Bob Norris, Secretary  
NYAG (New York Apple Growers), LLC  
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NYAG LLC is a strategic partnership of New York State apple growers founded to license exclusively in North America the rights to grow and market two new apple varieties, New York-1 and New York-2. The members-owned company is open only to New York State apple growers to help promote the growth and long-term competitiveness of the NY apple industry. NYAG aims to perform marketing research and to help its members with the growing, marketing/promotion and sales of the new apple varieties to achieve commercial success. New York-1 produces red apples with sweet, crisp and juicy flesh while New York-2 produces red fruits with sweet, juicy flesh, a touch of tartness and do not brown quickly when sliced.

Emerging Technologies

Graphene-Enhanced Growth of Covariant Organic Frameworks (COFs)  
William Dichtel, Chemistry & Chemical Biology

Covalent organic frameworks (COFs) are materials that have the potential to revolutionize the field of organic electronics (currently a $2B industry anticipated to grow to $18B by 2020). COFs offer a new way to organize organic semiconductors predictably into structures ideal for efficient charge transport. The first COFs have previously been synthesized as insoluble powders, making it difficult or impossible to incorporate the materials into devices or even measure their electronic properties precisely. A solution to these challenges was found that synthesizes 2D-COF thin films on single-layer graphene coated surfaces. Powdered COFs are of interest for gas storage and separation and catalysis applications.

ChiP Image Sensor for Biomedical and Security Uses  
Alykha Melnati, Electrical & Computer Engineering

An "angle sensitive pixel" developed for detecting the incident angle of imaged light to extract 3D information is coupled with lenses to optically perform image compression on-chip with minimal explicit computation. This method that uses a "sled". Sleds are commonly used by football teams to train their linemen, but are cumbersome and heavy. This device is not only light and easy to transport, but can also provide training for balance and reaction at unique angles. The technology can be implemented for patients on all levels, ranging from youth to professional, could use the device to develop good blocking techniques for warm-up sessions and to strengthen essential muscles used in blocking.

Medical Uses of Novel Polymers in Wound Healing and Surgical Procedures  
David Putnam, Biomedical Engineering

Post operative tissue adhesion can cause significant complications and often results in additional surgical procedures to remove the adhesions. Current solutions to prevent adhesion formation are limited due to their inflexible handling characteristics and inconsistent efficacies. This invention provides biomaterials that can be used for prevention or reduction of tissue adhesions offering desirable flexibility in the surgical environment.

Zuma BioSciences  
Eric Eisenhut, Director

Zuma BioSciences is transforming novel research in cellular metabolism. Cancer cells have nutrient requirements distinct from normal cells and Zuma BioSciences exploits these differences to develop novel strategies for therapeutic intervention in cancer. Zuma BioSciences is combining advancements in the understanding of cellular metabolism with medicinal chemistry to enable powerful new approaches for disrupting cancer cell growth by attacking the metabolic machinery which fuels oncogenesis.

Stealth Peptides  
Travis Wilson, CEO

Stealth Peptides is a clinical stage biopharmaceutical company developing novel and innovative mitochondrial targeted therapies for diseases with clear unmet medical needs including cardio-renal and metabolic disorders. Stealth was founded in 2006 with technology for a unique class of compounds unmet medical needs including cardio-renal and metabolic disorders. Stealth Peptides, is a clinical stage biopharmaceutical company developing chemistry to enable powerful new approaches for disrupting cancer cell growth by attacking the metabolic machinery which fuels oncogenesis.

Odyssey Molecular  
Paul Solloway, Founder

Odyssey Molecular intends to develop revolutionary single-molecule analytical systems for rapid quantification of selected molecular species. These systems will utilize a new paradigm for ultra-sensitive quantitative molecular analysis. The company envisions a range of applications enabled through these systems in medical diagnostics, therapeutics and research. The initial Odyssey Molecular products will be directed toward the emerging area of epigenetic analysis for medical diagnostics and research.

ADispell, Inc.  
Stephen Curry, CEO

Alzheimer’s disease (AD) affects 5.3 million individuals in the U.S. and 35 million worldwide according to the Alzheimer’s Association. As the overall population ages, the number of cases will grow rapidly. ADispell, Inc. is dedicated to the discovery and development of drugs for the treatment and prevention of Alzheimer’s disease, currently a disease without a cure. Their technology includes unique compounds that can impact both beta amyloid peptides, whose aggregation is believed to be a major cause of Alzheimers, and the ion channels that are involved in signal transmission between brain cells, thus affecting the progression of the disease in two ways. The company aims to halt AD advancement or other neurodegenerative disorders.

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Emerging Technologies

A Biologically-Inspired Ultra-Low-Power Phase-Only Electro-optic Modulator

Alyssa Apsel, Electrical & Computer Engineering

The nervous system uses large-scale synchronization of neurons through impulsive signals, known as spikes. Employing a similar scheme to regulate the beating of the heart, the technology utilizes this type of mechanism to synchronize networks of impulse radios. Once synchronized, impulse radios can facilitate power savings at both the receiver (Rx) and transmitter (Tx) by turning “on” only when needed. Using a 3–4 orders of magnitude radio that consumes only 20 pJ and offers orders-of-magnitude power savings over traditional radio implementations was designed.

Solar Cells Made Using Radio Isotope Powered Electron-Beam Lithography

Amit Lal, Electrical & Computer Engineering

This invention relies on the use of radioisotope based lithography to pattern nanoscale features over potentially very large silicon substrate or arrays of silicon wafers simultaneously. These wafers can be microfabricated into memory or electronic nanoarrays that can serve as templates for high-throughput solar cells, solar-cell arrays, disk storage media, field-emission displays, and molecular electronics.

Aptamer-Based Fluorescent Sensor Technology

Samie Jaffrey, Pharmacology, Weill Cornell Medical College

Messenger RNA (mRNA) is regulated by a complex and intricate network of intracellular structures that have a critical role in gene expression. Recent studies have shown that new intracellular structures have roles in regulating the processing of RNA, and it is clear that during RNA processing and maturation, transcripts traffic through different parts of the cell. Intracellular movement or location of proteins can be observed by fusing the protein of interest to the green fluorescent protein (GFP). In addition, there are currently no analogous simple and straightforward approaches to track RNA movement in living cells, and currently available methods have critical limitations that have precluded their widespread use. This technology uses an aptamer that turns on the fluorescence of a small molecule when it binds to it non-covalently.

Laser Tweezers for Biomolecules

David Erickson, Mechanical Engineering

An efficient and practical method for separating microscopic particles over long distances has been developed. This method employs a directed laser beam to move very large power sources with only millimeter scale separations, this device uses significantly less power and achieves a scale separation two orders of magnitude higher than competing devices. This device can also be used in pathogen detection.

Gene Panels to Provide Prognosis for Colon Cancer

Francis Barany, Microbiology & Immunology, Weill Cornell Medical College

Researchers have identified a set of 176 genes, 71 gene subset of the 176 gene set, and a partially overlapping 101 gene set. Displaying these genes will allow physicians to use this information to treat their patients. Expression patterns were assessed for percentage predicting good vs. bad outcome. Results of the test are predicted to guide physicians to prescribe one of two biological pathways to treat either cancer, surgery and chemotherapy, or surgery, further molecular diagnostic testing, and individualized treatment.

Methods for Processing Entangled Database Updates

Johannes Gehrke, Computer Science

A growing number of database applications need to support coordination and collaboration between systems distributed across the internet. An adequate support for this functionality forcing today’s developers to rely on ad hoc mechanisms. The invention uses an SQL DML statement in which updates are distributed with postconditions that can refer to the database changes occurring on remote machines. Cleverly observed through an execution model in which such “entangled” updates execute together if their joint execution causes all their postconditions to be satisfied, even if there is no way of serially executing the updates one by one while satisfying the postconditions.

Device to Sort and Classify Cell Membrane Components

Susan Daniel, Chemical & Biomedical Engineering

A lipid bilayer approach that can separate molecules without the use of detergent or crosslinkers has been developed. The microfluidic channel of this device features a non-covalent binding between supported lipid bilayers (SLB) and the cell membrane. SLBs are excellent remixes of the cell membrane because they maintain two-dimensional fluidity, proper orientation, and maintenance of membrane protein structure. This device is able to sort membrane species based on their physical or chemical preference for heteroregions in the bilayer that are created so that synergistic non-covalent interactions (raft favorable or raft liquid phase favorable species) can be covalently immobilized. This technology promises to significantly mass spectrometry or other means. This novel approach is superior to traditional methods by preserving and carefully controlling the membrane environment.

Villus Scaffold Structure

John Marck, Biological & Environmental Engineering

This technology introduces novel artificial villous structures and a method for their formation in three dimensions. These villi are formed as a soil-applied powdered fertilizer, for example, exfoliating skin, stem, or endothelial cells, and for growing mesenchymal cells for therapeutic studies. Simulating small intestine villi, this new three-dimensional model provides a large range of modeling parameters for cellular adhesion and cell structure. This application for this technology is included in compound or nutrient permeability studies and is applicable to pharmaceutical and biotechnology laboratories, as well as a research tool.

Use of Ultrasound to Track Electrical Activity in the Heart

Niles Otani, Biomedical Sciences

Ventricular Fibrillation (VF) is a common cause of sudden cardiac death. It causes 335,000 sudden cardiac deaths annually in the United States. This technology uses ultrasound imaging deep within cardiac tissue to track the location and motion of cardiac action potentials in two and three dimensions. It can be used to clinically diagnose ventricular fibrillation (VF) and ventricular tachycardia (VT) in the heart.

Treatment for Skin Disorders

Jochen Buck, Pharmacology, Weill Cornell Medical College

A new treatment for skin disorders including psoriasis, cancer, and warts, has been developed. Current treatments include steroids, keratolytic, anthralin and coal tar, retinoids, and vitamin D. Some drawbacks of these topical therapies include staining/cyaning/occasionally hyper-pigmentation (too much calcium in the blood), and irritating skin. This new treatment will block soluble adenylyl cyclase, a protein that is over-expressed in these skin disorders.

Functionalized Liposomes for Targeting and Treatment of Diseases

Michael Roth, Biomedical Engineering

Several technologies in combination create a novel method to target and/or treat cells, such as metastatic cancer cells. This invention involves the use of functionalized liposomes in combination with a developing drug. These liposomes may be functionalized with an adhesion molecule such as selectin alone or useful in combination with other entities. Potential applications include treatment of metastatic cancer, inflammation, and other targets.

New Biomass Pretreatment Process for Ethanol Production

Larry Walker, Biological & Environmental Engineering

This technology describes a method to pretreat diverse biomass sources at high solid content under consistent conditions using supercritical CO2 -water processes. While it is a common route to obtain monosaccharides from biomass sources, this technology expands the range of biomass producing species, including environmental intensive, costly, and demand large amounts of energy. This new technology employs the use of a supercritical fluid as a solvent to treat these other, since it is capable of pretreating different biomass species at a high solid content using very similar process conditions.

A Tool for Improved Corn Nitrogen Fertilizer Recommendations

Harald van Es, Crop & Soil Sciences

Nitrous oxide emissions are the largest source of greenhouse gases from agriculture. Current predictions of annual nitrogen fertilizer needs for corn and soybean will be used by farmers, agronomists, consultants, and government personnel to provide nitrogen recommendations. The invention uses the corn plant’s soil-like characteristics, and management practices. It provides an accurate, comprehensive, web-based tool to help farmers, and extension specialists make best decisions about nitrogen applications.

Building 3D Models from Photos

Noah Snively, Computer Science

This technology takes sets of two-dimensional still photos of an environment, for instance a home, museum, or car, and automatically builds a three-dimensional model, allowing users to create digital three-dimensional representations of places or objects using just a camera. This same process even works for photos of landmarks downloaded from the web. Given photos matching the keywords “Statue of Liberty,” for instance, the user can automatically create an immersive virtual experience of being at that place.

Alkaline Electrolytes for Better Fuel Cells

Geoffrey Coates, Chemistry & Chemical Biology

This invention provides novel thin films useful as anion exchange membranes for fuel cells. The resulting alkaline anion exchange membranes offer reduced operating costs and can lead to a great amount of development of anion exchange membranes. Furthermore, these membranes permit the use of cheaper, non-metal catalytic sites and thus allowing for higher thermal stability to be significantly reduced. This technology holds promise in expanding the utility of fuel cells.

Expanding Stem Cell Populations & Angiogenesis Studies

Shahin Rafi, Medicine, Weill Cornell Medical College

Sarrentis Ophthalmic is developing medical devices to improve corneal oc-spectrum disorders. In addition, low levels of this protein could be a negative target for treatment of individualized treatment.

Sarentis Ophthalmic

Denise Barbut, CEO

Sarentis Ophthalmic is developing medical devices to improve corneal presbyopia (i.e. loss of accommodative vision). The company has developed a biodegradable, transparent silicone contact lens (bandage) that significantly enhances vision for individuals with near vision challenges. In addition, Sarentis has developed a bandage initially to treat conditions of presbyopia. Presbyopia affects 70 million Americans per year and a significant portion of this bandage market. The company is also in the early development stages of a corneal treatment for skin disorders.