

ELECTRONICS AND IMAGING

Summary

Using data from the North American Industry Classification System and ESD's own analysis, New York's Electronics and Imaging industry cluster has been defined to include two major sub-clusters.

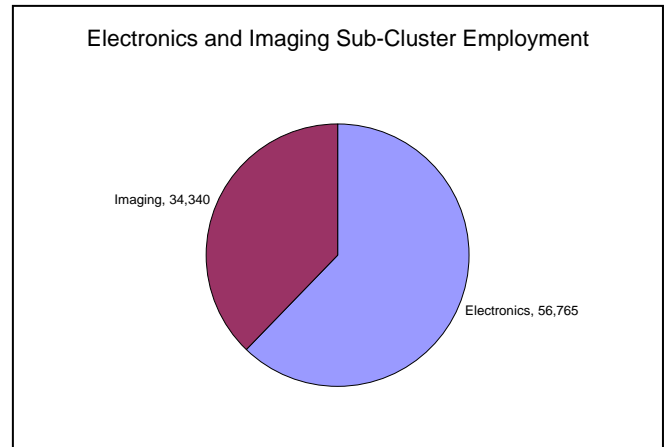
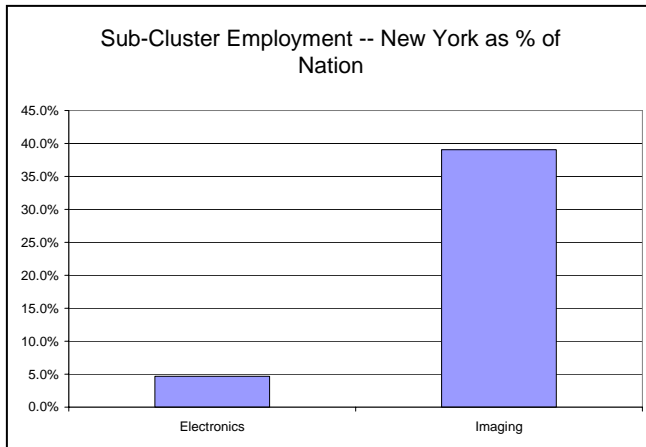
- components, computer hardware, communications and broadcasting apparatus, and audio and video equipment.
 - Imaging includes companies involved in the production of photographic film, optical instruments and lenses, and photographic and photocopying equipment.
- More than 91,000 New Yorkers were employed at firms in the Electronics and Imaging industry cluster in 2001.
 - About 57,000 were employed at New York companies in the electronics sub-cluster
 - 34,000 were employed at imaging firms in New York State.
- Several New York Regions are home to major concentrations of employment in Electronics and Imaging. These include the Finger Lakes, centered on Rochester, the Southern Tier, home of the Binghamton and Elmira metropolitan areas, the Mid-Hudson Region, ranging from Westchester County, just north of New York City, to Poughkeepsie, which is further north, and Long Island.
- The State's major concentration of employment in the Imaging Sub-cluster is located in the Rochester (Finger Lakes) area. There is also significant Imaging employment in the Southern Tier and on Long Island.
- Major employment in the Electronics sub-cluster is located in the Mid-Hudson region, on Long Island, around Binghamton and Elmira (in the Southern Tier) and in the Rochester metropolitan area (in the Finger Lakes region).

Overview

The Electronics and Imaging cluster consists of two related sub-clusters:

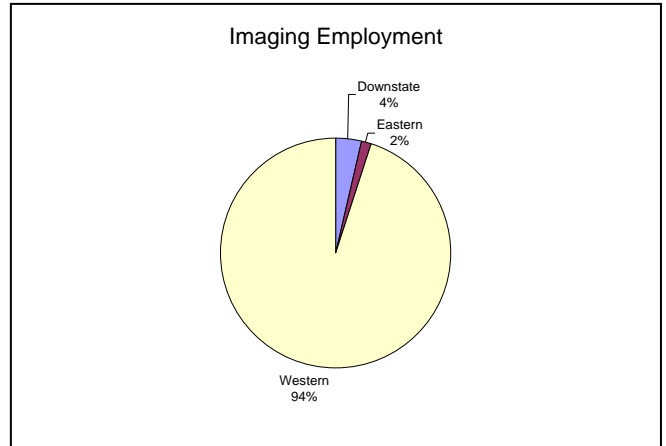
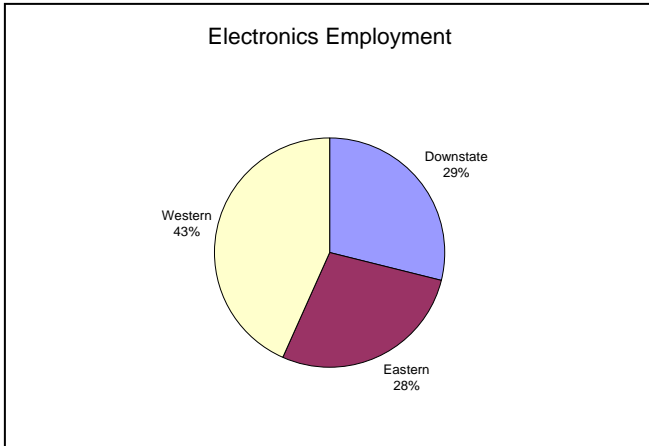
- Electronics includes businesses involved in the manufacture of:
 - computers and peripherals, such as storage devices, and terminals, telephone apparatus,
 - radio and television broadcasting equipment,
 - wireless communications equipment,
 - audio and video equipment;
 - electron tubes,
 - printed circuit boards,
 - semiconductors,
 - electronic capacitors and resistors,
 - coils and transformers,
 - connectors,
 - printed circuit assembly.
- Imaging includes businesses involved in the manufacture of:
 - Photographic film, paper, plates and chemicals
 - Optical instruments and lenses
 - Photographic and photocopying equipment.

New York's employment in the Electronics and Imaging sub-clusters is shown below:



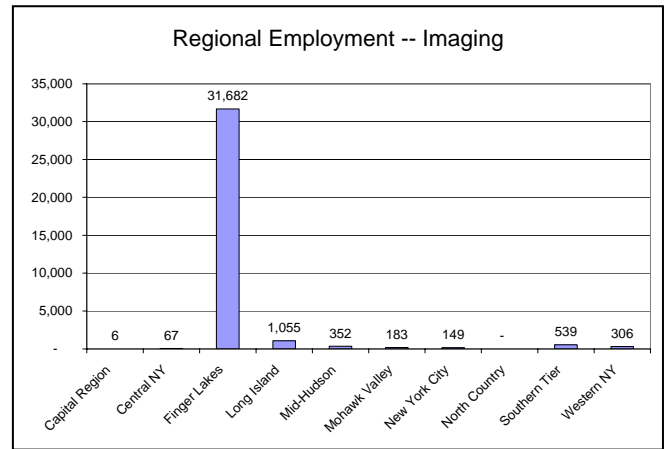
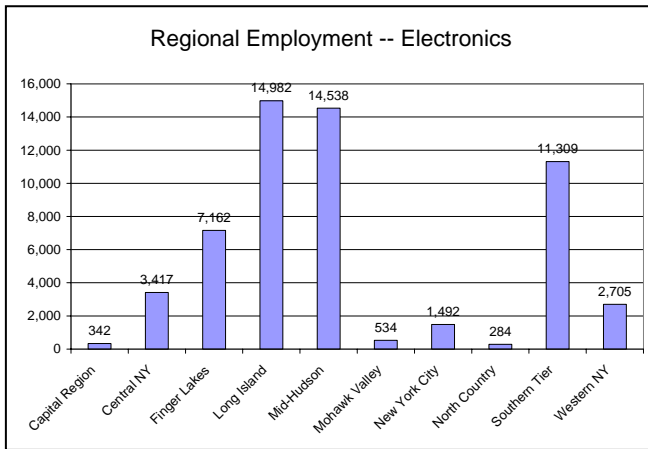
Employment in New York's Electronics and Imaging Cluster

Employment patterns in the two sub-clusters within Electronics and Imaging are similar. The charts below show that the western part of New York State has the largest employment in both Electronics and Imaging.



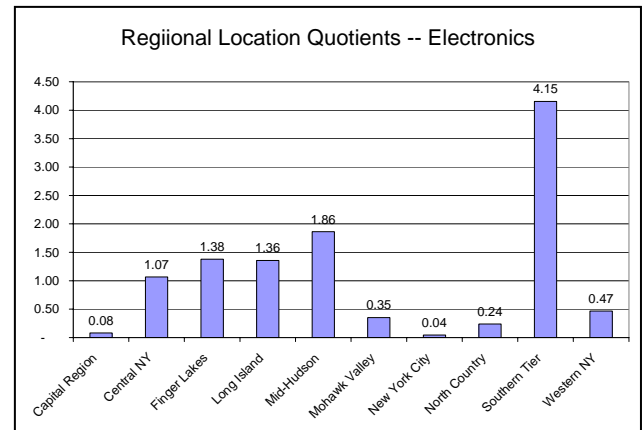
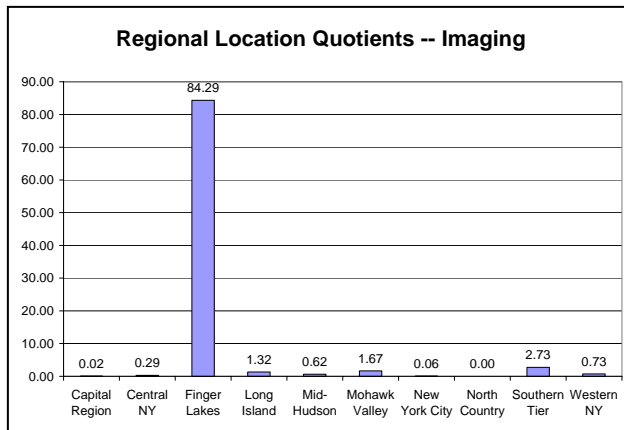
Employment in Imaging is particularly concentrated, with 92% of the state's employment located in the Rochester (Finger Lakes) area. More than 31,000 area residents work in the Imaging sub-cluster. The only other area of New York with more than 1,000 employees in Imaging is Long Island, with 1,055.

In contrast, New York's employment in electronics is primarily located in four regions – Long Island, with 14,900 employees, the Mid-Hudson (Westchester County through Poughkeepsie) region, with 14,500 employees, the Southern Tier (Binghamton and Elmira), with 11,300 employees, and the Finger Lakes (Rochester), with 7,160 employees.



Location quotients measure the concentration of employment in an industry or industry cluster in an area against the employment in the industry or industry cluster in the nation. Areas with more employment than would be expected based on national employment patterns have location quotients greater than one. The chart below shows that the Finger Lakes (Rochester) has an LQ of 84, which means that the region has 84 times the employment in Imaging that would be expected from national level employment patterns. Several other regions show higher than expected concentrations of employment in Imaging, including Long Island, the Mohawk Valley (Utica), and the Southern Tier (Binghamton and Elmira).

Employment patterns in electronics are less concentrated than in imaging, with four regions showing significantly higher than expected concentrations of employment. The Finger Lakes (Rochester), Long Island, the Mid-Hudson Region, and the Southern Tier all show concentrations of employment that are significantly higher than would be expected from national employment patterns. Electronics employment in the Southern Tier region is four times higher than would be expected from national level data.

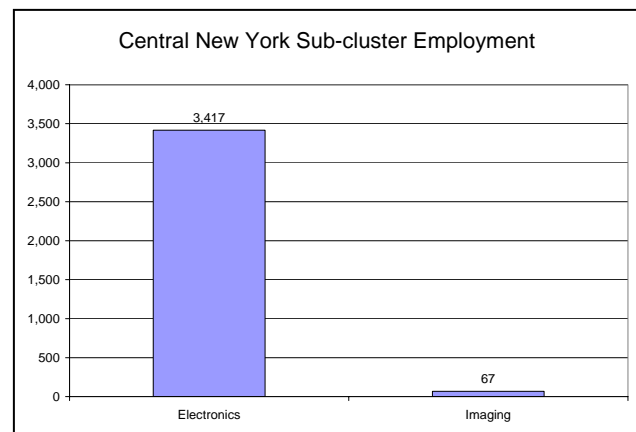


Remaining sections of this paper provide detailed information about the electronics and imaging cluster in regions of the state with substantial concentrations of employment. These are: Central New York, the Finger Lakes, Long Island, the Mid-Hudson region, and the Southern Tier.

Central New York

The Central New York region, centered on the city of Syracuse, had 3,484 workers employed at 43 establishments in the Electronics and Imaging cluster in 2001. Almost all of the employment in the cluster was at firms in the electronics sub-cluster, which employed 3,417 workers.

The largest single industry in Central New York within the Electronics and Imaging cluster was the manufacture of radio and television broadcast equipment and wireless telecommunications equipment (NAICS 334220), with employment of more than 1,300. More than 600 workers were at firms engaged in producing electronic connectors.



Major Electronics firms in the areas include:

- Lockheed Martin manufactures radar systems in East Syracuse.
- Sensis Corporation manufactures radar system components.

- Welch-Allyn Data Collection division manufactures a variety of electronic scanners.
- Anaren Microwave manufactures microwave components in East Syracuse.
- Philips Broadband Networks supplies a variety of systems for the cable television industry.

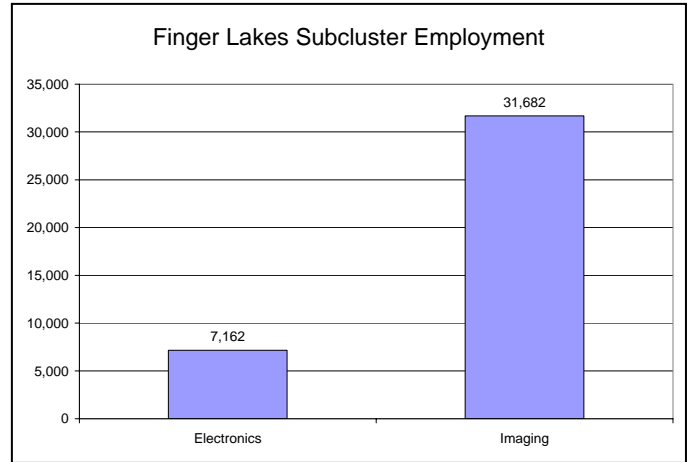
Supporting Resources

Syracuse University had nearly \$14,000,000 in research and development expenditures in engineering and the physical sciences in 2001. The University graduated 26 Ph. D's in those fields in that year.

Discipline	Institutions
Computer Engineering	Syracuse University
Electrical/Electronics Engineering	Syracuse University
Electrical/Electronic Engineering Technology	Bryant & Stratton Business Institute Cayuga County Community College Fulton-Montgomery Community College Onondaga County Community College SUNY Ag & Tech College at Morrisville
Telecommunications	Cayuga County Community College Onondaga County Community College Syracuse University

Finger Lakes Region

The Finger Lakes had more than 38,000 workers employed in the Electronics and Imaging cluster in 2001. Although employment in both Electronics and Imaging was greater than would be expected from national level employment patterns, the Finger Lakes, centered on Rochester, is best known for its specialization in Imaging. With 31,682 workers employed by Imaging firms in 2001, the area had more than 80 times the employment in the field than is found in a typical area. The best known imaging firm in the area is Eastman Kodak. Another major area employer is Xerox. A number of smaller imaging firms are in the area.



The Finger Lakes (Rochester) area has substantial employment at electronics manufacturing firms as well. The area's 7,100 Electronics employees are nearly 40% more than would be expected based on national employment patterns. The Rochester area has a number of major Electronics firms. These include:

- Alstom Signaling, a producer of signaling equipment for rail systems.
- Schlegel Systems, a producer of electromagnetic shielding equipment.
- Harris Corporation's RF Communication Division, a producer of microwave radios and wireless telephony systems.
- IEC Electronics, a contract manufacturer of electronics equipment.

Supporting Resources

The University of Rochester is a national leader in engineering and physical science research and development expenditures, with more than \$62,000,000 in 2001. Overall, the University ranked 45th in the nation in science and engineering R&D expenditures in 2001. The University granted 24 doctorates in electronics related fields in 2001.

Rochester Institute of Technology is well known for its close ties to area technology businesses. RIT had more than \$11,000,000 in science and engineering research and development spending in 2001.

New York State supports the **Center for Electronic Imaging Systems** at the University of Rochester and Rochester Institute of Technology. Research topics at CEIS include electronic imaging systems analysis, image quality, imaging processing, automatic pattern recognition, and three dimensional display and visualization.

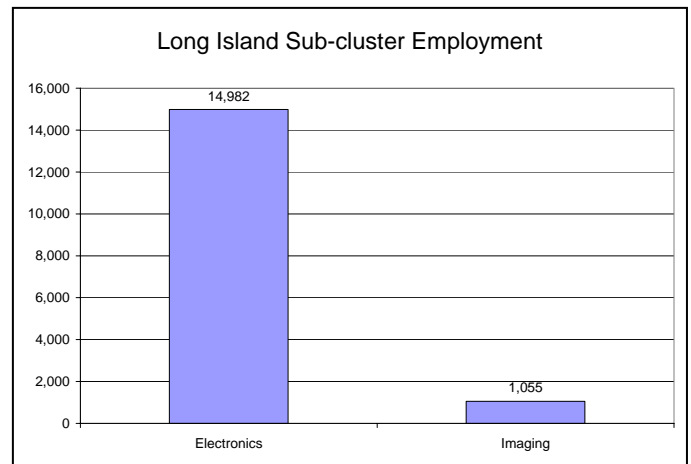
New York State has also agreed to fund the **Center for Infotonics Technology** at Canandaigua. CEIT will function as a research, development, education and economic development outreach resource for industries based in photonics and micro-optic systems.

Institutions of higher education in the region offering relevant academic programs include:

Discipline	Institutions
Computer Engineering	Rochester Institute of Technology
Electrical/Electronics Engineering	University of Rochester Rochester Institute of Technology
Electrical/Electronic Engineering Technology	Rochester Institute of Technology Bryant and Stratton Business Institute Finger Lakes Community College Genesee Community College Monroe Community College
Telecommunications	Rochester Institute of Technology Monroe Community College

Long Island Region

Electronics and Imaging employment in the Long Island region was 16,037 in 2001, at 174 establishments. Most of the region's cluster employment (about 15,000) was at firms in the electronics industry sub-cluster. Long Island had about 40% more employees at electronics firms than would be expected based on national level data. The largest number of employees at firms in the electronics sub-cluster was at firms making computer peripherals and semiconductors and related products.



About 1,000 employees worked at imaging firms in 2001. Employment was divided nearly evenly among firms engaged in the production of photographic film and chemicals, optical devices and photographic and photocopying equipment.

Among the region's larger firms in Electronics and Imaging are:

- Symbol Technologies, a producer of bar code scanners and related equipment.
- Periphonics makes products for computer telephone integration.
- JBL Incorporated manufactures audio equipment.
- General Semiconductor produces power rectifiers, voltage suppressors, transistors and diodes.
- Data Device Corporation produces data conversion components
- Olympus America produces video equipment for a variety of applications.

Supporting Resources

According to NSF, research and development expenditures at doctorate granting institutions in the region totaled \$168,000,000 in 2001. New York's newest Center for Advanced Technology is the Center for Advanced Technology in Sensor Systems and Diagnostic Tools at SUNY Stony Brook. The Center works with industrial partners to develop new sensor technologies with applications in many important markets, such as medical diagnostics, aerospace and satellite communications. The CAT encompasses research and development in emerging electronics, materials and photonics technologies for diagnostic tools and sensor systems. SUNY Stony Brook awarded 19 Ph. D's in Engineering in 2001.

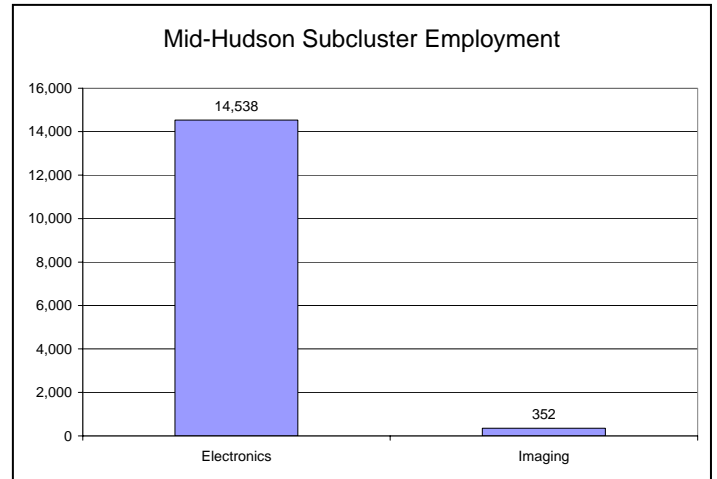
Polytechnic University in Farmingdale offers a variety of engineering programs at the undergraduate and graduate levels. Polytechnic reported \$8,277,000 of research and development expenditures in 2001.

Institutions of higher education in the region offering relevant academic programs include:

Discipline	Institutions
Computer Engineering	Polytechnic University
Computer Science	Adelphi University Dowling College Hofstra University Long Island University (C. W. Post) Molloy College Nassau Community College New York Institute of Technology St. Joseph's College SUNY College at Farmingdale State University at Stony Brook Sufflok County Community College
Electrical/Electronics Engineering	Hosftra University New York Institute of Technology Polytechnic University State University of New York at Stony Brook
Electrical/Electronic Engineering Technology	Briarcliffe College SUNY College at Farmingdale Suffolk County Community College

Mid-Hudson Region

The Mid-Hudson region is highly specialized in Electronics employment. The region shows an employment concentration that is 86% higher than would be expected from national level employment patterns. Regional employment in Electronics and Imaging was 14,890 in 2001. Nearly all cluster jobs were in the electronics sub-cluster (14,538). The region has a long tradition in electronics, as the home of IBM's headquarters, and several of its research and manufacturing facilities. Within the region, employment was most concentrated in computer (employment – 4,653) and semiconductor manufacturing (employment – 7,475).



Significant regional electronics companies include:

- IBM
- Micrus Semiconductor
- LeCroy Corporation

Supporting Resources

State-supported resources to support electronics in the Mid-Hudson region are located primarily outside the region's boundaries. Nearby is the Center for Advanced Thin Film Technology at the State University at the University at Albany. Also nearby is the Center of Excellence in Nanotechnology at the University at Albany.

Institutions of higher education in the region offering relevant academic programs include:

Discipline	Institution
Computer Engineering	Iona College SUNY College at New Paltz US Military Academy
Computer Science	Dutchess Community College Iona College Manhattanville College Marist College Mercy College Monroe College Mount Saint Mary College Orange County Community College SUNY College at New Paltz Ulster County Community College

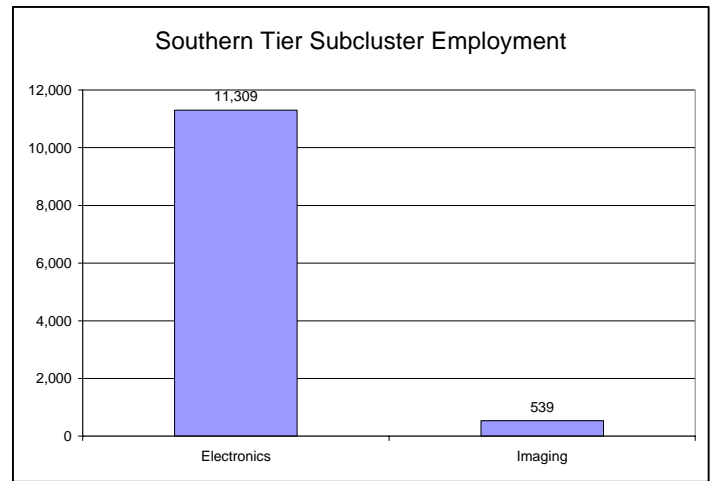
	US Military Academy Vassar College Westchester Community College
Electrical/Electronics Engineering	SUNY College at New Paltz US Military Academy
Electrical/Electronic Engineering Technology	Dutchess Community College Orange County Community College Rockland Community College Westchester Community College

Southern Tier Region

Electronics and Imaging Employment

Southern Tier Employment at companies in the electronics and imaging cluster was nearly 12,000 in 2001. The region showed the greatest specialization of employment in the Electronics sub-cluster in New York State with 4.15 times the employment that would be expected from national level patterns. The region's concentration of employment in imaging was 2.73 times what would be expected from national employment.

The region has very high employment concentrations in photographic film and chemical manufacturing (employment – 221), computer manufacturing (employment – 5253), electron tube manufacturing (employment – 1548), and bare printed circuit board manufacturing (employment – 1828)



Among the significant regional companies in electronics and imaging are:

- Amphenol Corporation manufactures electronic connectors.
- Imaging and Sensing Technology is a manufacturer of electro-optical products and electronic products
- Endicott Interconnect Technologies makes chip carrier packaging and printed circuit boards used to house electronic components and connect them to electronic systems.
- MT Picture Display Corporation of America makes color television picture tubes and color display tubes.
- Corning Incorporated makes optical fiber, cable and photonic products, glass for computers, and advanced optical materials.
- Sanmina-SCI Corporation makes circuit boards at its Owego facility.

Supporting Resources

Cornell University had more than \$440 million in research and development spending in 2001. The University had \$18 million in electrical engineering research in that year, and \$34,000,000 in physics research in that year. Cornell granted 315 Ph. D's in science and engineering fields in 2001.

The **State University of New York at Binghamton** is another leading regional research institution. SUNY Binghamton reported more than \$18,000,000 in research and development expenditures to NSF in 2001. SUNY Binghamton graduated 107 science and engineering Ph. D's in 2001. The Integrated Electronics Engineering Center pursues research in electronics packaging. The High Technology Commercialization Center at the

University is slated to receive \$21 in state funding. The funding will support the University's activities in packaging and manufacturing processes at the micro- and nanoscale levels.

Institutions of Higher Education in the region offering relevant academic programs include:

Discipline	Institutions
Computer Science	Broome County Community College Cornell University Corning Community College Hartwick College Ithaca College State University of New York at Binghamton SUNY College at Oneonta Tompkins Cortland Community College
Electrical/Electronics Engineering	Cornell University SUNY Binghamton
Electrical/Electronics Engineering Technology	Broome Community College Ithaca College

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