



AASTA Report Focuses on Economic Impact of Astronomy, Space Sciences and Planetary Sciences Research in Arizona - Recommends Agenda to Remain World Class and Advance Opportunities for Growth

The Arizona Arts, Sciences and Technology Academy (AASTA) has published a new economic impact report outlining the importance that Astronomy, Space Sciences and Planetary Sciences (APSS) research plays in Arizona.

Key Findings

APSS Research in Arizona in 2006 returned a total dollar economic impact of \$252.8 million. This includes \$138.6 million in earnings and \$12 million in tax revenues.

During FY 2006 Arizona's observatories and related APSS research institutions spent a total of \$135.4 million on operations, including wages. An additional \$28.8 million was spent on capital investment and construction. For FY 2006, total expenditures for these APSS organizations amounted to \$164.2 million. Of that, \$69.3 million was spent in Arizona.

The total investment in capital facilities and land among Arizona's APSS institutions in FY 2006 equalled \$1.119 billion, with an additional \$635.7 million reported in planned capital expansion.

APSS organizations and institutions employed 1,830 people in FY 2006 with a total payroll of \$83.9 million.

APSS organizations in Arizona attracted 200,805 visitors in FY 2006, 22% of which were from out-of-state. Out-of-state visitors spent \$61.4 million in FY 2006 generating an overall economic impact of \$25.7 million. APSS institutions across the state also generated \$119 million in revenues for state and local governments in FY 2006.

Building on Previous Reports

In prior reports prepared for the Arizona Department of Commerce, Battelle noted that "Arizona ranks among the top ten of all states in the physical sciences (7th), led by astronomy (2nd) in which Arizona has nearly 18 percent of all university research activities nationwide". Battelle further noted that Arizona has key strengths in space sciences and physics citing two areas of excellence; (1) remotely operated instruments for measurements in space, and (2) advanced land

based and space telescope design and mirror construction.

AASTA's report encourages the State of Arizona to commercially develop and exploit APSS technologies embedded in the state's universities, federal labs and private institutions such as biosensing, communications, computing, imaging, instrumentation, materials, microelectronics, navigation, optics, power, propulsion, sensors, software and systems integration.

AASTA's report also recommends increased scientific collaboration, additional federal funds for APSS research, an APSS roadmap for the State of Arizona, and new measures to control light pollution emitted from growing urban areas that is degrading the effectiveness of existing Arizona observatories and limiting the state's ability to attract major new facilities for optical astronomy.

Project Partners

AASTA's report, "Astronomy, Planetary Sciences and Space Sciences Research Opportunities to Advance Arizona's Economic Growth" is the result of a collaboration among AASTA and twenty-two APSS organizations; eleven observatories, three related research organizations and eight university based departments/centers/labs.

The study and report were sponsored by the Arizona Department of Commerce, The Large Binocular Telescope Observatory, the leadership of Lowell Observatory, Northern Arizona University, The National Optical Astronomy Observatory, Research Corporation, The University of Arizona, and The Vatican Observatory. Additional support for the publication of this report was provided by AURA and Raytheon.

AASTA wishes to acknowledge the participation of the Business Research Center at the Eller College of Management at the University of Arizona for their contribution in data collection and performing the economic impact analysis.

Read the full report at: <http://www.aasta.net>



Questions and Answers

AASTA Economic Impact Report

January 2008

Q: *What is the purpose of this study?*

A: The purpose of the study is to provide a quantitative measurement of the economic impact of astronomy, planetary and space sciences research to Arizona. The study provides common measures of economic activity and associated impacts such as the number of jobs, wages, output, and tax revenues.

Q: *What are “Astronomy, Planetary and Space Sciences”?*

A: These fields of study include ground based astronomy, space based astronomy, solar system missions, instrumentation and data analysis, earth observing missions, instrumentation and data analysis, related earth studies such as geology and astrobiology where clear connections to planetary and solar system research can be drawn, space related technology development, and theoretical studies.

The scope of the study is limited to impacts generated by expenditures associated with research in these fields at Arizona’s three universities, federal laboratories, and astronomical observatories.

Q: *How is the economic “impact” defined in this study?*

A: “Impact” is defined strictly as the consequences resulting from activity.

Q: *How do astronomy, planetary and space sciences generate new jobs, wages and output in the Arizona economy?*

A: Funding for astronomy, planetary and space sciences in Arizona mostly comes from institutions, such as the National Aeronautics and Space Administration and the National Science Foundation that are outside of Arizona. By definition, these funds are injected into Arizona’s economy, and thus capable of creating additional jobs, wages and output.

Direct impact is when observatories, related research organizations, and university departments and units hire professionals, faculty, staff and students and thus contribute to the overall employment in Arizona. Indirect impact is generated through purchases of equipment, office supplies, utilities and various professional and business services necessary for daily operations of these organizations.

Furthermore, a significant number of jobs are created through spending by out-of-state visitors who were attracted to observatories and universities.

Q: *How do Arizona's astronomy, planetary and space sciences generate tax revenues for the State?*

A: Revenue impacts are generated when visitors, university departments/units, observatories and other entities make purchases and pay taxes to state and local governments (direct revenues). In addition, the employees whose jobs are generated by astronomy, planetary and space sciences activity pay taxes to state and local governments in Arizona (induced revenues).

Direct revenue includes sales taxes paid to cities and the state; the state, in turn, shares some of the state revenues with cities and counties.

Induced revenues to counties are collected from state-shared sales taxes, state-shared fuel/highway taxes and property taxes. Induced revenues to cities include proceeds from state-shared sales taxes, state-shared fuel/highway taxes and local sales taxes.

Q: *What are the main sources of economic impacts identified in this study?*

A: Astronomy, planetary and space sciences in Arizona generate economic impacts through three main sources. These include:

- Spending by employees in observatories, related research organizations, and university departments and units;
- Operations-related purchase of goods and services from Arizona businesses; and,
- Spending by visitors such as visiting scholars, conference attendees, and general public attracted to observatories, planetariums, and specialty museums.

Q: *How were data obtained on Arizona-based expenditures?*

A: Because expenditure data are not readily available, a combination of methods was utilized. Financial data from observatories and related research organizations were collected through a survey instrument detailing operations-related and capital investment-related expenditures in Arizona. Data also included payroll, benefits and number of employees. For university departments and units we obtained financial data on all expenditures from respective central offices and combined these with purchases-in-Arizona-only data. University departments and units also received a survey instrument with additional questions.

Q: *Who participated in this study?*

A: A total of 22 organizations responded to the survey: eleven observatories, three related research organizations, and eight university departments/centers/labs.

Q: *How much did Arizona's observatories and related research organizations spend in FY 2006, and how much of that was spent in Arizona?*

A: Arizona's observatories and related research organizations spent a total of \$135.4 million on operations, including earnings and benefits. An additional \$28.4 million was spent on capital investment/construction-related items. Thus, in FY 2006, total expenditures amounted to \$164 million. Of that amount, \$69.3 million was spent in Arizona.

Q: *How much did Arizona's university departments and units spend in Arizona during FY 2006?*

A: Astronomy, planetary and space related departments and centers at the three universities spent a total of \$60.5 million (including earnings and benefits). Of that amount, \$33.9 million was spent in Arizona.

Q: *How many direct jobs and wages are related to astronomy, planetary and space sciences in Arizona?*

A: The participating organizations employed a total of 1,830 persons (including 168 jobs associated with overhead expenses), of which 320 were students. The total payroll was \$83.9 million.

Q: *What is the impact of employee spending (employees in astronomy, planetary and space sciences) on Arizona's economy?*

A: Not all the wages and salaries paid in Arizona are available for spending in Arizona: payroll includes contribution to Social Security, FICA, Medicare, and federal taxes. The amount of payroll that was actually spent in Arizona was estimated at \$64.8 million in FY 2006. This spending generated 720 jobs and \$26.3 million in wages in Arizona in induced economic benefit.

Q: *How many jobs in Arizona do observatories (including other research organizations) and university departments and units generate through purchases of operations-related goods and services?*

A: The total direct operations-related spending (excluding wages and salaries) of the participating organizations was \$21.4 million. This spending generated 274 jobs and \$10.8 million in wages. In addition, the capital investment-related expenditures in FY 2006 generated 137 jobs and \$5.9 million in wages.

Q: *How many out-of-state visitors are attracted to Arizona's astronomy, planetary and space sciences and how much do they spend?*

A: In total, observatories, space sciences and related sciences and technology facilities in Arizona received a total of 200,805 visitors in FY 2006, out of which 6,668 were professional visitors and 194,137 were public visitors. 22% of the public visitors were from outside Arizona. For the purpose of this study, only the economic activities of professional visitors and public visitors from outside Arizona were assessed to determine the effects of new money injected into Arizona's economy.

Q: *How many jobs are generated through visitor spending in Arizona?*

A: Out-of-Arizona visitors spent \$16.4 million dollars, generating an economic impact of \$25.7 million in total. The out-of-state visitors' spending generated 286 jobs and \$8.1 million in wages and salaries in Arizona in FY 2006.

Q: *What is the impact of locally spent benefits?*

A: Out of total benefits available, about \$5.2 million is spent locally on health services. This generated 81 jobs and \$3.5 million in wages.

Q: *What are the tax revenue impacts associated with Arizona's astronomy, planetary and space sciences?*

A: Astronomy, planetary and space-related observatories, centers, departments and units generate almost \$11.9 million in revenues to state and local governments. Approximately \$2.6 million is attributable to the operations of university departments and units, \$5.9 million to observatories and similar organizations, and \$2.1 million to visitors. Capital investment in 2006 generated approximately \$1.2 million in revenues.

Q: *How are tax revenue impacts distributed among state and local governments?*

A: The State of Arizona receives 57% of the revenues (\$6.8 million), Arizona counties receive 16% (\$2.0 million), and cities receive 26% (\$3.1 million).

Q: *What was the total monetary impact (output) of astronomy, planetary and space sciences in Arizona's economy in FY 2006?*

A: **The total dollar impact (sales or output) in Arizona that was attributed to Arizona's astronomy, planetary and space sciences was estimated at \$252.8 million in FY 2006.** This includes \$138.6 million in earnings and \$11.9 million in tax revenues.