Chapter 9   Research & Technology Transfer

Goals

Excellence in research and scholarly activity is a central tenet of the University of Michigan's mission. These activities have the power to expand knowledge, increase our understanding of the world, improve lives, and contribute to the common good at the U-M, the broad scope, overall size, and emphasis on interdisciplinary approaches throughout the institution contributes to its standing as one of the world's leading universities. The money to support research and scholarship comes from the federal government, private sector, foundations, and the U-M's operating budget itself.

The University expects that research discoveries by its faculty members have the potential to contribute to the development of innovative products and processes. The U-M places a high priority on supporting this kind of activity under the Innovation Partnerships organization.

Overview

Total research expenditures by the University from all sources (external and University funds) exceeded $1.8 billion in FY 2023. Furthermore, U-M ranks second highest in the nation for total research spending among all public universities (based on FY2022 figures, the latest available). Sixty-eight percent of U-M's research spending is provided by outside sources, with the largest share of research funding from the federal government.

The University's largest fraction of grant-supported work occurs in the biomedical and clinical sciences. The U-M Medical School alone regularly attracts more than $400 million each year in research grants.

Research is of special interest to the private sector. Innovation Partnerships works with faculty inventors to file patents and negotiate licensing agreements that benefit the University's industry partners and fund additional research and development work on campus. In certain instances, U-M faculty members establish companies to develop their inventions, thanks in part to an emerging campus culture of innovation and entrepreneurship.

In 2021, U-M established the Accelerate Blue Fund, an early state venture capital (VC) fund that invests only in U-M-licensed startups. The new fund aims to "bridge the funding gap between initial launch and [other private] funding for startups based on University of Michigan intellectual property."

For More Information

U-M Office of Research (research.umich.edu)

Innovation Partnerships (innovationpartnerships.umich.edu)

Charts in Chapter 9

9.1.1   Total Research Expenditures, Adjusted for Inflation, 1980-2023.

9.1.2   Research Expenditures by Major Funding Source, Adjusted for Inflation, FY2013-FY2023.

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9.4.2   Revenues from Royalties and Equity Sales, FY2013-FY2023.

9.4.3   Formation of Start-up Companies that Utilize U-M Technology, FY2013-FY2023.

The inflation-adjusted decline in total U-M research expenditures since FY2020 is largely attributed to the reduction in research activity on campus due to the pandemic. In spite of this dip, U-M spent fourth most on research among U.S. universities in FY2023.

9.1.1 Total Research Expenditures, Adjusted for Inflation[1], 1980-2023.
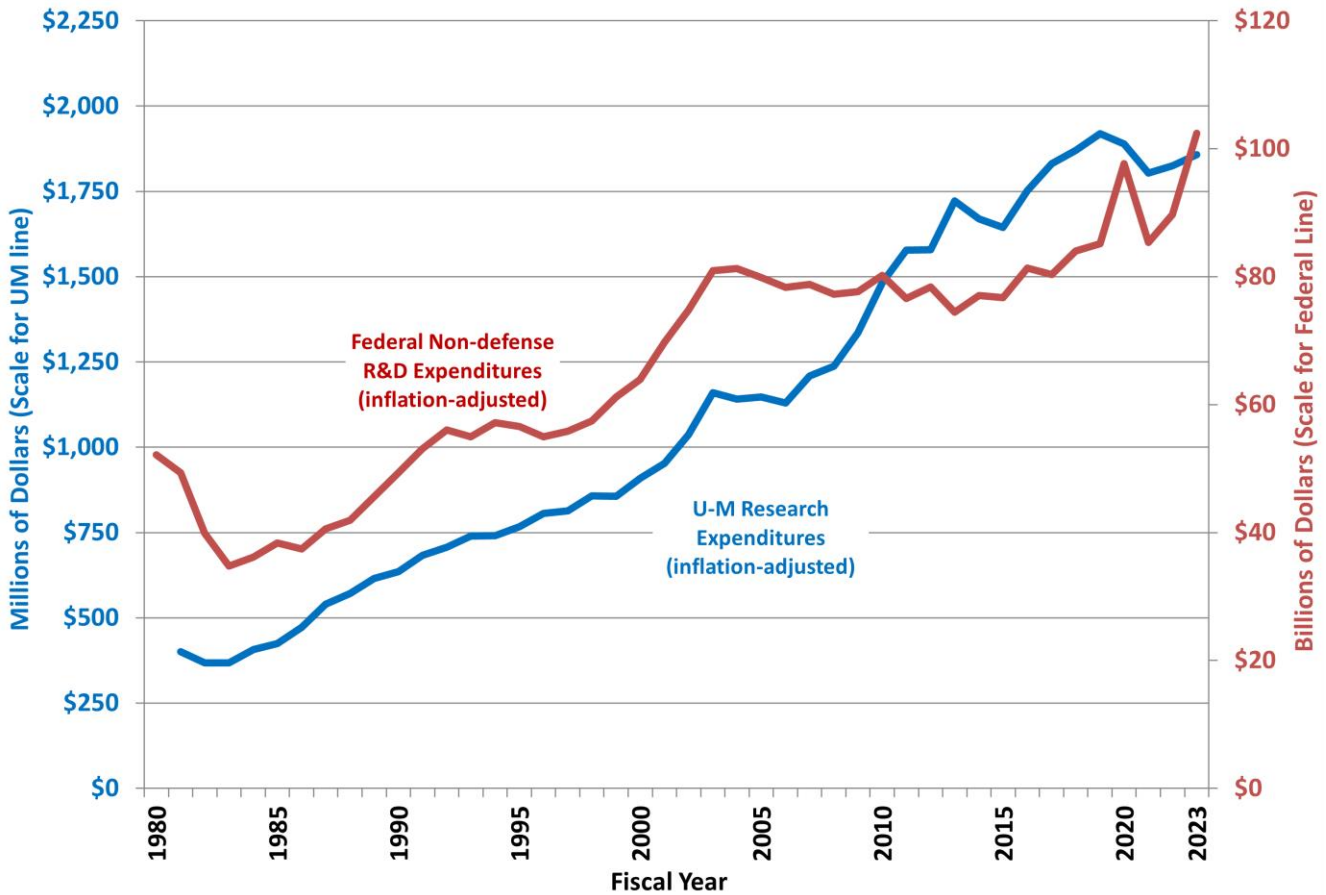
SOURCE: U-M Volume of Research (UMOR); American Association for the Advancement of Science Historical Trends in Federal R&D

The research expenditures displayed in this chart and the table for 9.3 include those for the Ann Arbor, Dearborn, and Flint campuses. All other figures show data only for the Ann Arbor campus.

Note: Starting in FY2007, research support originating from the U-M faculty medical group practice was included as research expenditures. Previously this was reported with clinical activity.

[1] Based on 2023 U.S. Consumer Price Index.

The portion of the federal budget allocated to non-defense R&D spending can't be counted on to increase every year. This this reality in mind, the U-M has made an effort to grow research support from internal and non-federal sources.

9.1.2 Research Expenditures by Major Funding Source, Adjusted for Inflation[2], FY2013-FY2023.
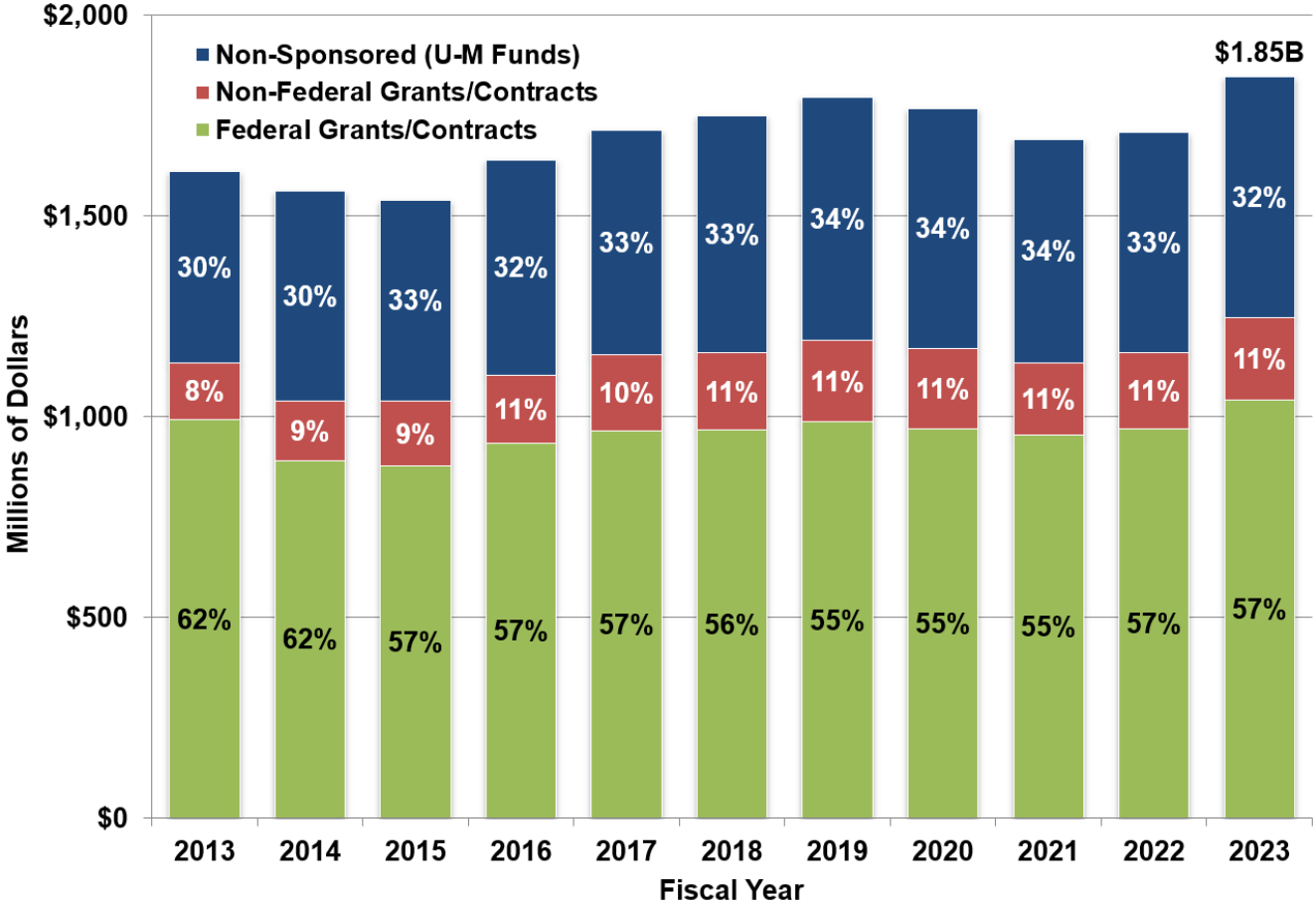

Source: U-M Financial Operations

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[2] Based on 2023 U.S. Consumer Price Index.

Direct research expenditures on the U-M campus are greater today compared to 2013 and are recovering from the spending decline precipitated by the COVID pandemic.

9.1.3 Direct Research Expenditures by Discipline Area from Federal and Non-Federal Sources, Adjusted for Inflation[3], FY2013-FY2023.
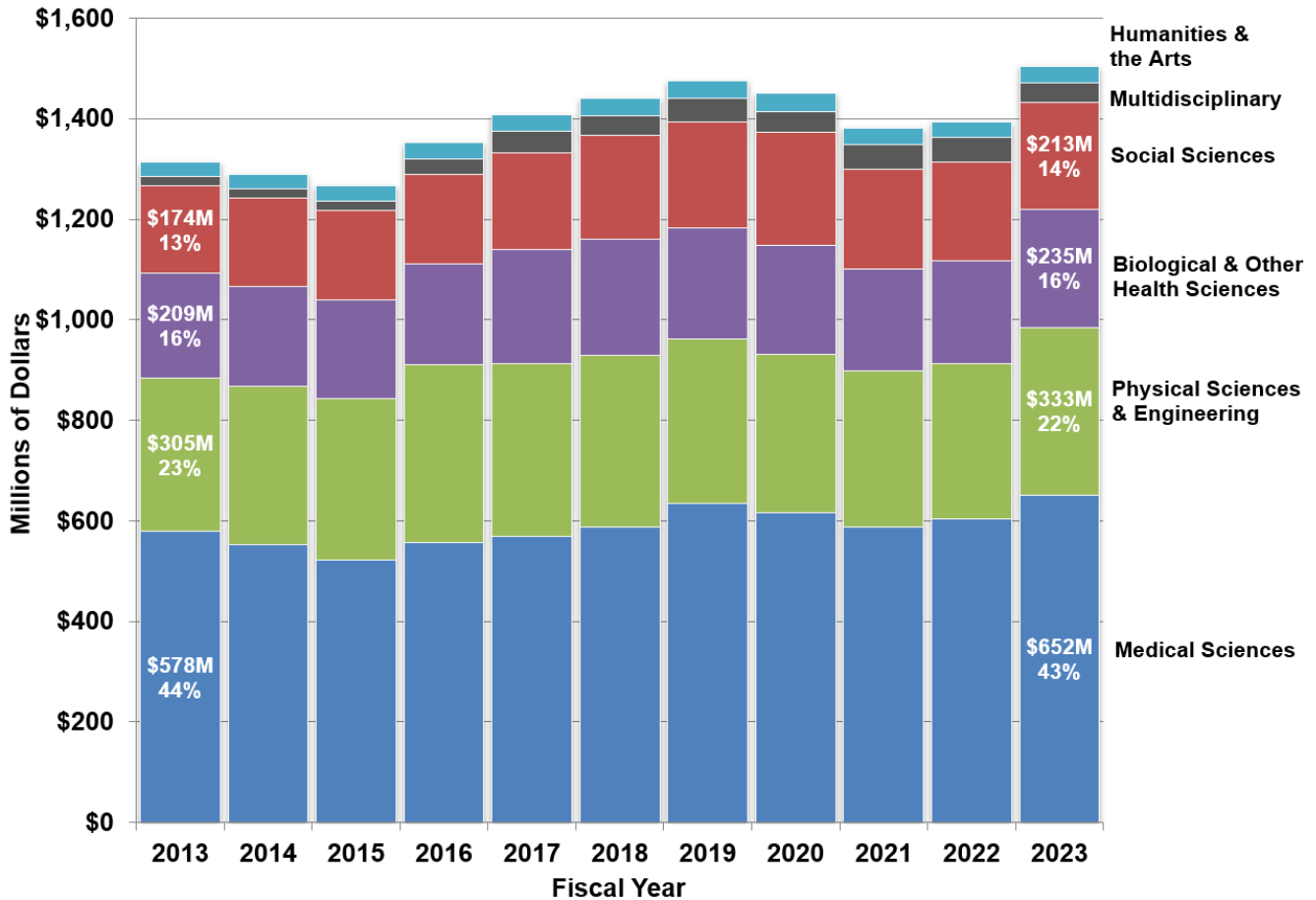
SOURCE: U-M Financial Data

Direct expenditures cover salaries and benefits of researchers, whether faculty, staff or students, as well as equipment and supplies, research-related travel and other expenses tied to specific projects. Overhead expenditures are presented in chart 9.1.5 .
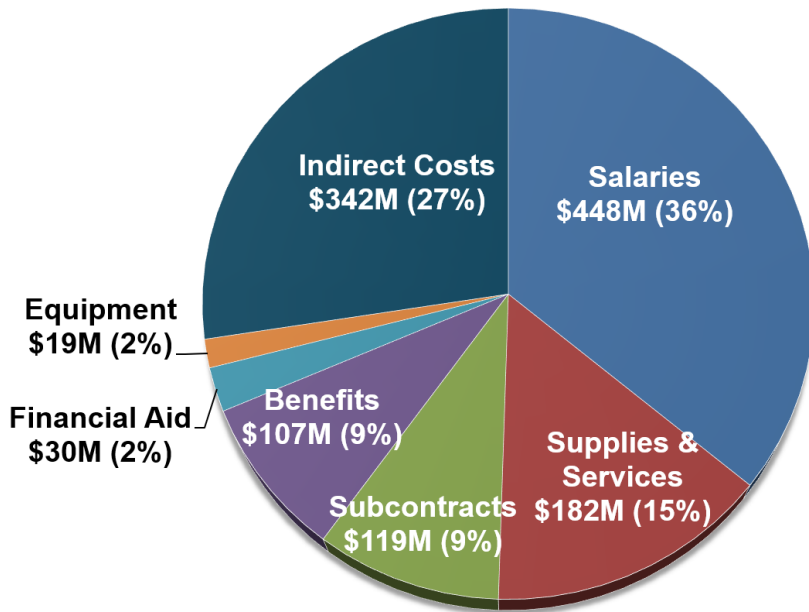
Direct research expenditures for Humanities & the Arts was $33M in FY 2023 and an inflation-adjusted $29M in FY2013. Multidisciplinary research projects had direct expenditures of $38M in FY2023 and an inflation-adjusted $19M in FY2023.

[3] Based on 2023 U.S. Consumer Price Index.

About 45 percent of the total annual sponsored research expenditures on the Ann Arbor campus goes to salaries and benefits for faculty, staff and graduate students.

9.1.4 Sponsored Research Expenditures by Type, FY2023.

FY2023 Total: $1,246,517,848

Indirect Costs $342M (27%)

Salaries $448M (36%)

Equipment $19M (2%)

Financial Aid $30M (2%)

Benefits $107M (9%)

Supplies & Services $182M (15%)

Subcontracts $119M (9%)

SOURCE: U-M Financial Operations

The FY2023 total externally funded research expenditures for the Ann Arbor campus was $1.247 billion, an increase of $88 million from the previous year. Salaries and benefits is the largest cost component.

Indirect costs (IDC) are the costs of University operations that are not assigned to a particular project, such as the costs for general research administration, utilities use in research space, and other services that contribute broadly to the operation of the University's research enterprise.

For FY2023, 27 percent of the total research expenditures went to pay for indirect costs, which are collected as a percentage of the project budget at different rates depending on the type of research activity and the sponsor. The indirect cost recovery rate for research funded by the Federal government or industry is 56 percent for on-campus research and 26 percent for off-campus research.

The indirect cost recovery rates charged to non-federal sponsors, such as foundations, State of Michigan agencies, and private companies, vary according to the sponsor's policies or through negotiations with the sponsor. In such situations, the recovery rate may not cover the actual expenses incurred by the U-M to support some of these projects.

Federal sponsored projects provide a huge majority of indirect cost recovery funds, which contribute to the overhead costs of conducting research.

9.1.5 Sponsored Research Indirect Cost Recovery by Source, Adjusted for Inflation[4], FY2013-FY2023.
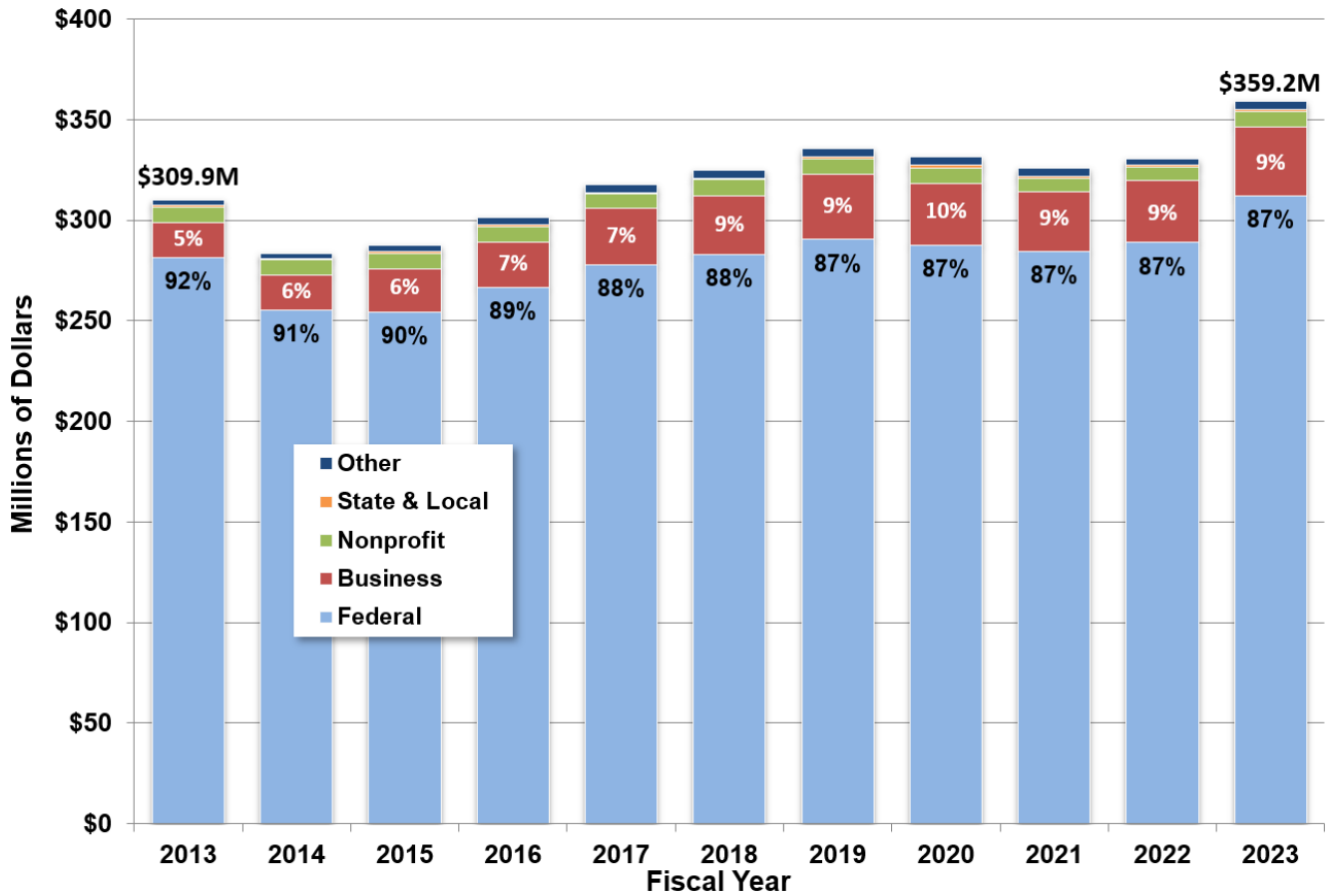

SOURCE: U-M Financial Data

Overhead spending covers items such as utilities, administration, and general maintenance of research facilities – known as "facilities & administration" or "indirect" costs – that supports the research enterprise.

[4] Based on 2023 U.S. Consumer Price Index.

A fall 2023 snapshot of personnel paid under sponsored projects shows that grants and contracts fund the full-time equivalent of 5,255 faculty members, post-docs, staff and students.

9.2   Sponsored Research Workforce by Full-Time Equivalents (FTEs), Fall 2023.
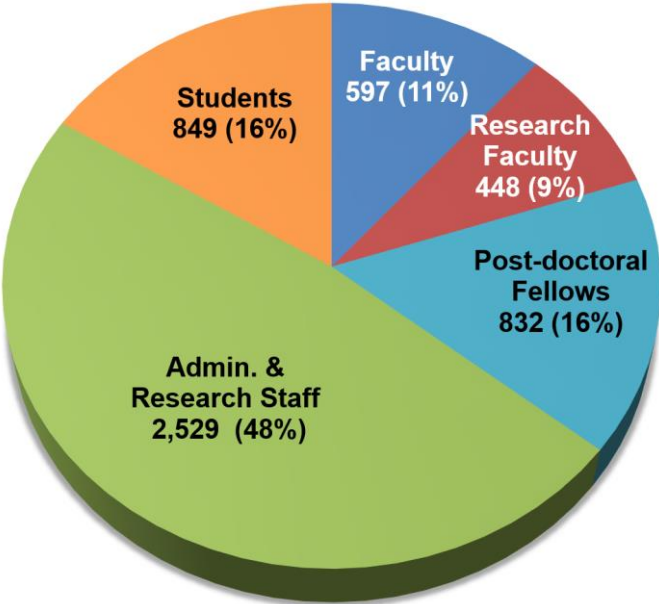
SOURCE: U-M Human Resources Data

Many tenured and tenure-track faculty members play key roles in sponsored research activity. Research faculty members, post-doctoral fellows, graduate (and some undergraduate) students, and a subset of the staff also contribute in major ways to the research enterprise.

The Fall 2023 total represents an increase of 341 FTEs (6.9 percent) supported on sponsored projects compared to Fall 2022.

This FTE total does not include faculty, staff, and student involvement in research and scholarship whose activities are paid for by the General Fund.

U-M spent fourth most on research over the last five years among all U.S. universities, and second most among U.S. public universities.

9.3   University R&D Expenditures, U-M and Other Leading Institutions, FY2018-FY2022.

Institution[7]	FY2018	FY2019	FY2020	FY2021	FY2022
Johns Hopkins[5]	$2.66B	$2.92B	$3.11B	$3.18B	$3.42B
UC San Francisco	$1.60B	$1.60B	$1.65B	$1.71B	$1.81B
Pennsylvania	$1.44B	$1.51B	$1.58B	$1.63B	$1.79B
MICHIGAN	$1.60B	$1.68B	$1.67B	$1.64B	$1.77B
Washington	$1.41B	$1.43B	$1.46B	$1.49B	$1.56B
UCLA	$1.32B	$1.31B	$1.39B	$1.45B	$1.54B
UC San Diego	$1.27B	$1.35B	$1.40B	$1.43B	$1.53B
Wisconsin	$1.21B	$1.30B	$1.36B	$1.38B	$1.52B
Duke	$1.17B	$1.23B	$1.20B	$1.24B	$1.39B
Stanford	$1.16B	$1.20B	$1.20B	$1.27B	$1.38B

SOURCE: National Science Foundation, Higher Education Research and Development Survey

The U-M is one of the nation's leading university's in total research spending for the past five years. Total expenditures include research spending from government sources, non-government sources, and the institution's own budget.

The list above is ordered by total research expenditures for FY2022. Data for public universities are shaded in yellow; private university data are shaded in blue.

The research expenditures displayed in this table and the chart for 9.1.1 include those for the Ann Arbor, Dearborn, and Flint campuses. All other figures show data only for the Ann Arbor campus.

[5] Johns Hopkins University expenditures include those by the Applied Physics Laboratory. In FY2022, APL R&D expenditures totaled $2.056B, 60% of JHU's total for the year.

Since Fiscal Year 2013, U-M faculty, staff and students have reported 5,177 inventions, have engaged in 2,360 licensing agreements, and have been issued 1,923 U.S. patents.

9.4.1 Invention Reporting, Licensing and U.S. Patent Activity, FY2013-FY2023.
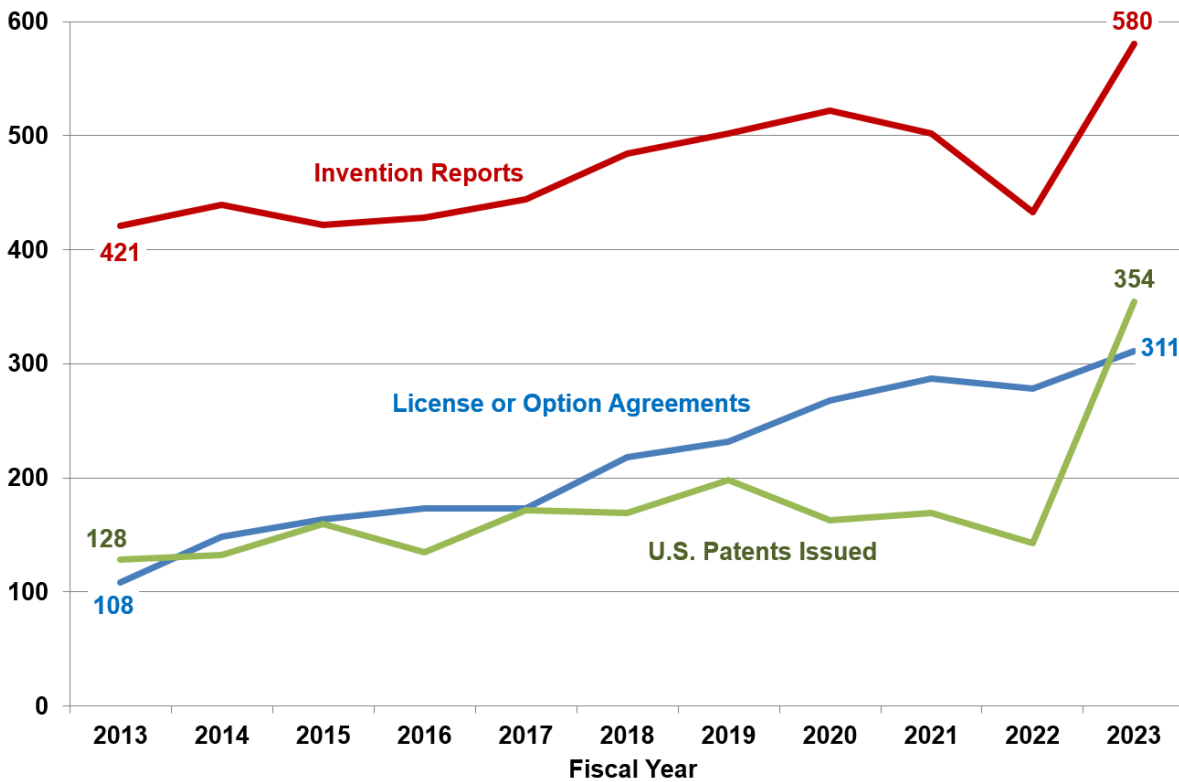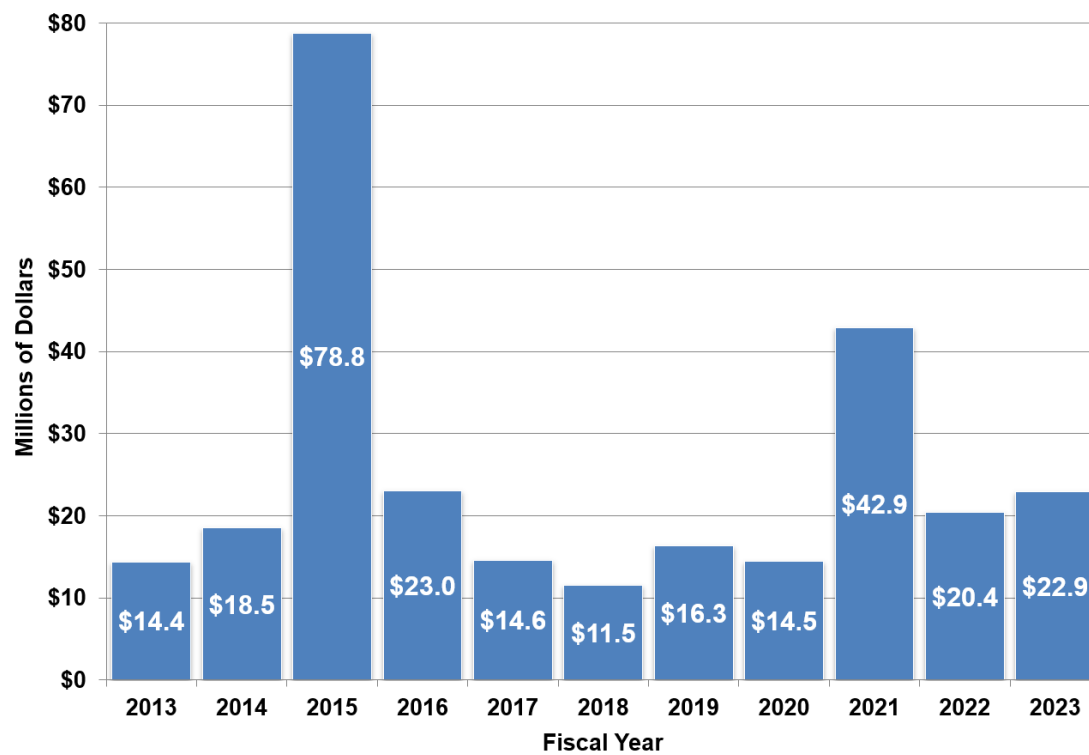

SOURCE: U-M Innovation Partnerships

Invention reports are descriptions of discoveries made by U-M faculty, staff and students with the potential to be further developed into new products or processes. Patents protect intellectual property that shows some promise for future development and application. License and option agreements are legal arrangements with companies (some of which have U-M faculty involvement) that allow the firms to use University-owned technology in products or processes being developed for the market.

Over the last decade, U-M discoveries have generated $278 million in revenues. The inventors and University share these revenues, with U-M administration's portion devoted to ongoing research and development.

9.4.2 Revenues from Royalties and Equity Sales, FY2013-FY2023.

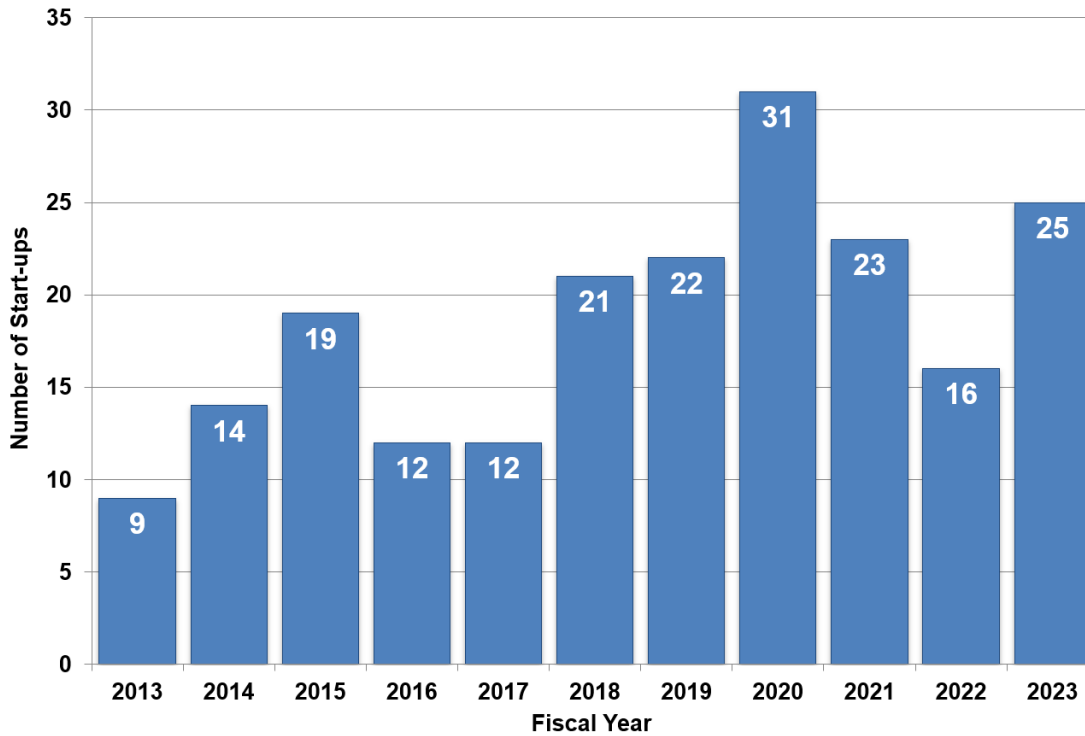SOURCE: U-M Innovation Partnerships

Revenues from licensing agreements support technology transfer operations as well as provide valuable resources for investment in research, education, and innovation.

Royalties are periodic payments by a licensee to the University of Michigan in order to have continued access to U-M-owned intellectual property. Equity sales include transfers of stock or cash payments by a licensee to U-M.

Royalty revenues reached an all-time high in FY2015. Nearly $75 million of that total comes from a new royalty agreement connected to a drug that was developed at U-M to help patients with Gaucher disease.

Since Fiscal Year 2013, <mark>204</mark> new companies based on U-M discoveries have been launched.

9.4.3 Formation of Start-up Companies that Utilize U-M Technology, FY2013-FY2023.

SOURCE: U-M Innovation Partnerships

While much of the new technology developed at U-M is licensed to existing companies for use in new products and processes, some inventions become the basis of new enterprises. Often this occurs when U-M inventors wish to have hands-on involvement in the further development of the technology.

A few of recently launched U-M start-ups include:

- Abcon, a cancer therapeutics startup.

- ArborMed, which is developing a treatment for Wilson's disease.

- Low Carbon Fuel Systems (LCFS), which is developing a flexible injection system.

- Decimal Code, which is applying advance artifical intelligenceand machine learning to optimize health system records and billing sytems.

Porfolio of U-M start-ups:
innovationpartnerships.umich.edu/portfolio/