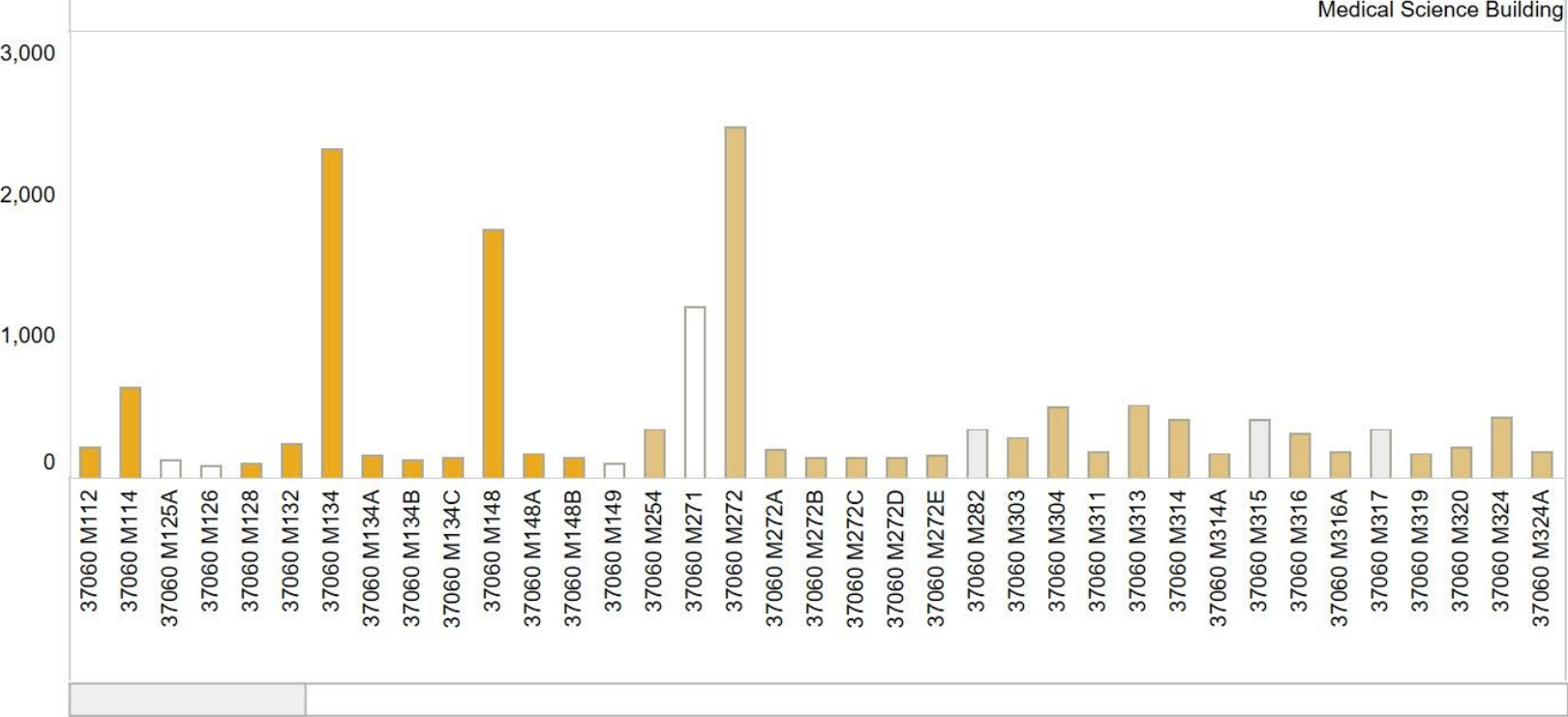
RATING

Poor

Fair

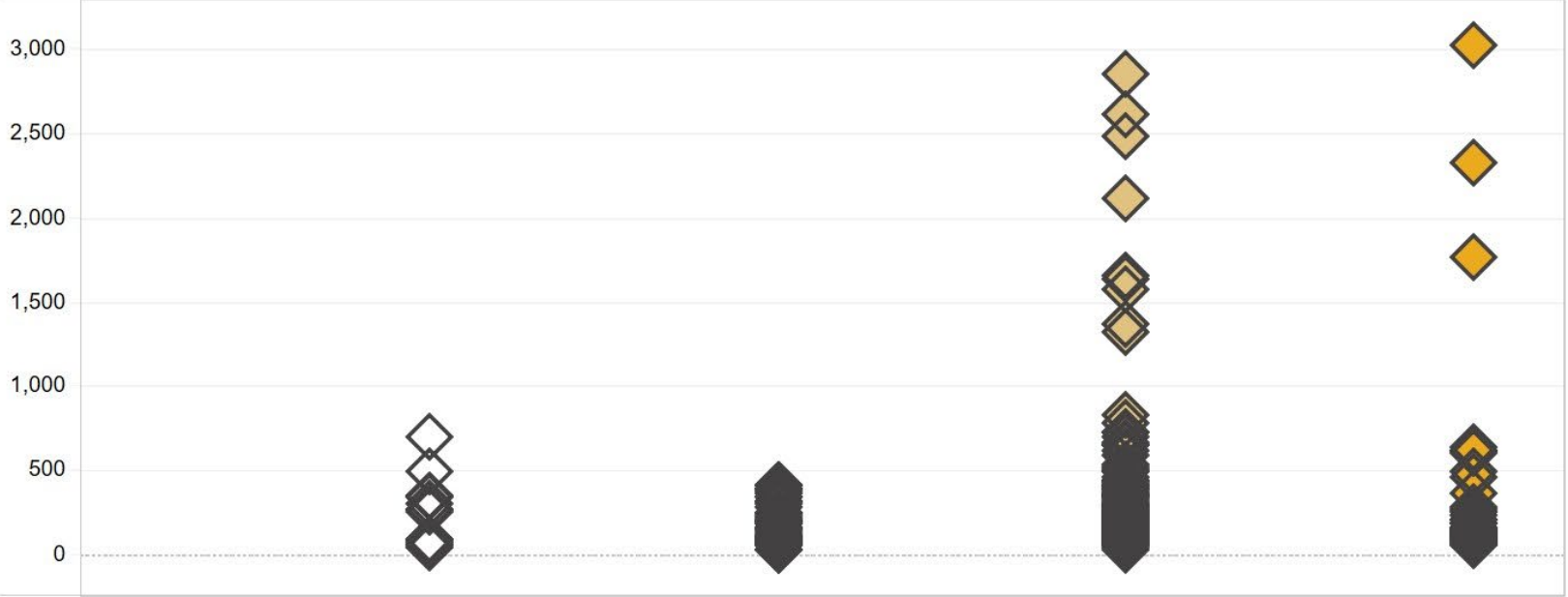
Good

Excellent



NOTE: Selecting a building in the map above will provide options to open a PDF of floorplans.

Building Name	Bldg & Room ..	Condition Category	
Clinical Support & Education Bldg	42000 CE530	Finishes	
		Flooring	
		Lighting	
		MEP	
	42000 CE0631A	Finishes	
		Flooring	
		Lighting	
		MEP	
Mason Institute Building	42089 EC202	Finishes	
		Flooring	
		Lighting	
		MEP	
	42089 EC203	Finishes	
		Flooring	

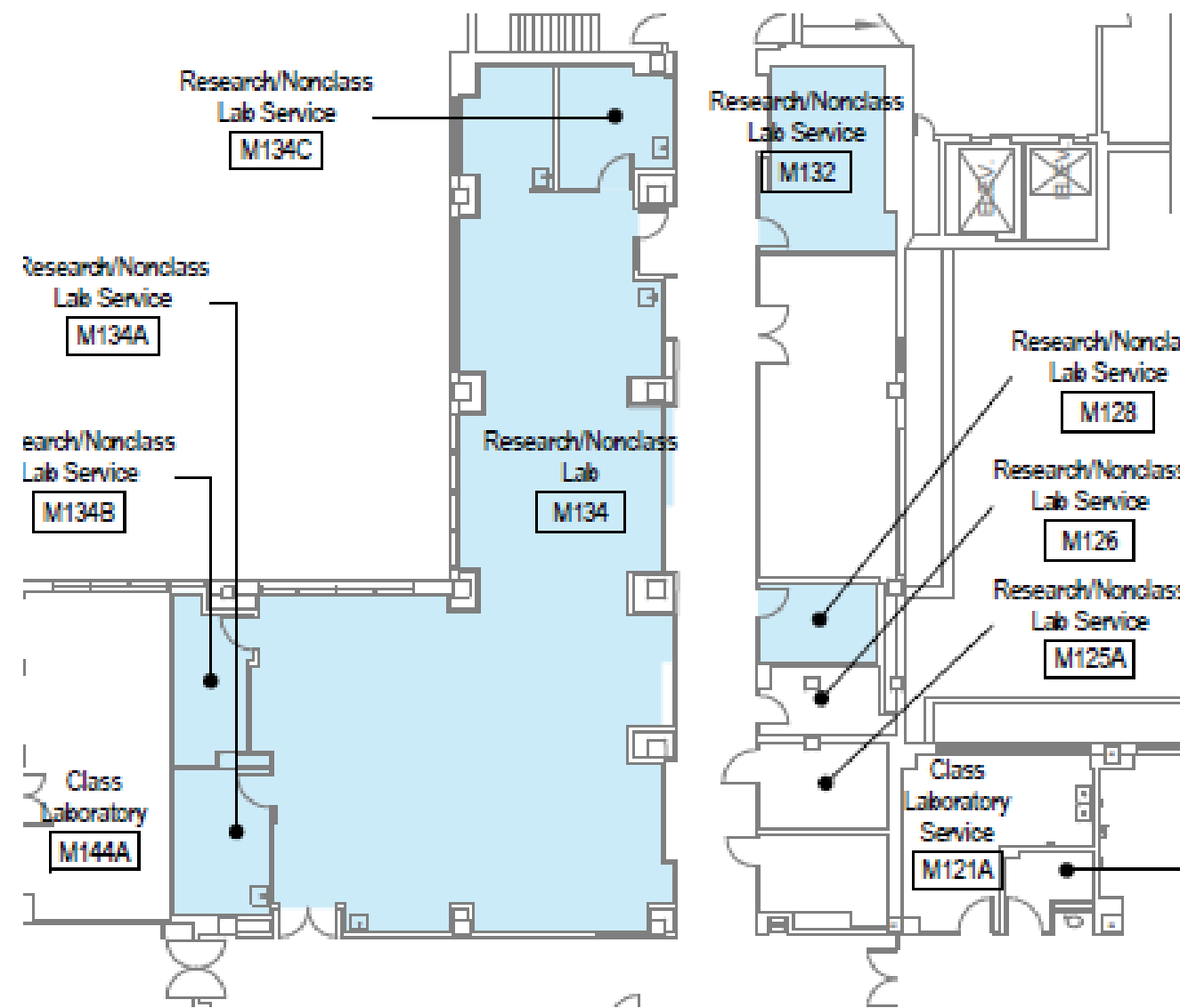


NOTE: Selecting a room in the chart above will provide options to open a PDF of either room pictures or floorplans.

OPPORTUNITIES TO INCREASE UTILIZATION:

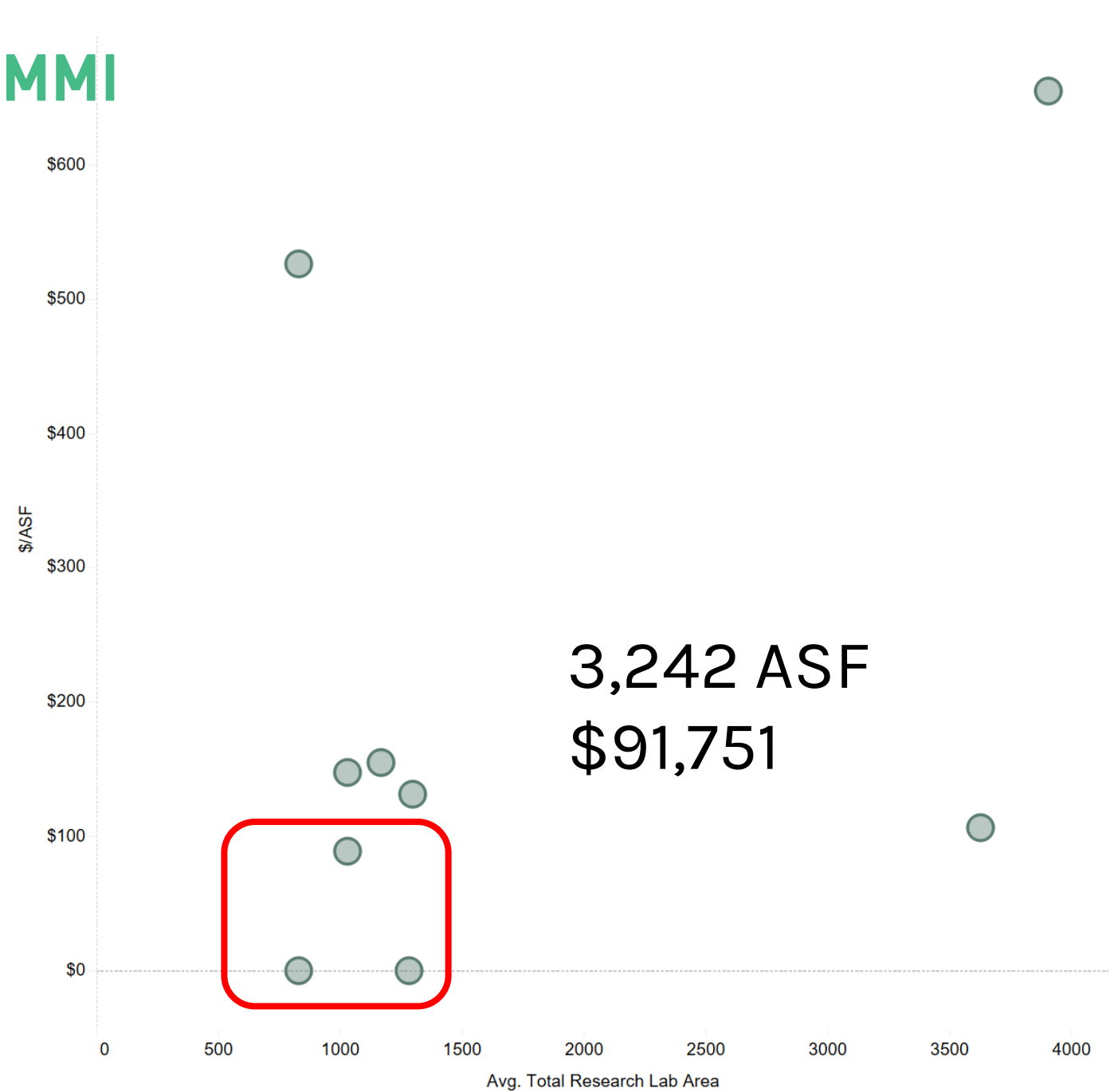
1. UTILIZE UNASSIGNED SPACE

MED SCI M-134

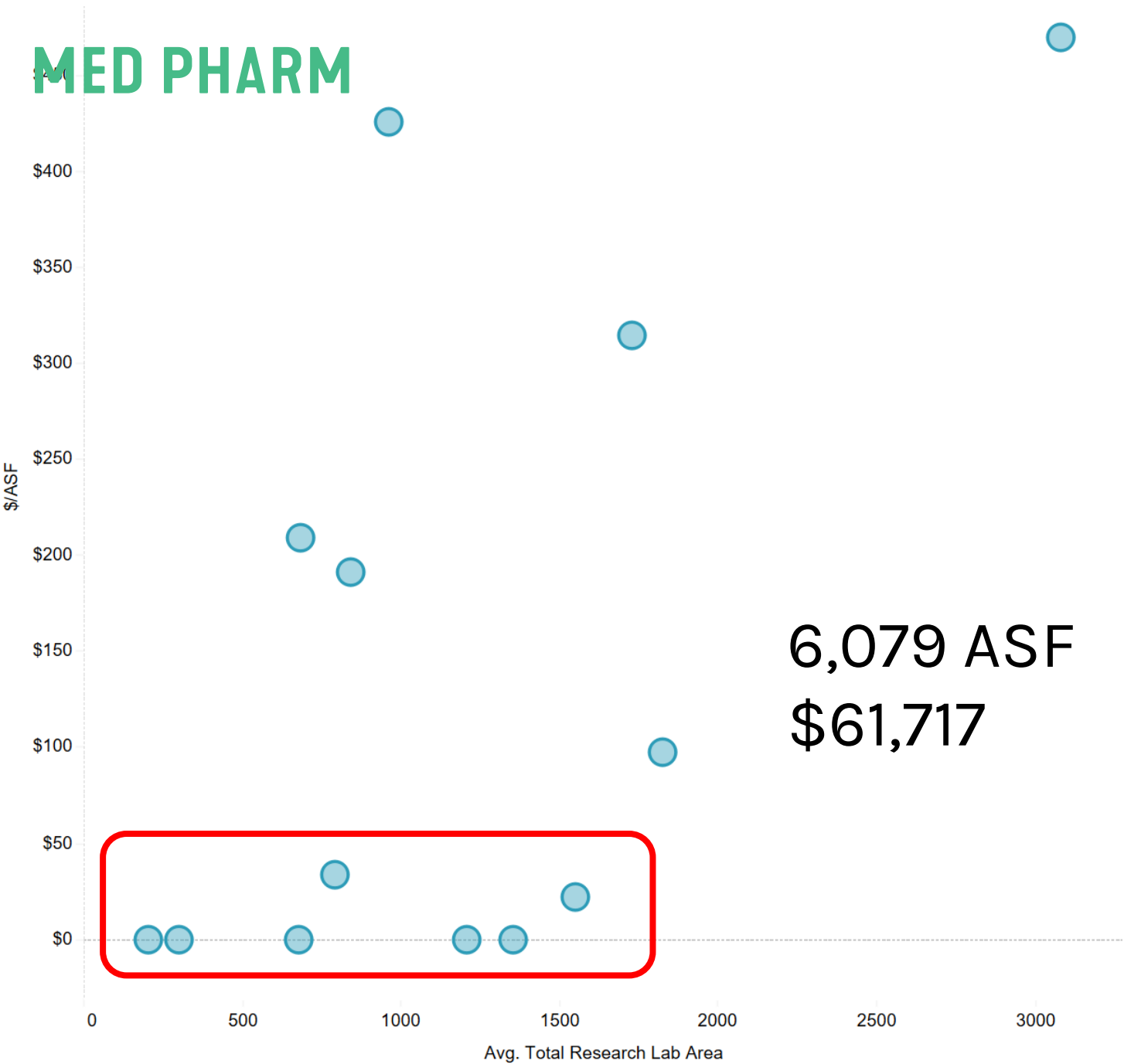


2. INCREASE PRODUCTIVITY OF EXISTING SPACE

MMI



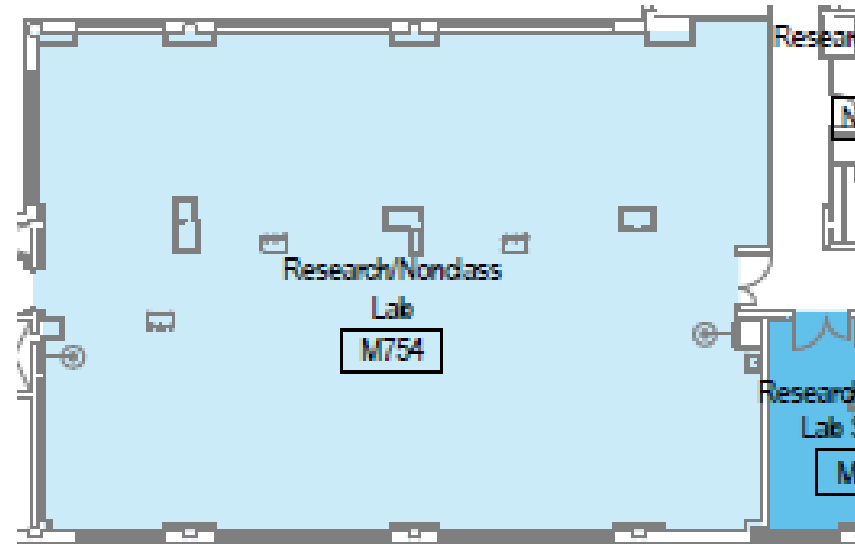
MED PHARM



2. INCREASE PRODUCTIVITY OF EXISTING SPACE

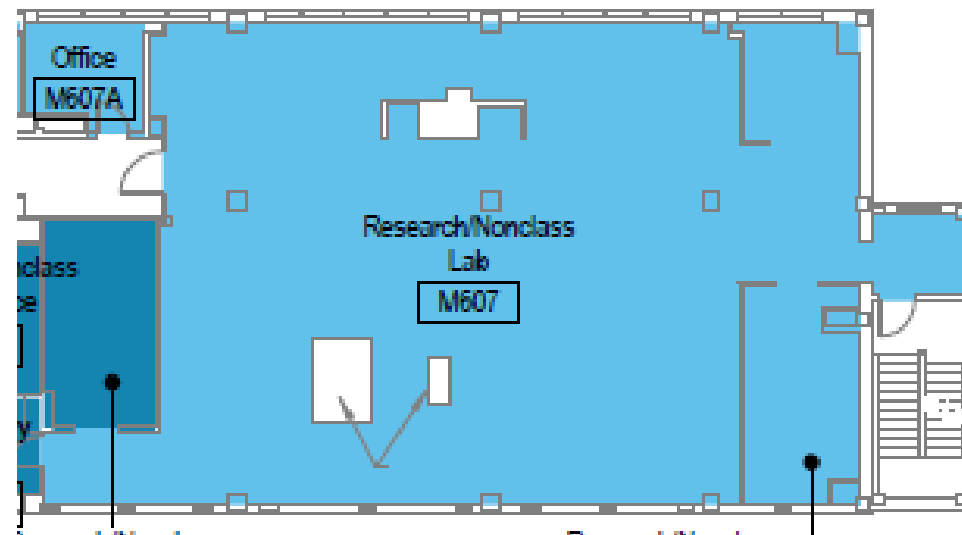
M-754

- 3,027
- Excellent Cond
- 7 PI's

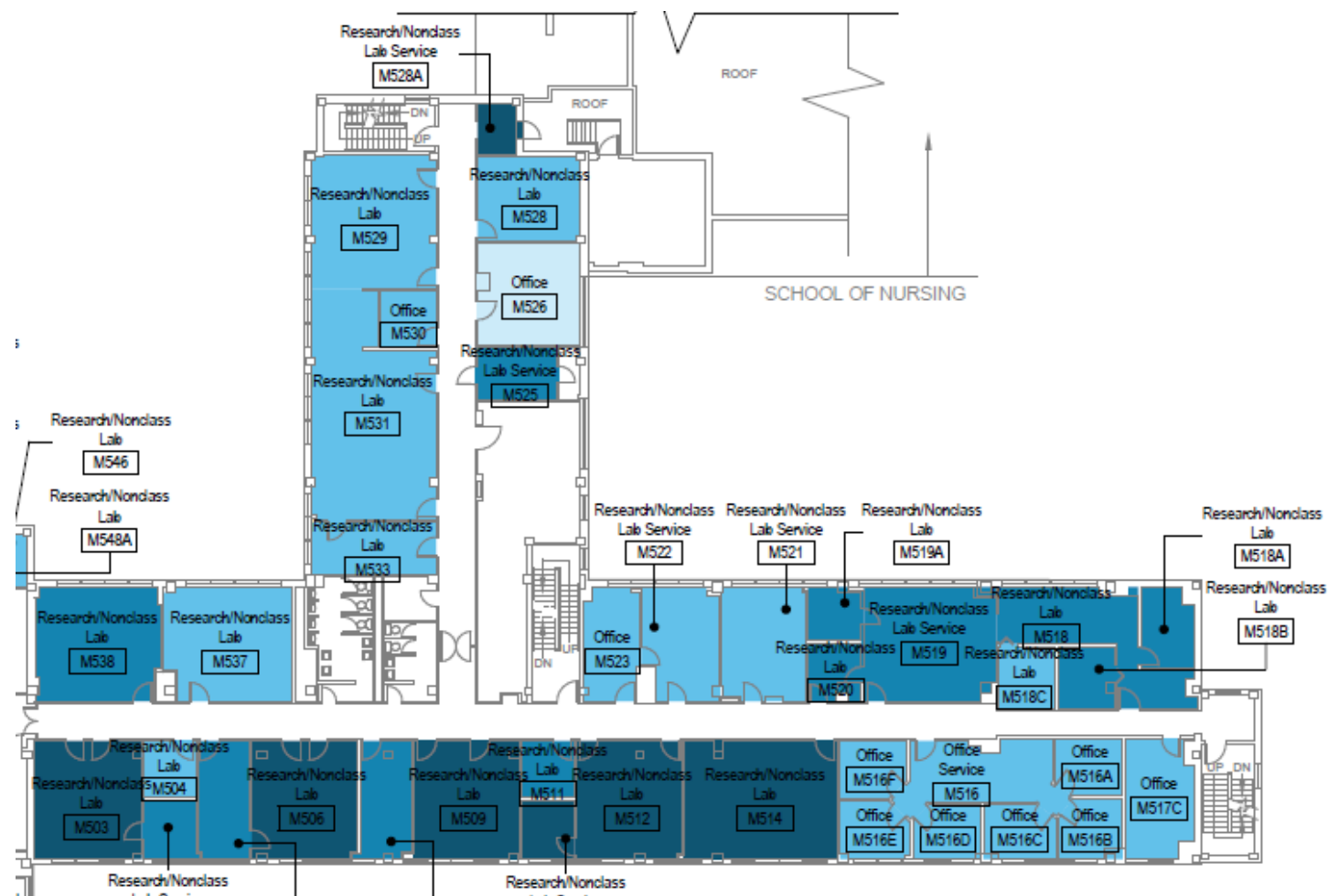


M-607

- 2,860 ASF
- Good Condition
- (1) PI



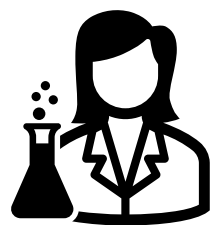
3. RENOVATE SPACE FOR FLEXIBILITY, PI DENSITY



ALTERNATIVE EXAMPLE: BUILD NEW

TARGET: \$100M
Expenditures

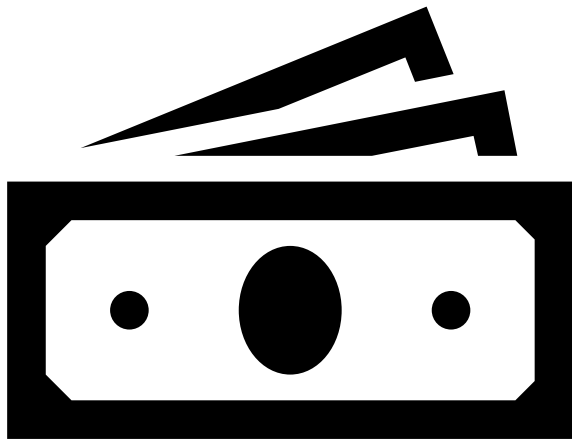
- \$250k/PI → 400 PI's
- \$500k/P I→ 200 PI's



- 50% Lab Intensive = 100 PI's
- 30 Engr @ 1500 ASF/PI
- 70 Scientists @ 1200 ASF/PI
- → 139,000 ASF
- → 232,000 GSF



- Construction cost @ \$1,000-\$1,200/GSF =
- \$232,000,000 – \$278,400,000



Our Call to Action

Measure what you want to manage

Measure what we have

Measure how we're using it

Use data to *inform* better decision making, planning,
policy and procedures

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THANK YOU

COMMENTS, QUESTIONS?

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