2005

ANNUAL REPORT

year ending June 30, 2005

TECHtransfer

UNIVERSITY OF MICHIGAN

building a community of innovation and entrepreneurship

Message from the Executive Director

Innovation is the engine of economic development. New ideas drive business growth and improvements in our quality of life. In this age of increasing global competition, major research universities such as Michigan are being challenged as never before to increase the transfer of knowledge and technology beyond campus boundaries. I'm proud to say that in Fiscal Year 2005, U-M Tech Transfer met that challenge—continuing our steady progress in transferring a record number of innovative technologies to the marketplace.

In FY 2005, we worked with U-M researchers on 287 new invention disclosures, completed 86 agreements with business partners—including 7 promising startups—and received $16.7 million in revenue, much of which is being reinvested in education and research. More importantly, our discoveries and new startups are having a major impact in the world, providing benefits and advantages to many people in many ways.

Last February, in a keynote address to the annual meeting of the Association of University Technology Managers (AUTM), U-M President Mary Sue Coleman issued a challenge for universities to facilitate innovation by transferring new discoveries and knowledge into the business sector, broadly and quickly. Taking up President Coleman's challenge, U-M Tech Transfer is working to help create a community of innovators.

In the spring of 2005, as a bold first step, we worked with University leadership to launch Ann Arbor SPARK—a public-private partnership designed to accelerate the number of high-tech companies and jobs being created in the greater Ann Arbor region. You'll find more information about Ann Arbor SPARK later in this report.

There are exciting and challenging days ahead for technology transfer at the University of Michigan. Working closely with academic, business and community leaders such as you, we will continue to bring the innovation, creativity and energy of our great University to the market. We invite you to join us in our quest.

Ken Nisbet

Kenneth Nisbet
Executive Director
U-M Technology Transfer

about U-M Tech Transfer

THE MISSION of U-M Tech Transfer is to effectively transfer University technologies to the market so as to generate benefits for the University, the community and the general public.

Technology transfer is the process by which research discoveries and inventions are transformed into valuable products and services that benefit society.

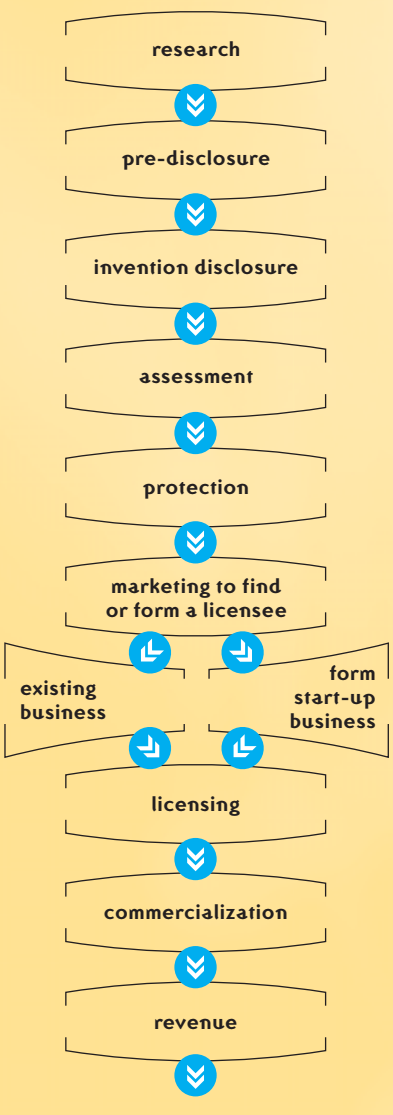
U-M Tech Transfer is comprised of specialists in licensing, new business development and law—all focused on providing professional, responsive services to our clients and partners. We work with inventors in every phase of technology transfer, from initial consultations and technology assessments to marketing, licensing and startup formation. We also aggressively cultivate a network of business partners to assist us in commercializing technology, building businesses and supplying capital and other resources.

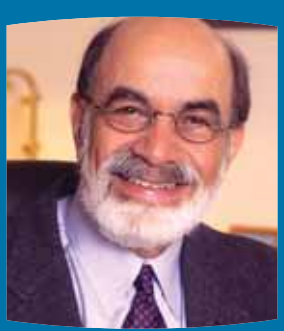
We view our role as that of "innovation facilitators" who encourage creativity, supply and link resources, and guide discoveries to a successful market deployment. In these roles, we take pride in supporting the University's mission by:

- Increasing the likelihood that new discoveries will provide tangible benefits to the general public.
- Helping to create a venue that attracts, develops and retains the very best students, faculty and researchers.
- Improving the flow of research dollars and resources to the academic community.
- Enriching the educational experience through student internship programs and other hands-on learning activities.
- Leveraging business partnerships to stimulate the regional economy.
- Enhancing the reputation and stature of the University.

FROM RESEARCH LABS TO WORLD MARKETS

components of the tech transfer process





"Our success in technology transfer reflects the investments and dedication of the entire University community. We take special pride in our contributions to the regional economy through new business startups, enhanced research relationships and employment opportunities for our students."

—Fawwaz T. Ulaby
Vice President for Research
University of Michigan

innovate or bust

On February 3, 2005, University of Michigan President Mary Sue Coleman presented a keynote address to the annual meeting of the Association of University Technology Managers (AUTM). Her topic was the role of American universities and university technology transfer in America's future competitiveness. In her remarks, she challenged the audience to set a new course for moving knowledge and discoveries into the wider world. Here we offer some excerpts from that address—"Innovate or Bust":

✷ ✷ ✷

I have a single message for all of us this morning: America's wake up call is *now*.

Throughout our history we have defined our nation as the land of opportunity and exploration. We are the very icons of forward momentum, social progress and economic success.

But all of that is at risk. The rest of the world is catching up.

The race to translate research and technology into business opportunity is hotly competitive… We are no longer in that privileged position as the unchallenged powerhouse of productivity and ingenuity.

Along with education, the most important university contribution to economic development in the years ahead will be found in our research enterprises. Here's why your role in tech transfer is so vital:

- Remarkable innovation is fostered when our faculty research intersects with a strong university commitment to disseminate that information broadly. Of course, revenue generation serves as an incentive. But first and foremost, tech transfer must serve our core mission: sharing ideas and innovations in the service of society's wellbeing.
- All of you play a powerful role in our ability to make good on that promise. You help us make the world better, healthier, safer and more economically robust.
- Universities bring ideas to life. But it is technology transfer that gives them wings and lets them fly.

"Universities will be called on to be major players in economic development in the years ahead, bringing new challenges, new partnerships and new opportunities for us all."

—U-M President Mary Sue Coleman addressing the 2005 Annual Meeting of the Association of University Technology Managers (AUTM)

fiscal year 2005 results

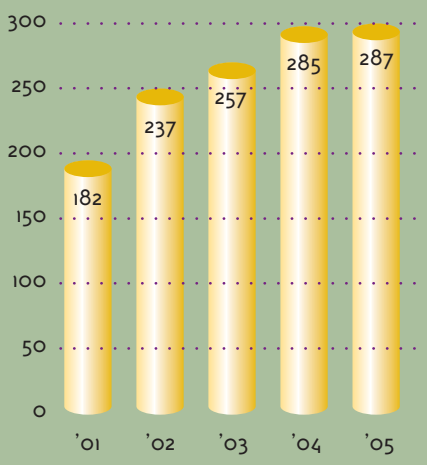
Thanks to the remarkable creativity of U-M faculty and researchers, fiscal year 2005 saw a strong and continuing upward trend in disclosures, licenses, startups and revenues. More importantly, new and improved tools, devices, medicines and products are now reaching world markets. The impact of U-M technologies is being felt in innovations that range from cancer therapeutics to improved energy-saving materials and technologies.

"2005 has seen the successful IPO of a U-M startup company, Intralase, and another gain in the number of agreements with companies partnering with us to commercialize our technologies. With increasing numbers of commercialization partners, we're helping more U-M technologies exert a positive impact on people's lives."

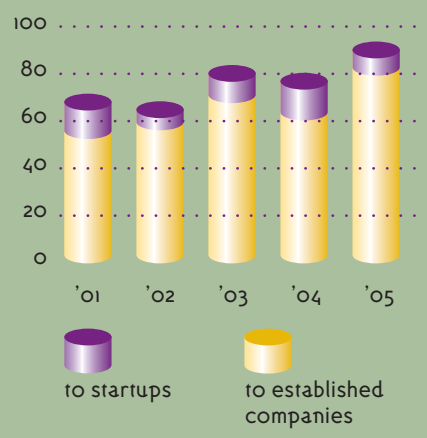
—Robin Rasor
Director of Licensing
U-M Office of Technology Transfer

THE YEAR IN REVIEW

Invention Disclosures

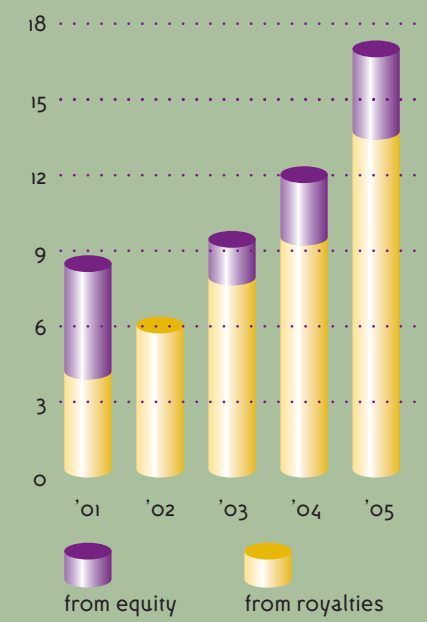


License Agreements



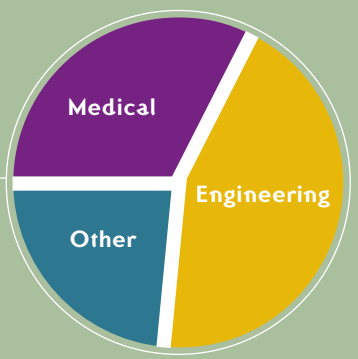
License Revenue

(in millions of dollars)



2005 Invention Disclosures

MEDICAL		
Biological Chemistry	4	4%
Dermatology	2	2%
Human Genetics	2	2%
Internal Medicine	34	37%
Mental Health	2	2%
OB/GYN	2	2%
Ophthalmology	5	5%
Otolaryngology	2	2%
Pathology	4	4%
Pediatrics	7	8%
Pharmacology	3	3%
Physical Medicine	2	2%
Physiology	3	3%
Psychiatry	3	3%
Radiation Oncology	4	4%
Radiology	7	8%
Surgery	4	4%
Other	3	3%
Total	93	100%
ENGINEERING		
Aerospace	6	5%
Atmospheric, Oceanic and Space Science	3	2%
Biomedical	15	12%
Chemical	9	7%
Civil/Environmental	4	3%
Electrical Engineering and Computer Science	38	30%
Materials Sciences	7	6%
Mechanical	31	24%
Naval/Marine	1	1%
Nuclear	13	10%
Total	127	100%
OTHER		
Architecture and Urban Planning	1	1.5%
Dentistry	9	13%
Literature, Science and Arts	42	63%
Music	2	3%
Pharmacy	6	9%
Public Health	1	1.5%
School of Information	1	1.5%
Transportation Research (UMTRI)	2	3%
U-M Dearborn	1	1.5%
U-M Hospital	2	3%
Total	67	100%



THE START-UP CLASS OF 2005

- **McCreadie Group —** Software for pharmacy applications
- **Accuri Instruments —** Research instruments measuring cell characteristics
- **CF Imaging Solutions —** Software for medical image visualization and quantification
- **Mayaterials —** Multifunctional organic/inorganic nano-composites for coatings and thin film technologies
- **Xoran —** Compact CT scanners for medical specialists
- **nPoint —** Detection of explosives and illicit contraband through the use of neutron backscatter technology
- **PreSense —** Multi-threat spectroscopic sensors to detect radiological and other environmental conditions

fiscal year 2005 disclosures

Disclosures listed by department of lead inventors

Aerospace Engineering
- Fabrication of Shape Memory Alloy Cellular Materials and Structures
- Multi-Spacecraft Interferometric Observatory Design in Earth Orbit
- Rotary Ramjet Turbogenerator
- A Filter for Use with Faraday Probes
- Rayleigh-Taylor Assisted Rotating Combustors
- Cooled Sandwich Panel for Structural and Heat Exchange Applications

Anesthesiology
- Improved Method for Detection of Deamidation of Proteins

Art & Architecture
- Architectural Structures

Atmospheric, Oceanic & Space Science
- Method and Apparatus for Improving Microchannel Plate Performance in Imaging Applications
- Method and Apparatus for Improving Microchannel Plate Performance in Imaging Applications
- Propulsion by Indirect Laser Ablation

Biologic & Materials Science
- Crosslinked Porous Material
- Particle-Containing Complex Porous Materials
- Porous Materials of Multi-Size Geometries

Biological Chemistry
- A Method of Producing Conjugated Dienoic, Trienoic and Tetraenoic Fatty Acids, Esters and Alcohols
- Fluorescent Methyltransferase Assay
- Enzyme for Use in Coupled Methyltransferase Assays
- Methods to Modify the Acute Phase Response

Biology—Molecular/Cellular/Developmental Biology
- A cDNA Encoding Eugenol Synthase

Biomedical Engineering
- Image-Based Design Software Suite for Designing Composite Microstructures and Biomaterial Scaffolds
- A Biodegradable Implant for Intertransverse Process Fusion
- Integrated Elastic and Permeability Microstructure Design Optimization Software
- Femtosecond Laser at Critical Intensity for Optical Data Storage
- Biochemical Analysis
- Cell Loading Unloading Well
- Method and Composition for Protection Against Osmolality Shifts in Primary Cell Culture
- Integrated Microfluidic Control
- Software For Microfluidics
- High-Throughput Ion Channel Screening for Diagnosis and Therapeutic Monitoring of Disease
- Arrays of Biomembranes to Screen for Drug-Membrane and Protein-Membrane Interactions
- Cracking Fabrication of Reconfigurable Protein Matrices

Biomedical Engineering Chemical Engineering
- Nanopore Based Detection of Agglutination and/or Self Assembly

Biophysics Research
- Quantum Mechanical Quality In Molecular Mechanics Modeling

Biostatistics
- Methods of Detecting Diabetes Susceptibility

Center for Advanced Computing
- Q-Graphs: Containment of Malicious Attacks in Networks
- The MARS Framework for Provisioning and Scheduling Distributed Resources in Virtual Organizations and Enterprises

Center for Performing Arts
- Block M Records

Chemical Engineering
- Biphasic Nanoparticles
- Laser-Enabled Polymer Coating Technology
- Fully CMOS Compatible Micro-Fuel Cells for Portable Device Power
- Construction and Screening of Gene Libraries Coding for New Antimicrobial Peptide
- Molecular Reconfiguration of Natural Organic Matter for Reducing Disinfection Byproducts in Water Treatment Operations
- Regeneration of Desulfurization Sorbents
- Nanoparticle Assemblies with Sensing and Optoelectronic Devices
- Chemical Confinement of Photogenerated Reagents on Substrates
- Method to Reduce Microcontaminants During Pentachlorophenol Synthesis

Chemistry
- Compounds and Methods for Treating Gram Negative Bacterial Infections
- Differential Phosphoprotein Mapping in Cancer Cells Using Protein Microarrays Produced From 2-D Liquid Fractionation
- Process for Preparing Single Enantiomers of Fluoroleucine Compounds
- Biocompatible Coatings for Intravascular Devices
- Sensing and Imaging of Free Zinc Ion
- Affinity Capillary Electrophoresis with Anistropy Detection
- New Benzodiazepine Crystal Forms
- Electrochemical Oligo Probes, PCR Reagent Mixtures, and Devices for PCR-DNA Detection Using Enzymatic Amplification with Electrochemical Methods
- Hydrogen Adsorption In Prussian Blue
- New Heterocyclic Analogues Of Modified Benzodiazepines
- New Heterocyclic Analogues of Bz-423
- New Cytotoxic and Antiproliferative Agents
- Apparatus for Depth-selective Raman Spectroscopy
- New Benzodiazepine Crystal Forms
- New Methods to Control the Regulation of Inflammation
- Enzyme Amplified Optical DNA Detection
- Fluoride Sensors
- Apparatus for Depth-Selective Raman Spectroscopy
- Zintrodes, Multitrodes and Uses Thereof
- High Hydrogen Adsorption in a Microporous Metal-Organic Framework with Open-Metal Sites
- Novel Compounds and Targets for Ischemic Disease
- Chromatography Fraction Collector Well Position Identification Software
- Shaped Bodies Containing Metal-Organic Frameworks
- Metal-Organic Framework Materials for Gaseous Hydrocarbon Storage
- Targets and Compounds for the Treatment of Lymphoma
- Porous Covalent Organic Frameworks
- Metal-Organic Framework
- Metal-Organic Frameworks for Use in High-Pressure Sorption and Separations
- High-Throughput Materials Synthesis

- New Applications for Aziridines and Related Compounds
- Compounds and Method for Modulating Albinism
- A Modified CF Buffer System for Analysis of Proteins Above pH 7.0
- Subsurface Raman Mapping with a Fiber Optic Array
- Brownian Moons

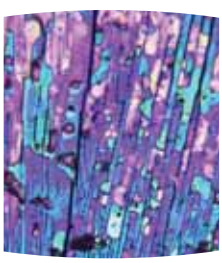
Civil & Environmental Engineering
- H2-GRID: A Novel Geotextile for In Situ Sediment Remediation
- Parallel High Throughput and Ultrasensitive Single Molecular Detection Platform
- Methods and Apparatus for Monitoring Strain Cracking in Cementitious Materials
- Reusable Microbial Fuel Cell

Clinical Sciences
- Method of Enhancing Solute Removal During Renal Replacement Therapy
- Method and Composition for Removal of Protein Solutes During Hemodialysis

Dermatology
- Method and Apparatus for use in Treating Fibrotic Skin Conditions
- Use of Systemic MMP Inhibitors for Preventing Photoaging

Electrical Engineering and Computer Science
- Accurate Current Mirroring in the Presence of Gate Leakage Current
- A Comparator Offset Cancellation Technique in PD-SOI
- Continuous Threshold Voltage Performance in a Discrete Multi-Threshold Voltage Process
- Method of Pattern Searching
- Two-Photon Flow Cytometry
- High Frequency Ultrasound Detection
- Dynamic Frequency and Voltage Scaling of Resonant Clocks
- Dual-Frequency Resonant Clocking
- Automatic Synchronization of Resonant and Legacy Clock Domains
- Energy Recovering, Low-swing, Low-activity Data Bus
- Configurable Auction and Market Game Server
- Fast Iterative Field-Corrected Magnetic Resonance Image Reconstruction
- Application-Specific Processing on a General-Purpose Core
- CCA-Tightly Coupled Accelerator
- CCA-Configuration Data Re-Use
- A Micromachined Device for Refractive Index Modulation in Optical Fibers and Arbitrary Shaping of Optical Waveforms
- Model-Based Fault Diagnosis In Electric Drives Using Artificial Neural Networks
- Circularly Polarized Magneto-Dielectric Resonator Antenna
- A Natural Language Interface to a Database
- Direct Write Laser Lift Off of Oxide Thin Films for Application to Lithography
- Integrated Microfluidic Capillaries
- Wireless Communication Scheme
- Stretching and Compression of Laser Pulses
- A Method and Apparatus for Alignment of a Sequence of High Dimensional Data
- Whole Spectrum Fluorescence Detection
- Flexible Neural Probe
- Math Co-Processor Design with Meta-Architectural Support
- Top, Double, Back Sided Recording and Stimulating Microelectrodes for Neural Prostheses and Neurophysiology Applications
- Multivariate Normal Distribution Based on Statistical Timing Analysis Algorithm for Digital VLSI Circuits
- A Software Method for Constructing Large Suffix Trees
- A Novel Metastability Tolerant SRAM Architecture
- Dual-Band Reconfigurable Antenna with a Very Wide Tunability Range
- Scalable Evaluation of a Batch of Nucleotide Sequence Queries with BLAST
- Circuit Level Checkpointing
- Memory System Having Fast and Slow Data Reading Mechanisms
- Nano-Field Emission Thruster
- A Tip-Less Electron Field Emission Technology Using MEMS Based Gate Structures

Emergency Medicine
- Method of Non-Invasive Hemodynamic Monitoring and Profiling for Diagnosing, Treating and Managing Patients with Heart Failure
- Hemorrhagic Shock Catheter



Reconfigurable Manufacturing Systems ERC
- Inspection Methodology of Deformable Objects

Hematology/Oncology
- SWI/SNF as Clinical Marker

Human Genetics
- Farnesyl Transferase Inhibitors for Treatment of Lamenopathies, Cellular Aging and Atherosclerosis

Industrial & Manufacturing Systems Engineering
- In-Process Monitoring and Control of Coating Qualities by Nano Plasma Spray

Industrial & Operations Engineering
- A Method and Apparatus for Marketing Manufacturing Process and its Use in the Product Manufacture

Internal Medicine
- Targeted Delivery of Imaging Agents and/or Therapeutics to Prostate Cancer Cells
- Gene as Cancer Susceptible Gene or Tumor Suppressor
- Process for the Production of Highly Pure Dendrimers
- Urine Assay for Podocyte Products
- Spectroscopic Analysis of Normal and Abnormal Cartilage
- KoolSole
- A Mouse Strain Allowing for Ligand-regulated Activity of Beta-catenin in Cutaneous Keratinocytes
- Methods and Apparatus for Predictor of Cardiac Death
- Therapeutics Targeting Bcl-XL
- A Novel Class of MDM2 Inhibitors
- Cell Lines for Evaluation of Glutathione-s-transferase Pi 1 (GSTP1) Function

- Cell Lines for Evaluation of CDX2 Function
- Cell Lines for Evaluation of Hypoxia Inducible Factor Alpha (HIF-1a) Function
- Cell Lines for the Evaluation of Tumor Resistance to Inhibition by Vascular Endothelial Growth Factor
- Fluorescent Substrate Detection of Cancer
- A Novel Class of Stat3 Inhibitors As New Anti-Cancer Drugs
- CHMIS-C: A Comprehensive Herbal Medicine Information System for Cancer
- Method of HIV Treatment
- Methods for Treating and Diagnosing Cancer
- DNA Test for Lupus Erythematosus
- Raman Analysis of Ocular Tissue Excised from Deli Transgenic and Age-Matched Wildtype Mice
- New Mouse Colon Cancer Progression Model
- New Classes of Inhibitors of the P53-MDM2 Interaction
- Crystalline Dendrimer-Stabilized Gold Nanoparticles
- Methods And Compositions For Using Alveolar Macrophage Phospholipase A2
- Synthetic Peptide Inhibitors of Thrombin and Activation of PAR1 and PAR4
- Method and Composition for Treatment of Leukemias and Lymphomas
- Method and Composition for Promotion of Neural Stem Cell Self-Renewal and Neural Development but not Mouse Growth and Survival
- Use of Renal Tubule Cells for the Treatment of Cardiorenal Syndrome and Primary Essential Hypertension
- Method for Engineering Three Dimensional Nerve-Muscle-Tendon Tissue Constructs in Culture
- Diagnostic, Prognostic and Therapeutic Tools in the Evaluation and Management of Vascular Disease

Materials Science & Engineering
- Methods for The Fabrication of Conducting Polymer Nanofibrils
- Flip Chip Underfill
- Friction Driven Stitch Welding Process and Tool
- Cytopolymer or CytoPEDOT, Situpolymer or SituPEDOT, Gelpolymer or GelPEDOT
- Well-Defined Nanosized Building Blocks for Organic/Inorganic Nanocomposites
- Energy Nano-Probe
- Thixomolded Light Alloys

Maxillofacial Surgery
- Electrical Stimulation of Cell Growth with Patterned Electrodes

Mechanical Engineering
- Reconfigurable Linescan Illumination
- Porous Metal Foam Filter for Automotive Applications
- Photographic Laser Absorption Spectroscopy for Three Dimensional Plasma Monitoring
- Method and Apparatus for In-Process Quality Monitoring of Laser Welds Made on Zinc-Coated Steel
- Prosthetic Foot
- High Performance Anomaly Detection
- A Rear Spoiler Of A New Type That Reduces The Aerodynamic Drag And Lift On Vehicles Having A Bluff Back Inchul
- Resettable Hood Lift
- Reconfigurable Sensor Array for Machine Vision Inspection
- Systems and Formulations for use as Coolants, Lubricants and Delivery Systems in Metal Cutting and Forming
- Roller Gripper for Mobile Robots
- Laparoscopic Surgical Clamp
- Method of Joining Dissimilar Materials
- Cylinder Bore Probe with Improved Angular Resolution
- Probe for Detecting Embedded Abrasive Particles in Cylinder Walls
- Multibeam Cylinder Bore Probe
- A Miniature Nanophotonic Visible/Near Infrared Spectrometer
- Multi-Scale Elastomer Integration for Flexible Nanophotonics
- Direct In-process Measurement of Geometric and Thermal Errors
- Methods and Apparatus for Parallel Direct Write Laser Nanomanufacturing
- Precision Thermal Management in Surgery
- Ultrasonic Assisted Manufacturing of Nano/Micro-Scale Features
- Manufacturing of Fuel Cell Bipolar and Interconnect Plates
- Ultrasonic Assisted Hydroforming
- Flexible Gripper for Handling of Sheet Material Parts
- Reconfigurable System with Integrated Inspection and Reconfigurable Machine Tools
- Thermal Modulation and Monitoring for Gas Chromatography
- Throttle And Gear Scheduling System For A Vehicle With Electronically Controlled Throttle And Automatic Transmission

Medicinal Chemistry
- Binding MOAD: Protein-Ligand Database

Mental Health Research Institute
- Enhancers of Synaptic Vesicular Glutamate Uptake
- MicroRNA Vectors

Molecular, Cell & Developmental Biology
- In Vivo Thiol Trapping Technique Using ICAT Technology

Naval/Marine
- Converter of Current/Tide/Wave Energy

Neurology
- Amidated Peptide Producing Gene Product for Pain Therapy

Nuclear Engineering
- Neutron Irradiative Methods and Systems
- A Novel Method of Cooling Micromechanical Structures
- A Novel Optical Detection Scheme for Sensing Structural Movement
- Interaction Timing Estimation
- Data Reconstruction Techniques for 3-Dimensional Position Sensitive Semiconductor and Gas Radiation Detectors
- Radionuclide Contamination Monitoring Device
- Airborne Radionuclide Monitoring System
- Low-Cost Integrating Digital Dosimeter
- A Very Low-Cost Spectroscopic Detector and Radionuclide Identification System
- A Single Photon Emission Mirocscope System

Nuclear Engineering & Radiological Science
- Integrating Dosimeters For Homeland Security, Environmental, and Retrospective Dosimetry

Nursing
- Computer-Based Interactive Multimedia Program For Hearing Test and Training

Obstetrics & Gynecology
- Vitrification MicroPipettor
- Artificial Matrix Hydrogel Culture Surfaces for Embryos and Embryonic Stem Cells

Ophthalmology
- Method to Reduce Nerve Damage During Prostatectomy
- Treatment and Prevention of Pathologic Intraocular Proliferations
- Prevention of Recurrent Human Papilloma Virus Lesions
- Biologically Active Components of Amniotic Membrane
- High Speed Fluorescence Microscope as a Novel Tool in Drug Development

Oral Medicine/ Pathology/Oncology
- Combination Treatment Therapy For Squamous Cell Carcinoma

Oral Medicine/ Pathology/ Surgery
- Isolation of Stem Cells
- An "Active" Material for Use in an Improved, Implantable Distraction Device"
- Methods and Compositions for Promotion of Angiogenesis in Cell Based Tissue Engineering Devices

Otolaryngology
- Steroid Response and Supporting Cell Antibody in Autoimmune Hearing Loss
- Receptor Having Anti-Proliferative Effect in Oral Squamous Cell Carcinoma

Pathology
- Methods of Diagnosing Breast Cancer
- Prostate Cancer Therapeutic Target Identification via Meta Analysis of Prostate Cancer Microarray Data
- Procedure for the Differentiation of Stem Cells into Renal Epithelial Cells
- Molecular Profiling of Thyroid Cancer
- Three-Dimensional Stereotactic Surface Projection

Pediatrics
- Reinstatement of Force Generation in 3D Bioengineered Internal Anal Sphincter of Aged Cells
- 3D Bioengineered Internal Anal Sphincter
- Dialysate Solution
- Adapted Power Mobility Units for Patient Transportation: Portable Fuel Cell/Adapted Battery Units

Pediatrics & Communicable Diseases
- Primer Design Using Degenerate Bases
- Sensitive Detection in Body Fluids of Human Papilloma Virus for Analyses of Cancer and Dysplasia
- NPHP Nucleic Acids and Proteins

Percussion
- HumidiFast Bass Drum Internal Humidifier

Periodontics
- Method of Using Gene Delivery to Block Periodontal Bone Loss

Pharmacology
- Gi2 RGS-insensitive Mouse
- Inhibitors of Rho Signaling
- Protection of Cocaine Lethality by Cocaine Esterase

Pharmacy
- Mutations of Schizophrenia Gene N°1
- Endotoxin (Lipopolysaccharide)-Free Escherichia Coli K-12
- WebIDS

Physical Medicine & Rehabilitation
- Distributed Cognitive Aid
- Folding Knee Spreader

Physics
- Thermoelectric Material Using Half-Heusler Structures
- Infrared Tracking Camera
- Ion Trap in a Semiconductor Chip

Physiology
- Expression Vectors for Wnt Gene
- Methods and Compositions for the Prevention of Cardiomyopathy and Muscle Injury in Muscular Dystrophy
- Methods and Compositions for the Treatment of Hypertension and Cardiovascular Disease

Psychiatry
- Genes and Pathways Differentially and Uniquely Expressed in Bipolar Disorder or Major Depressive Disorder
- Genes Differentially Expressed in Schizophrenia
- M-Start Behavioral Health Assessment Tool

Radiation Oncology
- Methods and Compositions for the Treatment of Patients with Prostate Adenocarcinoma
- Method of Radiation Protection
- Application Specific Integrated Circuit (MASDA-X Chip)
- Anti-Cancer Compounds and Methods

Radiology
- Radiolabeled Neuronal Nuclear Medicine Imaging and Radiotherapeutic
- Computer-aided Diagnosis Method and System for Mass Detection in Digital Tomosynthesis Mammograms
- Robust Wireless Monitoring of Physiological Parameters
- Droplet Emulsions
- Selective Magnetic Resonance Spectroscopy and Imaging of PEGulated Molecules
- A CAD System for Detection of Pulmonary Embolism in ED Computed Tomographic Pulmonary Angiography Images
- Controlled Target Placement for Enhancement and Localization of Energy Fields

School of Management Information Systems
- SWIM: Using IM Social Network To Share Information

Surgery
- Inhibition of Abdominal Aortic Aneurysm Growth
- Formation of Contractile 3-Dimensional Cardiac Muscle with the Presence of a Vasculature
- Methods and Compositions for Formation of Contractile 3-Dimensional Cardiac Muscle
- Mitral Valve Ring
- Effect of Thyroid Hormone on the Contractility of Bioengineered Heart Muscle

UMH MCIT Clinical Business I
- Anticoagulation Application

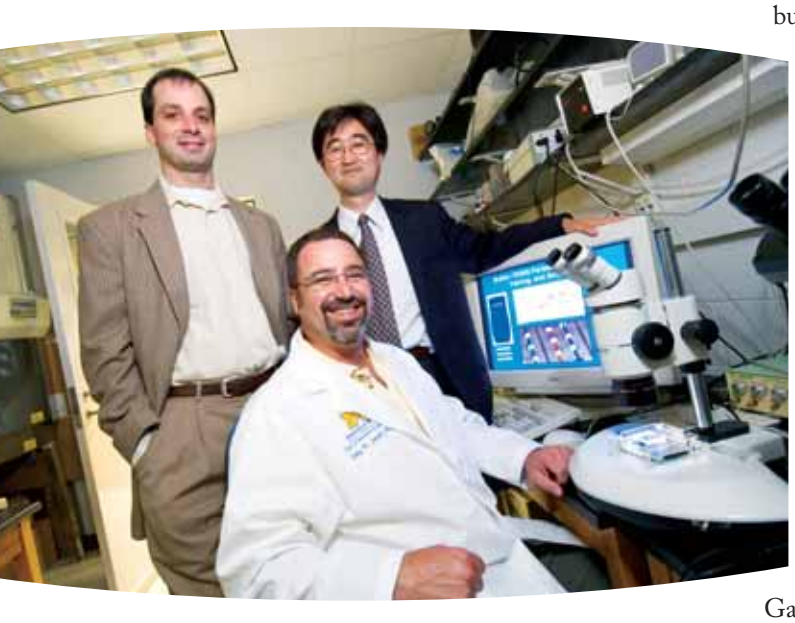
Transportation Research (UMTRI)
- Display Panning Based on Head Location
- Highway Work-Zone Smart Barrel System

Urology
- Detection of ADAM15
- CD55 Antibody Vaccine for the Treatment of Prostate Cancer

the birth of a start-up

INCEPT BIOSYSTEMS, INC.

Two years ago, startup veteran Mike Crowley was looking for an MBA program that offered him not only a premier education but access to top-flight researchers and new business opportunities. So, while other applicants were contacting business school admission officers, Mike was calling university tech transfer departments.



"For me, U-M Tech Transfer was the deciding factor," he says. "They were by far the most accommodating of all the technology transfer groups I approached." Convinced that U-M was brimming with opportunities, he enrolled in the Stephen M. Ross School of Business.

To jump-start his quest, Crowley co-founded the Nanotech Commercialization Group (NCG), a team of business student consultants. It was through NCG that Mike did volunteer research projects for Tech Transfer and ultimately met his future business partners: U-M Professor of Biomedical Engineering Shuichi Takayama and U-M Associate Professor of Obstetrics and Gynecology Gary Smith, who also directs a fertility counseling group within the U-M Reproductive Sciences Program. The basis of their research was an ingenious microfluidic device developed by engineering graduate student Wei Gu. With the addition of Braille-reading technology and nano-channels, the scientists were able to create tiny valves and pumps ideally suited for sorting sperm prior to *in vitro* fertilization.

While doing market research for Takayama and Smith, Crowley turned to U-M Tech Transfer's TechStart program to explore new applications for the technology (see p. 12 for more on TechStart). He and his TechStart cohorts discovered that the device could help fertilization clinics solve their biggest single challenge: selecting the healthiest embryos for transfer.

At summer's end, Crowley initiated discussions with Smith and Takayama to form a business. He notes that Tech Transfer has been, and continues to be, extremely helpful in mediating, providing guidance, identifying funding sources and incubating the relationship. Five months later, in January of 2005, he became president of Incept BioSystems. The three have since optioned the technology and are presently working to bring their first products to market.

The three partners credit the entrepreneurial environment at the University of Michigan for much of their success. "At Michigan," says Crowley, "there's enough support in enough places to keep pushing an enterprise like ours forward."

"Incept started with a big advantage in the form of funding from multiple sources," says company co-founder Dr. Shuichi Takayama (pictured *(right)* with company founders Mike Crowley and Gary Smith *(seated)*). "That included a grant of $102,000 from the Michigan University Commercialization Initiative, $75,000 from nationwide business competitions and $10,000 from the Dare to Dream competition sponsored by the U-M Ross School of Business. In addition to that, our research endeavors within the University have attracted $364,000 in NIH grants, approximately $400,000 from the US Department of Agriculture and $957,000 from the Michigan Technology Tri-Corridor Fund. Thus, by the time we began making formal presentations to venture capitalists, we essentially had $1.9 million in play."

Photo, by Steve Kuzma, courtesy the University of Michigan's Ross School of Business

the growth of a start-up

ARBOR NETWORKS

In 2000, Arbor Networks co-founders Dr. Farnam Jahanian and computer engineering doctoral student G. Robert Malan were hopeful that their unique network security appliance—developed in the University of Michigan Software Systems Lab—would make a mark on the world of cyber security. Today, their company has over 125 employees, projected annual revenues exceeding $40 million and major business centers in Ann Arbor, Lexington (MA), Washington (DC), London and Beijing. With over 70 percent market share, their security solutions to help clients detect, back trace and mitigate large-scale network attacks are deployed in the backbones of all the major service provider and Multi-Service Operator (MSO) networks across the globe, including Asia Netcom, AT&T, British Telecom, EarthLink, MCI and Sprint. And their research division, based in Ann Arbor, has added over 50 jobs and an estimated $20 million to the local economy.

"From day one, we were determined to keep our R&D group here in Ann Arbor," Jahanian explains. "In fact, that provision was written into the agreement we negotiated with investors. We started with ten individuals and since then have recruited aggressively from the University of Michigan and major technical centers nationwide." Jahanian notes that the company has received tremendous support from the local community, and that prospective employees are attracted to Ann Arbor's overall quality of life.

"Farnam Jahanian has designed valuable security products for the computer and communications industry, created well-paying, rewarding jobs for dozens of Michigan engineering graduates and helped grow the local Ann Arbor economy in the process. It's a model that we'd love to keep replicating."

—Dan Broderick
Director, Engineering-OTTC
U-M Office of Technology Transfer

In June of 2005, U-M Professor of Electrical Engineering and Computer Science Farnam Jahanian, co-founder of Arbor Networks, accepted the first-ever Governor's University Award for Commercialization Excellence (ACE). Jahanian (pictured *(left)* with U-M President Mary Sue Coleman and Lt. Governor John D. Cherry) was the top contender among universities with annual research expenditures exceeding $100 million. ACE is intended to recognize and encourage faculty entrepreneurship.

bootstrapping to success

MOLECULAR THERAPEUTICS, INC.

Left to right Dr. Al Rehemtulla, Dr. Brian Ross, Dr. Prasad Sunkara

In 2002, the year it was founded, Molecular Therapeutics, Inc. (MRx) operated with a staff of 4 and generated minimal profits. Today, the company has 24 employees, annual revenues approaching $5 million and 3 subsidiaries.

That kind of growth is remarkable for any start-up. What makes it even more remarkable is the fact that Molecular Therapeutics has accomplished all this without a single cent of venture capital funding.

It was MRx chairman and president, Dr. Prasad Sunkara, who initially suggested the go-it-alone strategy to his two partners and company co-founders Dr. Brian D. Ross, U-M professor of radiology and professor of biological chemistry, and Dr. Al Rehemtulla, associate professor of radiation oncology and radiology at U-M.

Currently, MRx—the parent company—is engaged in Phase Two studies on MRx1024, a small-molecule compound that holds large promise for cancer patients. In clinical trials, MRx1024 appears to protect normal cells from damage during chemotherapy and radiation, yet does not interfere with anti-tumor activity in cancerous cells. As a result, it prevents a number of side effects of cancer treatment such as oral mucositis, hearing loss and alopecia. The company is also continuing to develop nanosomes, a nanoparticle technology capable of delivering therapeutic agents directly to tumor cells, thereby reducing toxicity and damage to other body tissues. The patented nanoparticle technology is licensed from the University of Michigan.

To help support its R&D efforts, MRx has spun off numerous subsidiaries that offer everything from contract-based oncology assessments and preclinical evaluations of anti-tumor agents to compounds, reagents and equipment for scientists engaged in animal pharmacology. The company is also partnering with Cedara Software Corporation to develop the first turnkey workstation designed to help radiation and medical oncologists manage therapy for cancer patients.

"In 2002, a competitively-awarded $1 million loan from the Life Sciences Corridor— now the Tri-Corridor program—enabled Molecular Therapeutics to purchase an MRI unit and subsequently launch a new suite of services. Revenues are being used to support new product development, and MRx has paid back the initial loan, making those funds available once more to other promising, early-stage Michigan companies."

—Karen Studer-Rabeler
Associate Director,
New Business Development
U-M Office of Technology Transfer

advancing medical research

ONCOMINE

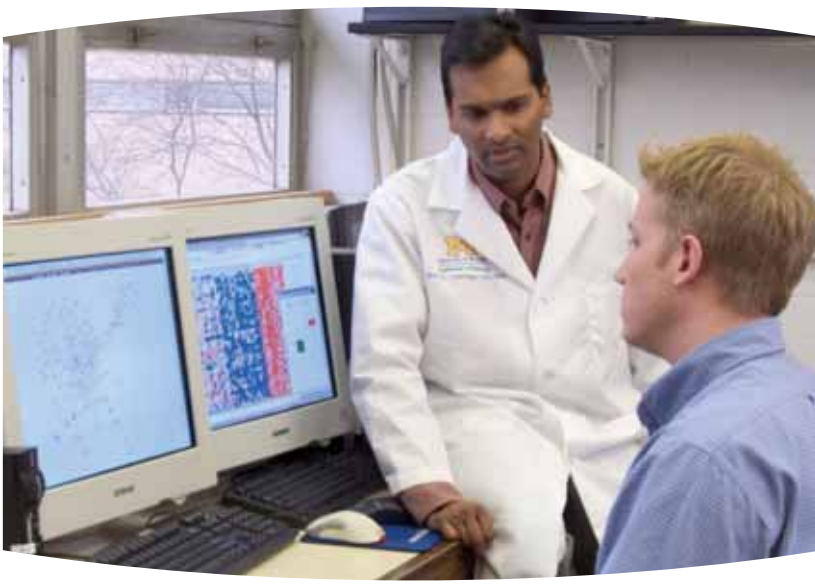
Often, in the realm of scientific discovery, the biggest problem facing researchers isn't too little information but rather too much—in too many formats and too many places. It was this conundrum that led U-M Professor of Pathology and Urology Arul Chinnaiyan and M.D./Ph.D. graduate student Dan Rhodes to develop Oncomine, a DNA microarray database now being used in 40 countries by more than 5,000 cancer researchers.

In the fall of 2001, Chinnaiyan and Rhodes began collecting data on prostate cancer and devising methods for analyzing data sets. Their goal was to make vast amounts of public-domain gene expression data readily available to the average biologist. In the process, they discovered two new genetic biomarkers involved in the development and progression of prostate cancer. They then extended their data collection model to all human tumors.

As Rhodes explains, "In its raw form, gene expression data isn't really useful to the majority of biologists. We unify the data, normalize it, analyze it, and present it in such a way that any researcher with access to the internet can figure out what their gene of interest is doing across a collection of 10,000 or so independent tumor samples."

At major pharmaceutical companies such as Amgen, Novartis and Celera, which have licensed the technology, Oncomine enables scientists to determine whether their target genes are activated in specific cancer tumors and to identify other disease populations that might merit investigation. The database, now in its third version, is available free of charge to researchers at academic institutions.

Initial R&D funding for Oncomine was provided by the U-M Comprehensive Cancer Center and the Department of Pathology. U-M Tech Transfer worked closely with the two researchers to facilitate the commercial licensing agreements.



Both Chinnaiyan *(left)* and Rhodes *(right)* can testify to the scientific value of their creation. In the fall of 2005, the two will announce what Chinnaiyan describes as "the identification of a new causal agent in prostate cancer—a discovery, he notes, that would have been impossible without Oncomine.

"Securing patent or other intellectual property protection is often essential to facilitate commercialization.

Our goal is to be creative and efficient in obtaining the most appropriate protection that adds value to partner agreements, such as those for Oncomine."

—Rick Brandon
Assistant General Counsel
U-M Office of Technology Transfer

cultivating the talent of tomorrow

TECHSTART

Each summer for the past six years, TechStart has given U-M faculty researchers access to the skills and expertise of outstanding graduate students in business, engineering, information, law, medicine and other disciplines to help them move forward their University commercialization projects. The 2005 TechStart team included (pictured below left to right) Sylvie Khajuria (Masters of Science in Information), Trushar Naik (MD/MBA dual-degree program), Roy Esaki (MD program), Linda Sanchez (Masters of Science in Biomedical Engineering), Craig Komanecki (JD program), Jay Ng (MBA program), Wenyun "Sunny" Sun (Masters of Science in Financial Engineering and Information Science) and Mark Maynard (U-M Tech Transfer).

When graduate student Trushar Naik applied to the U-M TechStart program, he had high expectations. As a dual-degree MBA/MD student, he was interested in assisting with the business development of university-based innovations—evaluating concept technologies, devising entry positioning strategies and searching out potential markets and funding sources. But he was also hoping that his projects might have the potential of offering real benefits to patients.

As part of the TechStart team assigned to BioAvrion, a startup project with its roots in the U-M Kellogg Eye Center, Naik found exactly what he was looking for. Along with MBA student Jay Ng and law student Craig Komanecki, Naik was given the challenge of searching out promising applications and markets for the RetinoMetaboScope, a unique ophthalmoscope able to measure retinal cell metabolism.

Developed by Dr. Victor M. Elner and Dr. Howard R. Petty, both professors of ophthalmology and visual sciences at the U-M Medical School's Kellogg Eye Center, the technology offers a completely new method for evaluating eye health. As Naik explains, "Until now, physicians have diagnosed and monitored diseases such as glaucoma and macular degeneration by looking at the physical characteristics of the eye and measuring visual acuity. This, of course, makes it difficult to detect

minute, short-term changes. However, Drs. Elner and Petty discovered that unhealthy retinal cells emit metabolites with altered electrochemical energies. By measuring those light particles, their scope can track even the smallest changes and revolutionize the way eye disease is monitored."

Naik and his teammates began exploring potential applications for the technology. Their final recommendation: market the scope as a way of speeding up drug trials by quickly and accurately assessing the impact of experimental compounds on cells within the eye and then, leveraging that success, explore the roll-out of a diagnostic tool.

Observing the success of this project, TechStart Leader Mark Maynard points out that "TechStart exists to give our students real-world experience in commercializing early-stage technologies. Perhaps more importantly, however, it gives our researchers access to dedicated, top-notch talent with backgrounds in relevant industries. The process also serves as an introduction to Ann Arbor's entrepreneurial community, giving some of our most promising students an opportunity to build networks which have led to local opportunities after graduation."

After several years working as a software architect designing computer interfaces in California, U-M-trained engineer Linda Sanchez and her husband returned to Michigan to be near their extended families. Now pursuing graduate studies in Biomedical Engineering, Linda has set a new long-term goal for herself—to develop medical devices and one day launch her own company.

Through TechStart, Sanchez was able to gain practical experience in the commercialization of technology. She worked on three separate projects: identifying potential applications for a U-M-developed technology for semiconductor manufacturing and testing; creating a market entry plan for a company with origins in the Departments of Surgery and Biomedical Engineering; exploring business opportunities for ClinfoTracker, a software program designed to enable primary care clinics to provide high quality, effective management for chronic diseases and preventive care.

"TechStart helped me in many areas," she notes. "I gained contacts in the local entrepreneurial scene, learned more about the University's biomedical research and became involved in the process of creating early-stage venture companies."

"Most faculty innovators, like ourselves, are not expert in market research and analysis, nor do we have the time. The TechStart students spent time with us up front, learning about the product we'd developed. They kept in close contact throughout their work, and left us with a very professional market analysis and roadmap for getting our software into the commercial space. This was a positive experience in every respect for me and my faculty colleagues on the ClinfoTracker team!"

Donald Nease, MD
Associate Professor, U-M Department of Family Medicine, and co-creator of ClinfoTracker

igniting innovation

ANN ARBOR SPARK

Rick Snyder remembers the day when the concept of Ann Arbor SPARK originated. A successful venture capitalist and former President and COO of Gateway, Inc., Snyder serves on the National Advisory Board of U-M Tech Transfer. "The Board was discussing ways to encourage more technology transfer in the greater Ann Arbor area," he recalls, "and we kept coming back to the role of the community. We knew that U-M Tech Transfer had grown to be one of the top ten organizations of its kind in the country, but we wanted to set our sights higher."

That seminal discussion led to months of research, benchmarking and analysis of other leading regions of innovation. "Everyone told us the same thing," says Snyder. "If you want to be great, then invest in your environment and enlist the entire community in a focused effort to encourage innovation-focused economic development."

The concept was to enhance the strong foundation already in place through a process of convergence, focusing on five core areas: Business Acceleration, Early-Stage Funding, Talent Development, Business Outreach and Events/Marketing. Within a year, and with seed funding from the University of Michigan, Ann Arbor SPARK was officially underway.

On May 26, civic leaders, venture capitalists, business executives, faculty researchers, local government officials and U-M staff members gathered to celebrate the official launch of Ann Arbor SPARK. The broad-based coalition is focused on making the Ann Arbor region a national center for innovation, business growth and world-class talent.

Nearly two dozen organizations—including Eastern Michigan University, Pfizer Inc., the Dow Foundation, and Washtenaw County Government— joined U-M as partners of Ann Arbor SPARK. As partners, each provided financial support, talent and time. As a founding partner, the University of Michigan pledged up to $1 million over five years.

U-M Associate Vice President for Research Marvin Parnes sees this collaboration as a fundamental strength. "The University of Michigan is, in many ways, the engine of innovation for this region," he notes. "But innovation on this scale has to involve public and private sectors, academia and business, big players and small."

Today, Ann Arbor SPARK is building its infrastructure, expanding its partnership base, and recruiting resources. As Snyder explains, "Innovation-focused economic development is really a 20-year effort. We've started strong, and we intend to finish strong."

innovation partnerships and service

National Advisory Board

Our U-M Tech Transfer National Advisory Board (NAB) has been an invaluable resource, guiding our plans and activities. Correctly recognizing regional infrastructure and resource enhancements as vital components for continued progress in technology transfer, it was the NAB that created the initial impetus for Ann Arbor SPARK (see story on p. 14). Drawing on their professional experiences and connections, this diverse set of advisors is helping us enhance our capabilities and plan for the future.

In 2005, members of the NAB include:

Thomas Bumol
Vice President
Research Technologies and Proteins
Eli Lilly

John Denniston
Chief Operating Officer
Kleiner, Perkins, Caufield & Byers

Richard Douglas
Sr. VP Corp. Development
Genzyme

Jan Garfinkle
Managing Partner
Arboretum Ventures

Thomas Kinnear
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Zell Lurie Institute for Entrepreneurial Studies

Ed Pagani
Senior Director, Strategic Alliances
Pfizer, Inc.
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Ken Pelowski
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Thomas Porter
Trillium Ventures

Doug Rothwell
President
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Chuck Salley
Chief Executive Officer
CAS Ventures

Rick Snyder
Chief Executive Officer
Ardesta

Michael Staebler
Partner
Pepper Hamilton LLP

Carl Stjernfeldt
Battery Ventures

Jack Turner
Associate Director
MIT, Technology Licensing Office

Tom Washing
Sequel Venture Partners

Supporting Innovation Organizations

U-M Tech Transfer plays a vital role in many regional, state and national organizations involved in technology transfer and innovation. Our staff members serve on boards and committees of organizations such as:

- Ann Arbor IT Zone
- Ann Arbor SPARK
- Ann Arbor Area Chamber of Commerce
- Association of University Technology Managers
- MichBio
- Midwest Research University Network
- New Enterprise Forum
- Washtenaw Development Council
- Washtenaw Wireless

In furthering the University's mission of outreach, U-M Tech Transfer staff members—individually and collectively—lend their support to various community groups and organizations. One example is our holiday gift collection for the Ann Arbor Ronald McDonald House, a "home-away-from-home" for the families of seriously ill children. Another was our day of service with Habitat for Humanity, a time when tech transfer specialists learned a "whole new set of skills" as part of our local Jimmy Carter Work Project.

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6. Linda Hamlin
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10. Ken Nisbet
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