REGIONAL TECHNOLOGY DEVELOPMENT & ENTREPRENEURSHIP
(A Case Study – Biotech)

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Biggest Global Problems Today

• Global Climate Change, Sustainability of the Planet
• Clean Water
• Energy Security, Energy Self-Sufficiency
• Food Security & Food Production
• Healthcare and Healthcare “Reform”

...and, Biotech will solve/tackle all of them
The Beginnings of an Industry – 40+ Years Ago

**West Coast**
- ALZA (1968)
- Cetus (1971)
- Genentech (1976)
- Hybritech (1978)
- Chiron (1981)
- Amgen (1980)

**East Coast**
- Genex (1977)
- Biogen (1978)
- Centocor (1979)
- Genzyme (1981)
- Celgene (1986)
- Cephalon (1987)
Several Thoughts on the Global Ecosystem

• Single, flat, interconnected, borderless marketplace
• Exploding population of middle class consumers
• Ascendancy of BRICs/CIVET
  – Brazil   – Columbia
  – Russia   – Indonesia
  – India    – Vietnam
  – China    – Egypt
  – South Africa   – Turkey
• Decreased importance of US economy in the world
• Increasing regulatory and trade friction
• Governments building their local economies, excluding others
• Political instability
• …but really ALL governments want to build/rebuild their economies with biotechnology

Source: Jeff Kindler and Burrill & Company
Global Pharmaceutical sales were in 2001

Global Pharmaceutical sales will be in phamerging markets by 2011

Global Pharmaceutical sales will be in phamerging markets by 2020

13%

33%

50%

Source: IMS Health
Greying World

Population aged 60 and over, % of total

The Number of People with Chronic Conditions is Rapidly Increasing


Number of People with Chronic Conditions (millions)

Percent of the Population with a Chronic Condition

Year


44.7% 45.4% 46.2% 47.0% 47.7% 48.3% 48.8% 49.2%

The “Healthcare System (Globally) Is Changing

<table>
<thead>
<tr>
<th>1900s</th>
<th>2000s</th>
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<tbody>
<tr>
<td>Acute care</td>
<td>Chronic care (to wellness care)</td>
</tr>
<tr>
<td>People/dying patients</td>
<td>Systems/Software</td>
</tr>
<tr>
<td>Place (hospitals)</td>
<td>Consumer digital health</td>
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<tr>
<td>Payment: Cost-based care</td>
<td>Value based care</td>
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</tbody>
</table>
The Healthcare Challenge

Outcomes
clinical, economic, quality-of-life

Infinite demand vs finite resources
unmet medical needs

Innovation and Cost of Care
increasing cost of care and acceleration of new technologies

Access to Care

Source: George Poste
The Strategic Future of Healthcare

Economic Unsustainability

or

Reform and Rational Care

Confronting the Imbalance Between Infinite Demand and Finite Resources

Source: George Poste
Market Trends and Drivers: Revolutionary Technologies and Evolutionary Practices

Automated Systems

Information Correlation

1st Generation Diagnostics

Revolutionary Technology

Where are we today

Evolutionary Practices

Electronic Health Records

Digital Imaging

Clinical Genomics

Genetic Predisposition Testing

Molecular Medicine

CA-Diagnosis

Pre-symptomatic Treatment

Lifetime Treatment

Personalized Healthcare

Artificial Expert System

Personalized Healthcare

Transitional Medicine

Episodic Treatment

Organized (Error Reductions)

Nonspecific (Treat Symptoms)

Source: IBM Life Sciences Solutions/Burrill & Company
The Key Strategic Elements in the Evolution of Healthcare

- Molecular diagnostics for disease prediction, prevention, earlier detection
- Biomarkers for health status profiling
- Risk management
- Molecular medicine
- Health status monitoring
- Optimized decisions
- E.care: EMR, PHR integrated care and wellness

- Prevention
- Disease subtyping and Rx choice
- Compliance
- M.health

Source: George Poste
So what will healthcare look like in 2020?
Healthcare is Digitized!

Home Diagnostics/Monitoring Systems:
• Drop blood onto your Blackberry or iPhone, telecommunicated to central labs, real-time Dx/Px
• Home monitoring

Centrally Delivered
• WAL*MART®
  & other consumer distribution centers
• Genetic Screening
• Pharmacy Distribution
• “Doc-in-the-Box”, staffed with nurse practitioners

Specialized Delivery
• Comprehensive cancer / cardiovascular centers
• “Heart Transplants ‘R’ Us” (surgery centers)
• Mayo/Cleveland Clinic for complex diseases
Big Trends: The Promise of Mobile Technologies for Health

Source: World Bank, world Development Indicators, U.N. telecommunications agency, Kaiser Family Foundation
So Who is Interested in Consumer Digital Health?

Answer: EVERYONE

Enablers:
- Information
- Broadband Carriers
- Providers
- Payors
- Facilitators

Digital Health Companies:
- Intel
- Microsoft
- Verizon
- Mayo Clinic
- WellPoint
- FedEx
- zipongo
- AT&T
- WebMD
- Aetna
- UPS
- MedApps
- HUMANA
- Kaiser Permanente
- CMS
- MedClim
- Wireless-Life Sciences Alliance
- Qualcomm
- BT
- All Hospitals/ Clinics
- Local Delivery
- BioSign
- HP

Patients:
- Individuals
- Social Media
- Blogs
Continuum of Care

1. Chronic Condition Management
   - Assisted self-management of chronic conditions powered by information and communication technologies

2. Episodic Care
   - Assisted self-management of non-urgent conditions, replacing in-person office visits where appropriate

3. Home as Hospital
   - Reduced hospital utilization and greater patient convenience and comfort through transition programs powered by home monitoring technologies

4. Health and Wellness
   - Increased patient empowerment and satisfaction through on-demand remote access to personalized information, education, and providers

5. Tele-consultation
   - Increased physician efficiency and productivity through remote consultation

Source: Kaiser Permanente
A Bio-Refinery Industry is Emerging

**Petrochemical Industry**
- Crude oil and natural gas
- Hydrocarbons
  - Fuels: Gasoline, diesel
  - Chemicals
  - Materials

**Biobased Industry**
- Plant biomass and wastes
  - Sugars, oils, etc.
  - Feedstocks and intermediates
  - Biofuels: Alcohols, Alkanes
  - Biodiesel
  - BioChemicals
  - BioMaterials
  - Fuels
  - Bulk and Specialty Chemicals
Biomass Crop-Energy Business

Petroleum Industry

- Exploration
- Production
- Supply
- Refinery
- Terminal
- Transport
- Retail

Reshaping the Biomass Feedstock Industry

- Biotechnology
- Seed
- Feedstock
- Biorefinery

- Proprietary feedstock
- Scaled production
- Designed to spec
- Coordinated supply
- Process efficiency
Revenue Potential of Biorefineries

- **Agricultural Inputs**
  - Seeds
  - Crop protection
  - Fertilizer

- **Biomass Production**
  - Energy crops
  - Sugarcane
  - Short rotation forestry

- **Biomass Trading**
  - Biomass aggregation
  - Logistics
  - Trading

- **Biorefining Inputs**
  - Enzymes
  - Organisms
  - Pretreatment chemicals

- **Biorefining Fuels**
  - First- and second-generation biofuel production

**Potential revenue by 2020 in USD B**
- $15B
- $89B
- $30B
- $10B
- $80B

Revenue potential: There is significant revenue potential along the entire biomass value chain.

Source: World Economic Forum
Conclusions Regarding Capital Markets:

Capital is readily available globally

• Regional differences in both availability and cost
• Angels: More established in US/Europe, but available globally
• Venture capital/private capital is readily available globally
• Public equity capital generally available for risk mitigated companies
• Non-dilutive capital available
  – Gift/grants
  – “Global arbitrage”
• Debt capital generally available only for operating companies with cash flow and/or profits

Creativity in capital raising is a must!
Conclusions

- Confluence
- Co-opetition
- Consumerization/customers
- Commercialization
- Cultures
- Creativity especially in business models/financings
- Change (accelerating)
Looking Back

• Science moves faster than expected
• Still IP uncertainty globally
• Capital was readily available and affordable
• Company model created value
• Traditional competition
• Value created in all segments
Innovation Makes a Difference

• Changes in healthcare solutions
• Reduces cost dramatically

…and it creates value:

- For Society: 1970-2000, increased life expectancy produced 50 percent of the growth in America’s GDP
- For Companies: Genentech $100B when acquired by Roche (Pfizer $91B at that time)
Defining Innovation

• The introduction of something new, a new idea, method, or device

Merriam-Webster

• Innovation is a new way of doing something or “new stuff that is made useful”. The goal of innovation is positive change, to make someone or something better.

Wikipedia

• The specific instrument of entrepreneurship. The act that endows resources with a new capacity to create wealth

Peter F. Drucker

• Without tradition, art is a flock of sheep without a shepherd. Without innovation, it is a corpse

Winston Churchill

• Innovation distinguishes between a leader and a follower

Steve Jobs, Apple
But What Is It Really…

• Where does it come from?
• Why do we have a lot of it here?
• What does it take to foster our innovative environment?
• What hurts innovation / makes it difficult
• What have we learned about innovation?
We encourage taking risks?

or

We tolerate failure?
Innovation Takes Many Forms

• New ideas, new products
  - Fax
  - GPS
  - Email
  - WebMD

• Changing existing products with new features/new industries
  - US mail → FedEx
  - Diagnostic test → “Onco-type Dx” (personalized medicine)
  - Rx (“one size fits all”) → Targeted therapeutics (biomarker/mutation based)
How Do We Stay Innovative?

- Allocate time to it
  - Google
  - 3M
- Build it into culture
  - Mission statement
  - Internal reinforcement
- Reward it
  - Measurement – financial, options (entrepreneurship/intrapreneurship)
  - “Atta boy!”
- Spin-outs are good
  - Genentech > Genencor
  - Cell Genesis > Abgenix
What Do We Know from Winners

• Management: Back the best people!
• Market: Identify large market need and satisfy it (be aware of “snapshot mentality”)
• Technology: Understand freedom to operate, needs to be real breakthrough innovation
• Execution: Essential
• Financial: Is there a well thought out road to success?
Lessons from “Losers”

- What can go wrong will go wrong
  - Technology is tough
  - IP: FTO
  - People issues
  - Time delays
  - Burn rates out of control
  - Clinical failures/delays
  - Reimbursement more challenging
  - Competition underestimates

Therefore, anticipate problems – they will happen
“Leadership is the art of accomplishing more than the science of management says is possible”

Colin Powell
Keys to Regional Innovation and Entrepreneurship

- Network, virtual world – physical geographic clusters less important
- Capital always available, just inefficient to get (and sometimes costly)
- Every idea “deserves” a company product – not true
- Entrepreneurs can be trained, it’s not born into them (Biz Plan Competitions, EOY, Idea to IPO, etc.)
- It’s not just having a patent, it’s FTO and it’s barriers to entry
- Importance of role models and community support

Therefore, it can happen everywhere!
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