NII is on the cusp of introducing revolutionary products using photoacoustic imaging technology, vein illumination technology, and biometrics technology.

*The result will be a paradigm shift in the imaging of tissue and bleeding in the brain, identification of hard-to-locate veins, and in fingerprint identification.*
Near Infrared Imaging has been accumulating technologies, paying state and Federal Taxes, developing new products and funding research since 2009.

NII holds Exclusive Rights to patents developed at Lawrence Livermore National Laboratory.

NII holds Exclusive Rights to patents developed at the City University of New York.

NII holds Exclusive Rights to a patent developed at UCLA’s School of Medicine.

- NII is owned in part by the Regents of the University of California (UCLA).
- NII is owned in part by the City University of New York (CUNY).
- NII is owned in part by Lawrence Livermore National Laboratory (LLNL), which is a division of the Department of Energy (DoE).

Near Infrared Imaging’s first product, the AVV–1 vein illumination camera, is FDA registered and will soon be available for purchase.

Near Infrared Imaging’s “non-contact” biometric camera is in development.
There are over 2,700,000 needle sticks every day in the USA.

While vein illumination is important in every needle insertion, it is critically important when the patient is obese, very young, aged and/or has dark skin.

The average number of attempts to insert a needle in a vein of young children is three (3). The failure to stick a needle the first time causes pain to the child, the child’s family, and the medical practitioner or nurse.

The AVV–1 solves the two most common complaints of medical practitioners:

- Existing vein illumination devices are too expensive,
- Existing vein illumination devices only illuminate veins that can be seen.

Recent studies have shown that patients overwhelmingly prefer vein illumination when their veins are punctured.

The importance of these findings is even greater based on the 2012 Affordable Care Act. Medicare now considers a patient’s well being.
The technology is based upon patents assigned to the City University of New York (CUNY) and Lawrence Livermore National Laboratory. The technology uses near infrared wavelengths that are polarized.

The patented technology detects objects below the surface of a scattering medium. This medium could be human tissue, water, and/or smoke.

The CUNY technology has been highlighted in over 250 research articles.

The AVV–2 next generation camera will color code veins according to depth.

NII will continually modify the AVV–1 and AVV–2 according to the needs of the end user.

We are presently in discussions with a metropolitan fire department to wall mount the camera and display in their ambulances.

Our technology has the capability to detect small objects, such as tumors, that are near the surface of the skin.
VI – Competitive advantages

- In a recent head-to-head comparison against the leading selling vein illumination cameras, the AVV-1 was clearly the better product.

- The images of the veins had more clarity and definition with the AVV-1.

- The AVV-1 images the entire vein, which is necessary for IV placement.

- The AVV-1 can be used with a PC or iPad.

- The AVV-1 uses LEDs; the competitors use lasers.
  - Lasers can cause damage to the eyes of the patient or medical practitioner.

- The MSRP of the leading selling vein illumination devices range from $4,300 to $25,000.

- The AVV-1 will have an MSRP in the $1,499 range.
Traumatic Brain Injury (TBI) is the leading cause of death for people under the age of 45.

Near Infrared Imaging (NII), and the scientists at Lawrence Livermore National Laboratory, are on the cusp of introducing a revolutionary new technology for the detection and monitoring of brain injuries, malignant cancers, brain diseases, brain disorders, and cardiovascular diseases (the #1 cause of death in the USA).

The innovative technology is Optical Ultrasound Tomography®.

The product, the PAT 2700, will be non–contact, non–invasive, non–radiation, and affordable to everyone worldwide.
Motivation

- Traumatic Brain Injury (TBI) is the leading cause of death for people under the age of 45.
- Children are much more vulnerable to TBI as their skulls are thinner.
- 350,000 sports–related head injuries are treated at U.S. hospital emergency rooms every year.
- TBI is a major health issue affecting service members and veterans during times of both peace and war.
“The NHL has something wrong with its head, and no one is sure what to do about it, or if there is anything that can be done to make an inherently dangerous game substantially less a killing field.” – *Boston Globe*

When NHL player Bob Probert died suddenly, at the age of 45, scientists at Boston University discovered that the constant blows to his head caused a degenerative brain disease called *chronic traumatic encephalopathy*.

News of the recent and unexpected death of Junior Seau, 43–year–old former Pro Bowl linebacker, has once again raised questions regarding the long–term impact of *traumatic brain injuries* in the National Football League.

“Traumatic brain injury (TBI) is a significant health issue which affects service members and veterans during times of both peace and war.” – *US Army*

"Ideally, screening should occur immediately following the injury event or as soon as operationally feasible." – *Defense and Veterans Brain Injury Center.*
The “Golden Hour” after a brain injury is critically important to saving the life of the patient. Unfortunately, many people feel fine immediately after a traumatic brain injury.

Actress Natasha Richardson fell on a ski slope and initially felt dizziness and slight pain. Approximately one hour later, she began feeling ill but it was too late. *Natasha Richardson died from an epidural hematoma, a treatable condition if detected early.*

Existing technologies require transport to a medical hospital for a CT scan, mammogram, or MRI. A suffering patient may not have that time.

The #1 cause of death to newborns in the Neonatal Intensive Care Unit is brain injury.
“X-rays from a single full-body CT scan give a dose of radiation similar to cancer-associated radiation doses in A-bomb survivors,” David J. Brenner, PhD, director of Columbia University’s Center for Radiological Research.

“Radiation from CT scans done in just one year will cause 29,000 cancers in cancer-free patients and kill nearly 15,000 Americans,” researchers said Monday, December 14, 2009 (Archives of Internal Medicine).

“We fret about airport scanners, power lines, cell phones and even microwaves. It's true that we get too much radiation. But it's not from those sources — it's from too many medical tests.”
http://www.msnbc.msn.com/id/37623994/ns/health-health_care/
Optical Ultrasound Tomography®: early detection, safe, more data

- Optical Ultrasound Tomography is an enhanced version of photoacoustic imaging.

- The basic design elements of our new medical imaging technology are particularly suited for early detection and continuous bedside monitoring.

- This is an all-optical, non-contact imaging technology that combines light and sound to obtain functional and anatomic information.
Our non-contact ultrasound solution will be incorporated into the PAT 2700 family of cameras and scanners.

These will be portable, non-radiation cameras that will detect the presence, size, and location of a brain injury and send images to the waiting neurosurgeon.

They will provide “real time” images so that an Emergency Room physician will be able to triage which patient requires immediate surgery and which patient is able to be monitored and treated with medication.

They will safely provide continuous bedside monitoring.

They will detect if the blood in the brain is pink “new” blood or if it is dark “aged” blood – very important in the case of abuse.

The cameras will also be used as a tool for investigating brain illnesses and brain disorders, such as epilepsy, Parkinson’s, MS and schizophrenia.
“Photoacoustic Imaging combines light and sound to create detailed pictures of tiny structures in the body without the use of high-energy X-ray beams, which can be damaging. Unlike traditional radiology techniques, it also provides functional information about tissues and cells, with the ability to show blood flow and oxygen saturation. Photoacoustic imaging could revolutionize the way doctors detect and monitor cancer.” Dr. Wang, the Gene K. Beare Distinguished Professor of Biomedical Engineering, Washington University.

- Optical Ultrasound Tomography® will not only detect lesions and tumors, but will also non-invasively distinguish between malignant and benign masses.

- Optical Ultrasound Tomography® will calculate the concentration of oxygen-carrying blood cells—or hemoglobin—in each lesion.

- This is critically important as early-stage invasive cancers have a two-fold higher total hemoglobin concentration than benign lesions.
Our technology is non-invasive and non-contact.

Ultra High Resolution Optically Converted Ultrasound Image Pattern

LLNL near infrared light patent

Ultrasonic/Optical Conversion Algorithm

LLNL patent

LLNL – Lawrence Livermore National Labs
## Pricing comparison of medical imaging equipment

<table>
<thead>
<tr>
<th></th>
<th>X-ray</th>
<th>CT scan</th>
<th>MRI</th>
<th>PAT 2700</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of equipment</td>
<td>$350,000–$600,000 for a digital mammography</td>
<td>$1M</td>
<td>$1M–$1.7M</td>
<td>$49,900–$69,000</td>
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<tr>
<td>to the hospital or</td>
<td></td>
<td></td>
<td></td>
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<td>Cost of medical</td>
<td>$100</td>
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<td>Limited</td>
<td>Limited</td>
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<tr>
<td>Handheld</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Uses radiation</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
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</tr>
</tbody>
</table>
Revenue and profit projections (conservative)

Year 1  Development of prototype, submission for testing.

Year 2  Product fully tested, submitted to the FDA and EU, and “commercially ready” products shipping.

Year 3  $70M in revenue, $30M EBITDA (earnings before interest, taxes, depreciation and amortization)

Year 4  $200M in revenue, $80M EBITDA

Year 5  $700M in revenue, $275M EBITDA

In the top 15 most populous countries, there are approximately 107,000 hospitals, 4,500,000 physicians, and 500,000 medical clinics. Assuming just 1% of 5.1M places of opportunity purchase one scanner, the result is $175M in net profits.
Health care costs have been rising for several years. Expenditures in the United States on health care surpassed $2.3 trillion in 2008, more than three times the $714 billion spent in 1990, and over eight times the $253 billion spent in 1980.

In 2008, U.S. health care spending was about $7,681 per resident, the highest of all industrialized countries.

Almost twenty-five percent (25%) of all Americans facing foreclosure indicated that their foreclosure was caused by unmanageable medical bills.

An increasing number of U.S. businesses cite healthcare costs as the reason for failures.

*Health care costs are increasing much faster than the growth in the economy, gross domestic production (GDP), and wages. Such increases, if unchecked, threaten the financial stability of individuals, businesses and the future viability of our health care access.*” – *Massachusetts Attorney General*
Doctor Stavros G. Demos, Ph.D., is a scientist at Lawrence Livermore National Laboratory in the Physical and Life Sciences Directorate. Also, he is on the Scientific Staff at the National Science Foundation SF Center of Biophotonics Science and Technology at UC Davis. He is the premier expert in near infrared and optical imaging instrumentation. His work centers on:

- Interaction of lasers with optical materials,
- Non-radiation processes in laser materials,
- Optical properties of defects in high power laser materials,
- Laser material processing,
- Laser-induced damage in optical materials,
- Photonic applications in medicine,
- Subsurface imaging and lesion assessment in tissues, and
- Optical methods for in vivo tissue diagnostics.

http://cbst.ucdavis.edu/research/meet-the-researcher/dr-stavros-demos

Doctor Alexander Rubenchik, PhD, is presently a Staff Scientist at Lawrence Livermore National Labs, in Livermore, CA. His work centers on:

- Laser-matter interaction,
- Biomedical optics,
- Laser-tissue interaction and Plasma physics.

http://math.arizona.edu/~nrw/FNW_2010/talks/rubenchik.pdf
The NII Team

- **Dr. Patrick Dallas, PhD.**, has a background in Chemical Engineering and Process Control. He has lectured all over Europe and written many papers while working in research and academia. He is presently Chairman of Information Technology in Jamaica.

- **Dr. Neel Madan, MD.**, is a practicing Neuroradiologist at Tufts University Medical Center, Boston, MA. In addition to his clinical work, he is also an Associate Professor of Radiology and Pediatrics at Tufts University School of Medicine. Neel received his education at the New York Medical College and is associated with six (6) medical facilities, including Mass General Hospital. He is Board Certified and specializes in Pediatric Neuroradiology.

- **Michael J. Feeney**, President, M.S., Northeastern University, has extensive experience in optical networking and optics in medicine. He has a lengthy record of accomplishment in sales and sales management working for Fujitsu Network Switching, NYNEX and ITT.

- **James Hoffecker**, Field Engineering Manager, has extensive experience working as a Lead Field Service Engineer with knowledge of Nuclear Medical Imaging and pharmaceutical equipment.

- **Doctor Ryan Abbott** has an MD and JD and is an Assistant Professor at the David Geffens School of Medicine at UCLA. [http://www.drryanabbott.com/](http://www.drryanabbott.com/)