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On October 21, we had the pleasure of co-hosting, with the Haas Alumni Network, an event entitled:

## High Tech in Biotech: How Computing, Communication and Materials Technologies Are Revolutionizing Biotech and Medical Devices

As engineers with MBAs working in biotech, we are personally fascinated and inspired by the convergence of info tech, biotech, nanotech, communications, devices, and healthcare. This phenomenon is not new; in fact, it has been written about for nearly three decades. But what is occurring today has the promise of revolutionizing modern healthcare and extending it to millions more people around the world.

*The Economist's* April 2009 special report on health care and technology highlighted companies that are leading the charge including two of our presenting companies, Proteus Biomedical and Complete Genomics. This report and others have discussed several ways in which this revolution is occurring.

- Through IT, masses of information are being collected, analyzed and made accessible, driving new research and empowering patients.
- People in far-flung areas of developing countries are receiving medical care for the first time via the cell phones in their pockets.
- Smart pills and communicating devices are enabling precise targeting of therapies and driving patient adherence to regimens.
- Remote and less invasive surgeries are being conducted via robotics and sophisticated imaging technologies.

These advancements come at a cost, but many have the potential to reduce healthcare costs by enabling targeted therapies, reducing doctor and hospital visits, and eliminating some of the waste associated with treatments that are inappropriate or misapplied.

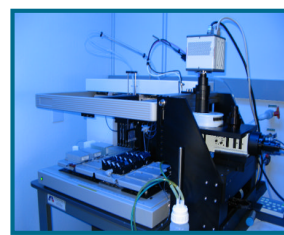
Wednesday evening's discussion included leaders from some of the most innovative firms in this space. We heard how these companies are developing the markets and business models for their products, what challenges they face, and, ultimately, how patients, physicians and investors will benefit. Here are some of the highlights.

### PRESENTING COMPANIES

#### Clifford Reid, CEO, Complete Genomics

Complete Genomics (CGI) is in the business of sequencing complete human genomes. They build

gene microscopes that allow us to see the basis for genetic disease the way light microscopes allow us to see microbial diseases. The first human genome was sequenced in 1995 for \$2.7 billion; CGI did it earlier this year for about \$4,000.



Gene Microscope

Mr. Reid comes from enterprise software, and is bringing together people with software, hardware, science, and business backgrounds to deliver sequencing via a unique services model.

CGI is building the largest DNA sequencing factory in the world and providing a turnkey, “cloud-sequencing” solution for any researcher with access to FedEx and the internet.

Because there are multiple pathways to the same disease, drugs only work about one third of the time. CGI plans on enabling researchers and biopharma companies to disambiguate cancer and other diseases so all patients can be treated, not just some of them. Eventually, they intend to enable the sequencing of every baby's genome.

CGI hopes to ultimately do for cancer what the light microbial microscope did for tuberculosis and generally enable a round of discovery that will change the face of medicine.

[www.completegenomics.com](http://www.completegenomics.com)

#### Mark Zdebllick, Founder and CTO, Proteus Biomedical

Proteus Biomedical is developing intelligent medicine products that address therapeutic areas where disease management complexity, patient monitoring requirements, therapeutic efficacy, and poor patient adherence create large clinical and commercial opportunities.

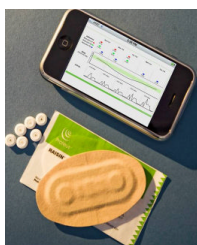
Their first technology is applied to therapeutic devices and improves patients' response rates to traditional heart failure treatments. ChipSkin

“We intend to do for cancer what the first microscope did for tuberculosis.”



technology enables the inclusion of silicon chips in pacemaker leads, so the location and direction of the stimulation energy may be electronically reprogrammed and directed toward the heart and away from the nervous system.

The second technology improves traditional pharmaceutical treatments. A chip on a pill that is food-based and powered by the body communicates to a patch which then relays encrypted data to a cell phone or computer where it is processed and sent to the patient, family members and doctor. It detects information such as medications taken, heart rate, temperature, steps taken, and position of the



body. Patients respond differently to therapies and often deviate from prescribed treatment plans or don't provide adequate information about their behavior and health - all contributing to wasted healthcare expense. The Proteus system enables active, intelligent management of treatments to improve results and reduce waste.

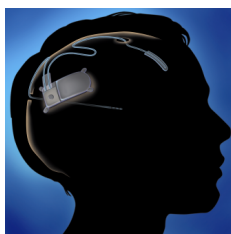
Overall, Proteus intends to change how the world interacts with medicine in the same way Apple has changed the way we interact with music by enabling digital communication of health information, electronic control of treatments, and personalized, computer-based management of patients' conditions.

[www.proteusbiomed.com](http://www.proteusbiomed.com)

**Frank Fischer, CEO, NeuroPace**

NeuroPace is developing implantable devices to treat severe neurological disorders with direct brain stimulation. Their product places electrodes on or in the brain which enables monitoring and recognition of EEG activity and treatment based on analysis of that data. Its first application will be treatment of epilepsy which affects about one percent of the population or three million people in the U.S. Half of those patients are not satisfied with their care because of poor seizure control or side-effects of current treatments.

The device monitors the brain's activity and if it detects abnormal electrical activity for that patient, stimulates as programmed. Information stored in the device can be transmitted to a web-based repository where the patient's physician



can see it anywhere in the world with internet access. This information can then be used by the physician to reprogram the device to improve response. The device is designed to reduce seizures by sending a series of imperceptible electrical pulses to normalize the brain's abnormal electrical activity before clinical symptoms occur. In one patient example, the number of episodes dropped from multiple per day to only a couple per month.

NeuroPace's technology is expected to be applicable in many other disease states as well. After twelve years of R&D, NeuroPace completed its pivotal study this year and will learn the results this fall.

[www.neuropace.com](http://www.neuropace.com)

**Wende Hutton, General Partner, Canaan Partners**

Canaan Partners is a global venture capital firm that invests in people who turn visionary ideas into valuable and significant healthcare companies. With \$3 billion under management, Canaan invests about 30-40% in biotech, device, and other healthcare firms. They focus on early stage investments and operate globally.

Examples of companies they're invested in:

- Apieron measures parts per billion of eNO (Nitric Oxide) in asthma patients
- Dexcom enables continuous 24/7 glucose monitoring of diabetic patients
- Transoma Medical makes implantable devices to track cardiac rhythms
- Data Sciences International is implanting sensors in lab animals for testing and extracting data
- Theraclone Sciences pulls data from B-cells and applies arrays to find antibodies for use in fighting infectious disease and inflammation

Below are some of the factors that Canaan considers when looking at companies in this sector:

- Is the technology enabling?
- What's the clinical value of the technology or size of the unmet need?
- Does it provide cost or efficiency advantages with data to prove it?
- Are there potential FDA hurdles?
- How does it contribute to personalized medicine?

[www.canaanpartners.com](http://www.canaanpartners.com)

“Doctors know only half of their patients take their medicine. They just don't know which half.”



## CHALLENGES THESE FIRMS ARE FACING

Managing a diverse staff

Scientists, hardware engineers, software programmers, device experts, and business people speak different languages and frequently hail from different countries.

*“The challenge is getting them to talk with each other about topics like project risk, success and completion using similar definitions but without getting rid of the language they need to operate effectively in their worlds.” - Clifford Reid*

In response, senior leaders along with HR actively and openly work through these issues, offering appropriate leadership development and training and encouraging a feedback-rich culture.

The FDA

The regulatory process is lengthy and unpredictable due to varying quality of reviewers, powerful proponents of an aggressive FDA, and high-profile problems that have led to risk-aversion. The FDA is only criticized for not being careful enough. There is little incentive for them to bring groundbreaking therapies to market quickly.

To address this, companies plan for different scenarios including significant, unexpected hurdles that can add a full year to time-to-market.

Policy changes and access to capital

There is a strong fear that healthcare reform combined with the financial environment will limit access to capital and stifle innovation in areas that would improve outcomes and ultimately decrease healthcare cost. For example, heart failure is the biggest item in the healthcare budget, most of which is hospital admissions. Half of those are re-admitted, mainly because patients don't take their medicines. One patient didn't take his medicine as directed, then fainted and broke his hip, creating additional cost.

*“If you remove the uncertainty around patient compliance with prescribed therapies, you dramatically reduce overall cost of healthcare.” - Mark Zdeblick*

To receive funding, even innovative companies addressing unmet needs often need to add an economic component to their story. Startups are calculating the cost of treatments and the impact on days out of work.

## TAKE-AWAYS

Today, wealthy countries spend far too much on healthcare while developing countries have far too little access to it. Four billion people are using the internet but only two billion benefit from modern healthcare. Complex diseases like cancer remain confounding to scientists. The most advanced disease treatments work on only a third of patients and only half of patients take their medications as

prescribed. Patients have too little information and control over their own care.

Healthcare may be late, relative to other industries, in going digital. But, these presenting companies and others are striving to make a major impact on the world's healthcare situation by braving the difficult, uncertain regulatory and financing environments to pave exciting new ground at the crossroads of high tech, biotech, and devices.

### About Sides & Associates

Sides & Associates, Inc. (S&A) was founded in 2001 to help high-potential biotech and technology businesses drive and manage growth. We work with promising start-ups and rapidly-growing companies to identify the right opportunities, plan their next stage of growth, and manage the consequences of that growth on their organizations. Bringing depth of expertise in cross-functional product development, portfolio management, and organizational excellence, S&A delivers solutions that are carefully customized to each company's size, culture and priorities.