Consumer systems for molecular biology

Lausanne

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Lecture overview

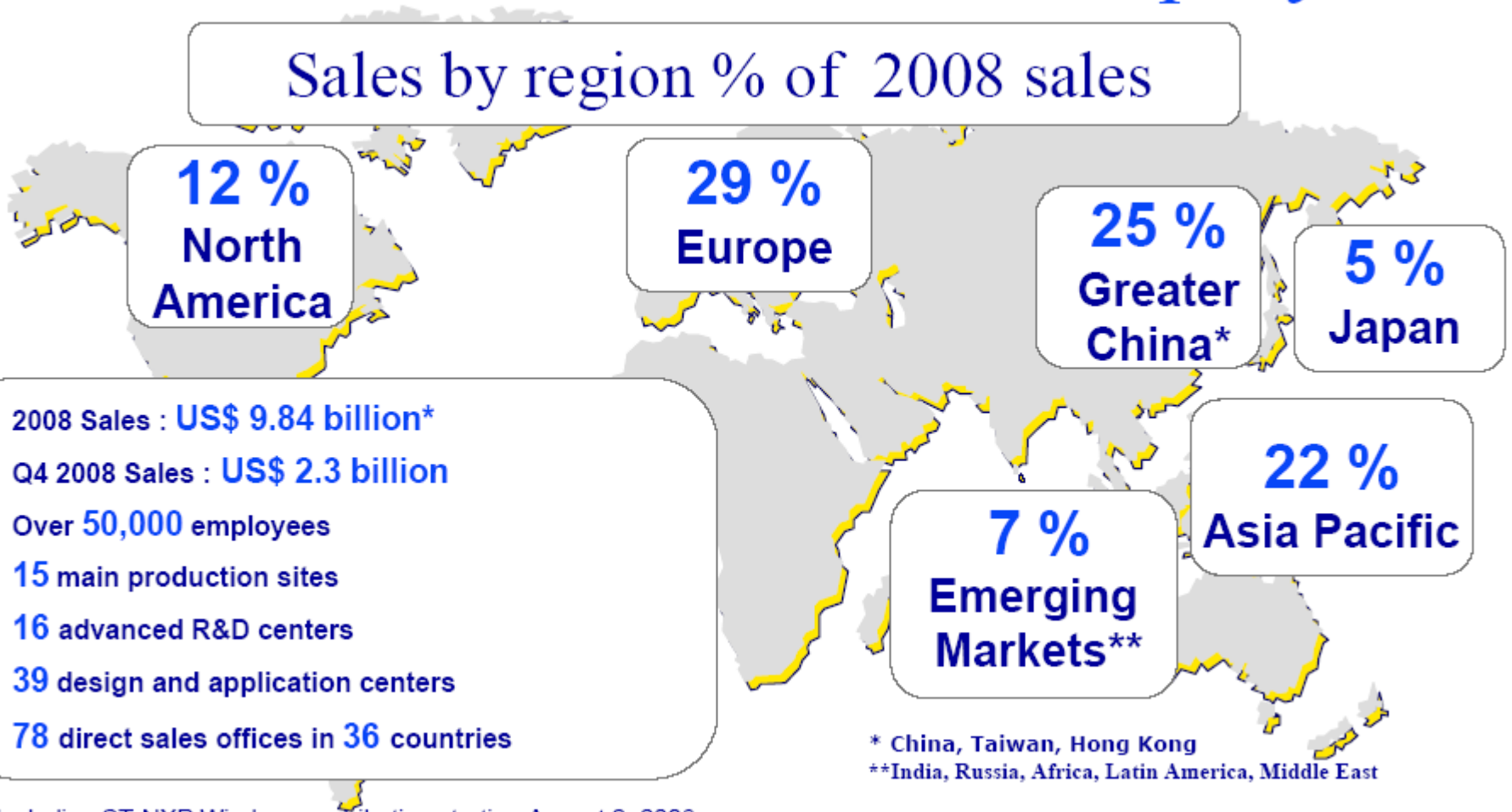
- First part (vision)
  - The position of a semiconductor company toward biotech
  - Looking for a successful businness
- Second part (roadmap)
  - What have we done until now (Products available)
  - What are we doing (New systems ready to launch)
  - What we want to do (Fields of improvement and research)

Top semiconductor ranking

2007 Rank	2008 Rank	Company Name	2007 Revenue	2008 Revenue	Percent Change	Percent of Total	Cumulative Percentage
1	1	Intel	33,995	33,767	-0.7%	13.1%	13.1%
2	2	Samsung Electronics	19,691	16,902	-14.2%	6.5%	19.6%
4	3	Toshiba	12,186	11,081	-9.1%	4.3%	23.9%
3	4	Texas Instruments	12,275	11,068	-9.8%	4.3%	28.2%
5	5	STMicroelectronics	10,000	10,325	3.3%	4.0%	32.2%
8	6	Renesas Technology	8,001	7,017	-12.3%	2.7%	34.9%
7	7	Sony	8,055	6,950	-13.7%	2.7%	37.6%
13	8	Qualcomm	5,619	6,477	15.3%	2.5%	40.1%
6	9	Hynix	9,047	6,023	-33.4%	2.3%	42.4%
9	10	Infineon Technologies	6,201	5,954	-4.0%	2.3%	44.7%
12	11	NEC Electronics	5,742	5,826	1.5%	2.3%	47.0%
10	12	Advanced Micro Devices (AMD)	5,918	5,455	-7.8%	2.1%	49.1%
14	13	Freescale Semiconductor	5,264	4,933	-6.3%	1.9%	51.0%
19	14	Broadcom	3,746	4,643	23.9%	1.8%	52.8%
17	15	Panasonic Corporation	3,880	4,473	15.3%	1.7%	54.5%
15	16	Micron Technology	4,869	4,435	-8.9%	1.7%	56.3%
11	17	NXP	5,746	4,055	-29.4%	1.6%	57.8%
21	18	Sharp Electronics	3,401	3,682	8.3%	1.4%	59.3%
18	19	Elpida Memory	3,838	3,599	-6.2%	1.4%	60.7%
25	20	Rohm	2,633	3,348	27.2%	1.3%	61.9%
20	21	nVidia	3,466	3,241	-6.5%	1.3%	63.2%
23	22	Marvell Technology Group	2,777	3,059	10.2%	1.2%	64.4%

A Global Semiconductor Company

Sales by region % of 2008 sales



- 2008 Sales : US$ 9.84 billion*
- Q4 2008 Sales : US$ 2.3 billion
- Over 50,000 employees
- 15 main production sites
- 16 advanced R&D centers
- 39 design and application centers
- 78 direct sales offices in 36 countries

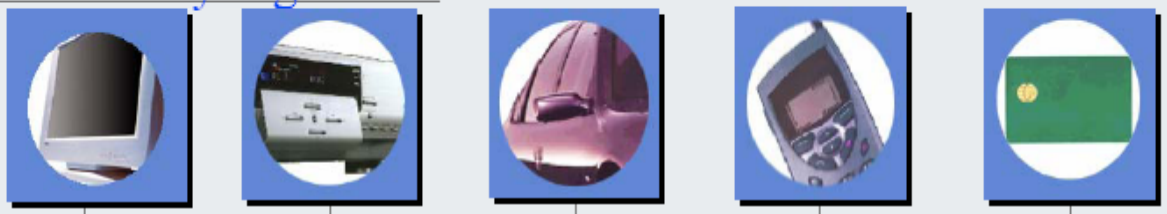
* China, Taiwan, Hong Kong
**India, Russia, Africa, Latin America, Middle East

* Including ST-NXP Wireless contribution starting August 2, 2008

Products portfolio

Complete product solutions for high growth applications

Priority segments



Computer peripherals | Digital consumer | Automotive | Communications | Smartcards

Focus applications

- Data storage
- Printers
- Optical mouse
- Monitors & displays
- Imaging
- Set-top boxes
- DVDs
- Digital TVs
- Digital cameras
- Digital audio
- Engine/body/safety
- Car radio
- Car multimedia
- Telematics
- Wireless
  - Connectivity
  - Mobile phone
  - Portable multimedia
- Networking
- Telephone
- Banking
- User ID
- Security

MEMS Success

STMicroelectronics Rides the Crest of the Coming Motion-Sensing Consumer Wave

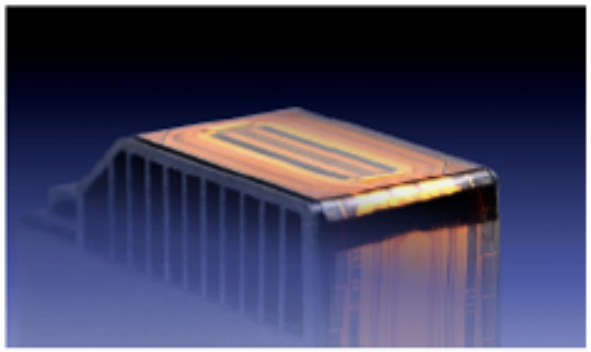
Market analyst iSuppli ranks ST No.1 in consumer and portable applications of motion-sensing chips: games controllers and smart phones fuel massive 118% growth in 2008 - ST jumps from No.4 to No.1 with

revenues more than twice those of its closest competitor

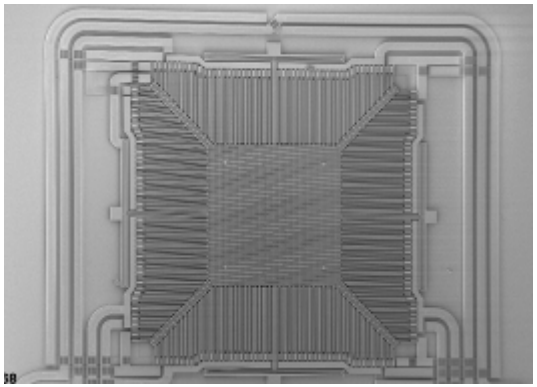
Geneva, January 15,2009

According to market analyst iSuppli, ST's sales of MEMS devices for portable and consumer devices, which are used in the Nintendo Wii, for freefall detection in PCs such as the Fujitsu Siemens ESPRIMO range, the Gyration Air Mouse, leading smart phones and many other new applications, surged from $96m in 2007 to more than $209m in 2008, a growth of 118% that makes ST the world's number one supplier in this exciting and rapidly growing market.

MEMS products



Micro Fluidic

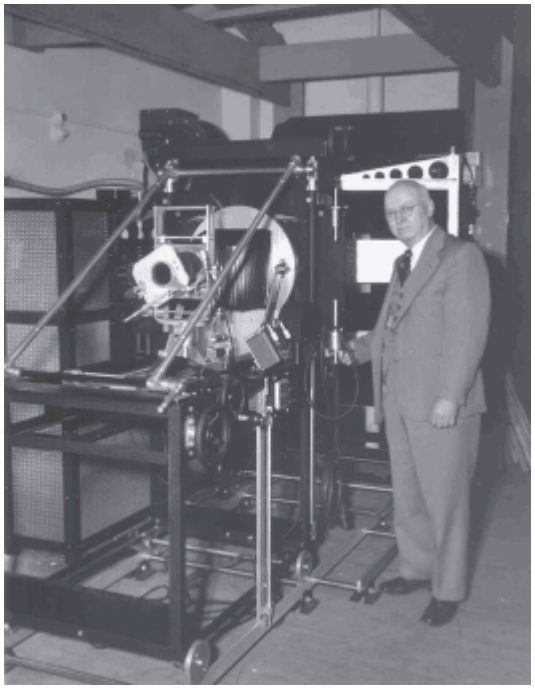


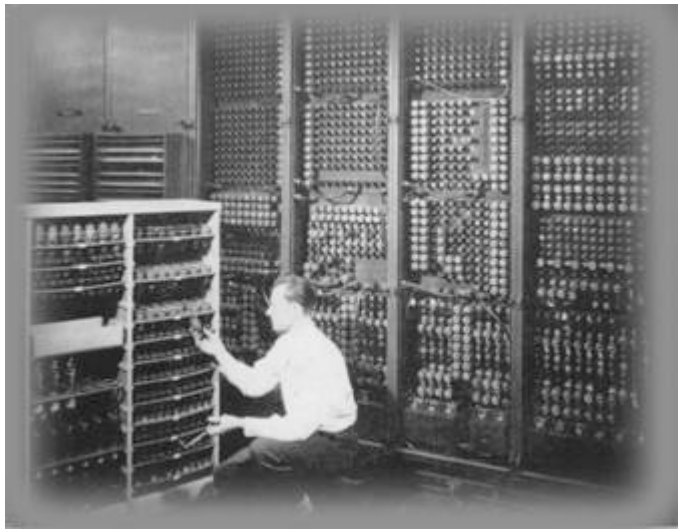
Accelerometer

The true story of MEMS in ST

- It started because it was “cool”.
- We found a “promising application”
- We developed the suitable technology
- We developed the product…
- That commercially proven to be a failure
- We found a “more promising application”
- We developed another product…
- That was another commercial failure
- We found another use of the product
- Success!!!

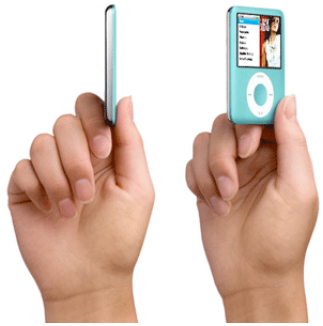
Achievements of Microelectronics

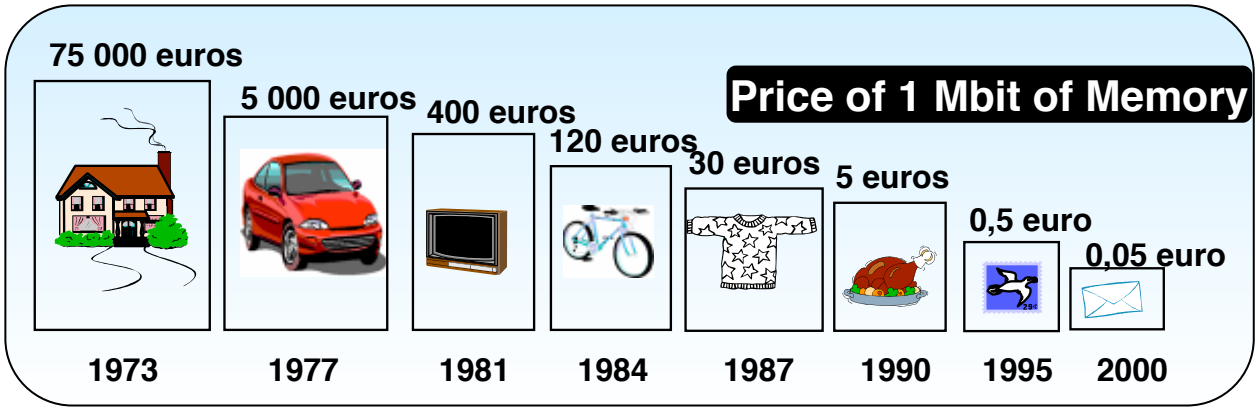




Trends

Miniaturization

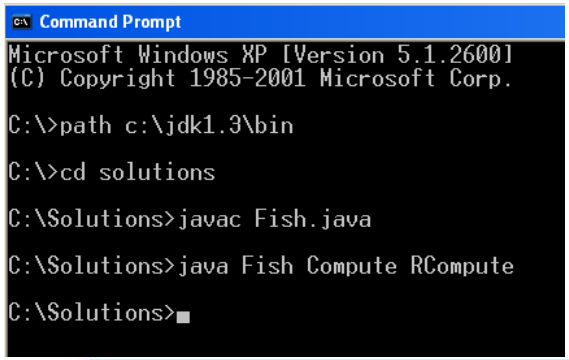




Lower cost

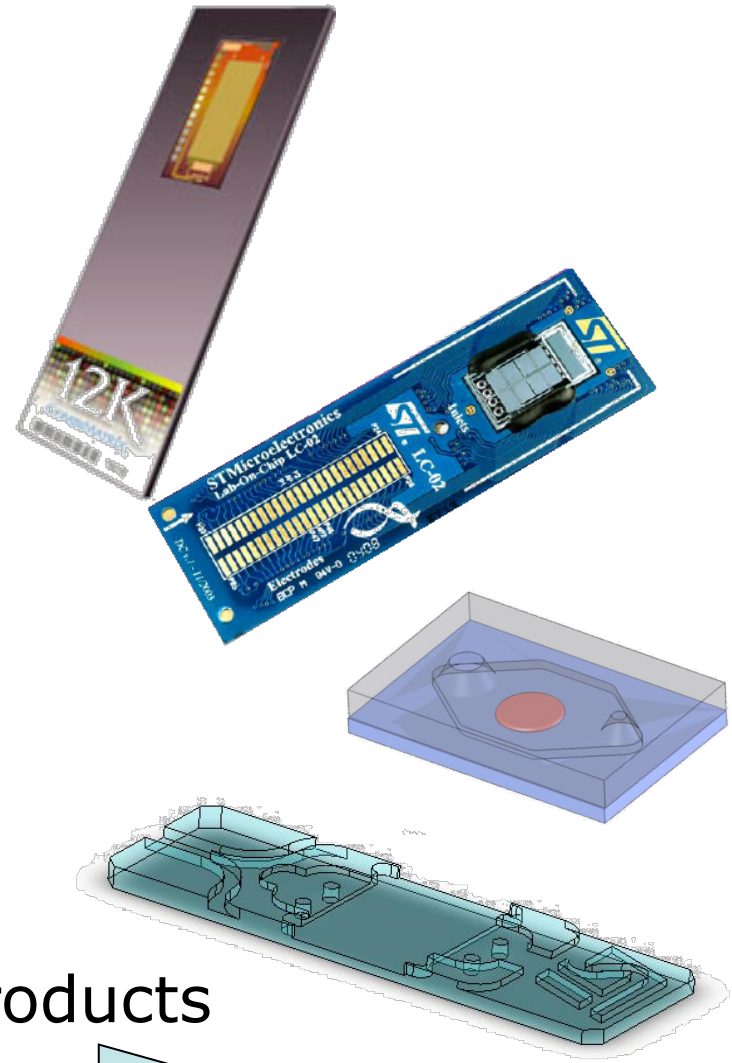
0,001 euro

2008



More functions
but
easier to use

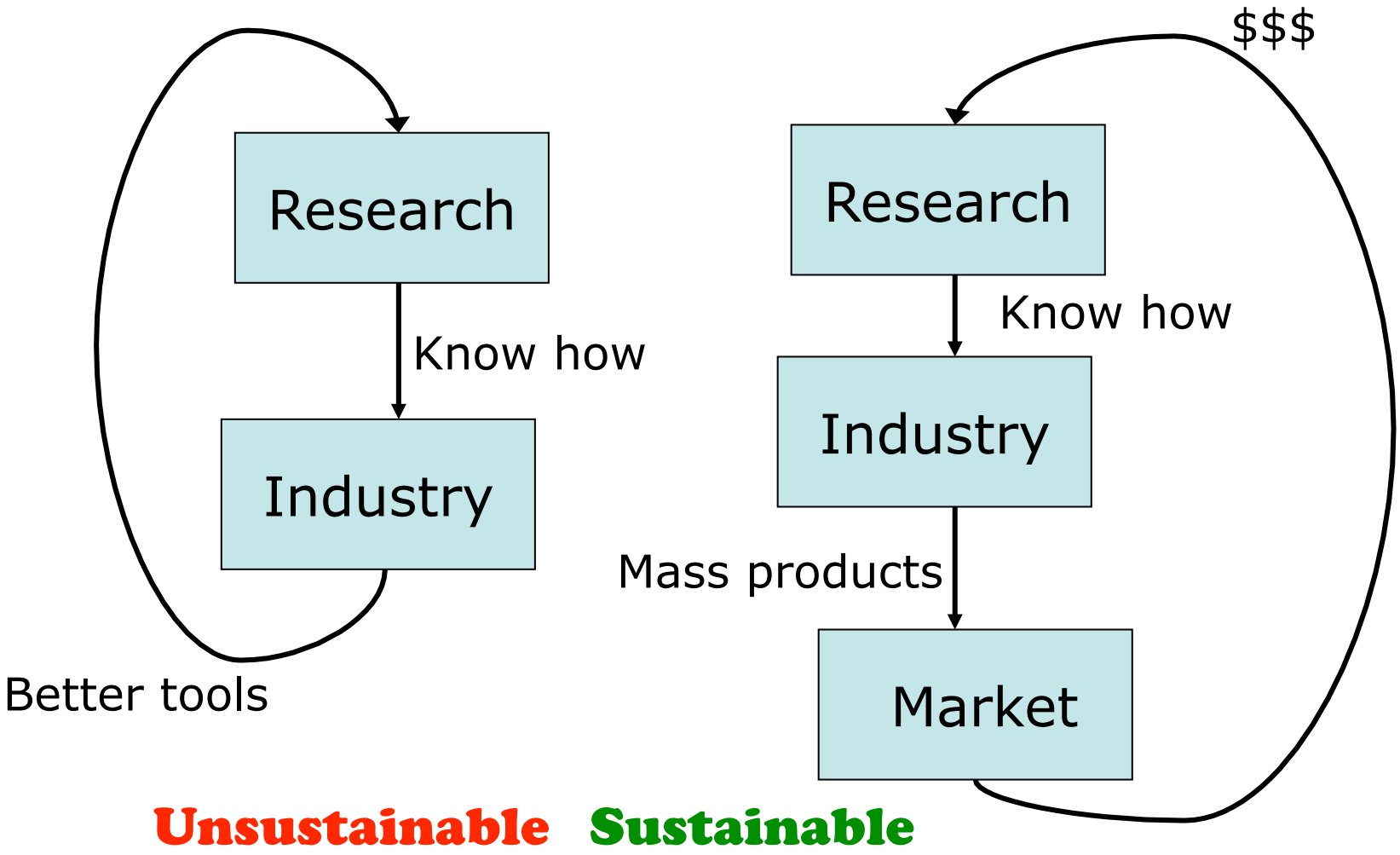
For Biology



From lab to “lab-on-chip”

From niche to high-volumes products

Development cycles



Unsustainable **Sustainable**

Which will be the successful application?

"Prediction is very difficult, especially if it's about the future."

--Nils Bohr, Nobel laureate in Physics

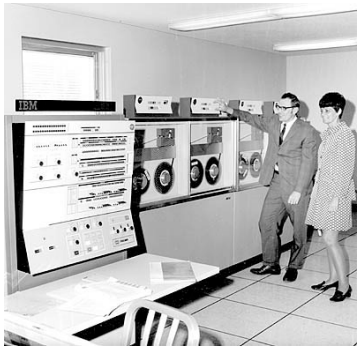
"It is far better to foresee even without certainty than not to foresee at all. "

--Henri Poincare in The Foundations of Science, page 129.

“The only way we can guess about the future in a certain situation is to look at the past, and with similar starting conditions expect a similar outcome. "

IT paradigma

Mainframe



Small business

Personal Computer

Internet

Multimedia

Portable appliances

- Research
- Banking
- Enterprise
- …

~ 1960 1980

- Desktop document creation
- Office automation
- e-mail

~ 1980 1995

- Entertainment:
  - Games
  - Music
  - Movies
- Communication
  - Voip
  - Blogs
  - Social
  - NW

Cost	>100k$	>10k$	<1k$
Target	Professionals	Experts	Everybody

Biotech Paradigma

Labs

Small health centers

•Research
•Hospital
•Biotech enterprises

Today

Lab on chips

•? Food control
•? Environment

?

Personal Genetics ?

• ???
• ???
• ???

Cost	>1000k$	>10k$	<1k$
Target	Professionals	Experts	Everybody

Our first target : DNA test

- WHAT?
  - Ability to identify specific DNA sequences in a sample
- WHY?
  - DNA is global, the whole life is based on it, from bacteria, plants, animals to humans.
  - DNA provides a lot of significative information
  - DNA techniques are robust and well established
  - DNA is relatively easy to detect (thanks to PCR)
  - DNA applications are “general purpose” (like a PC is a general purpose machine.
- HOW?
  - In a low cost instrument suitable for Point of care

Point of care solutions

Abbot i-Stat

Abaxis “Piccolo xpress”

QuickVue

Biosite “triage”

IN Ratio

Spectral Cardiac STATus™

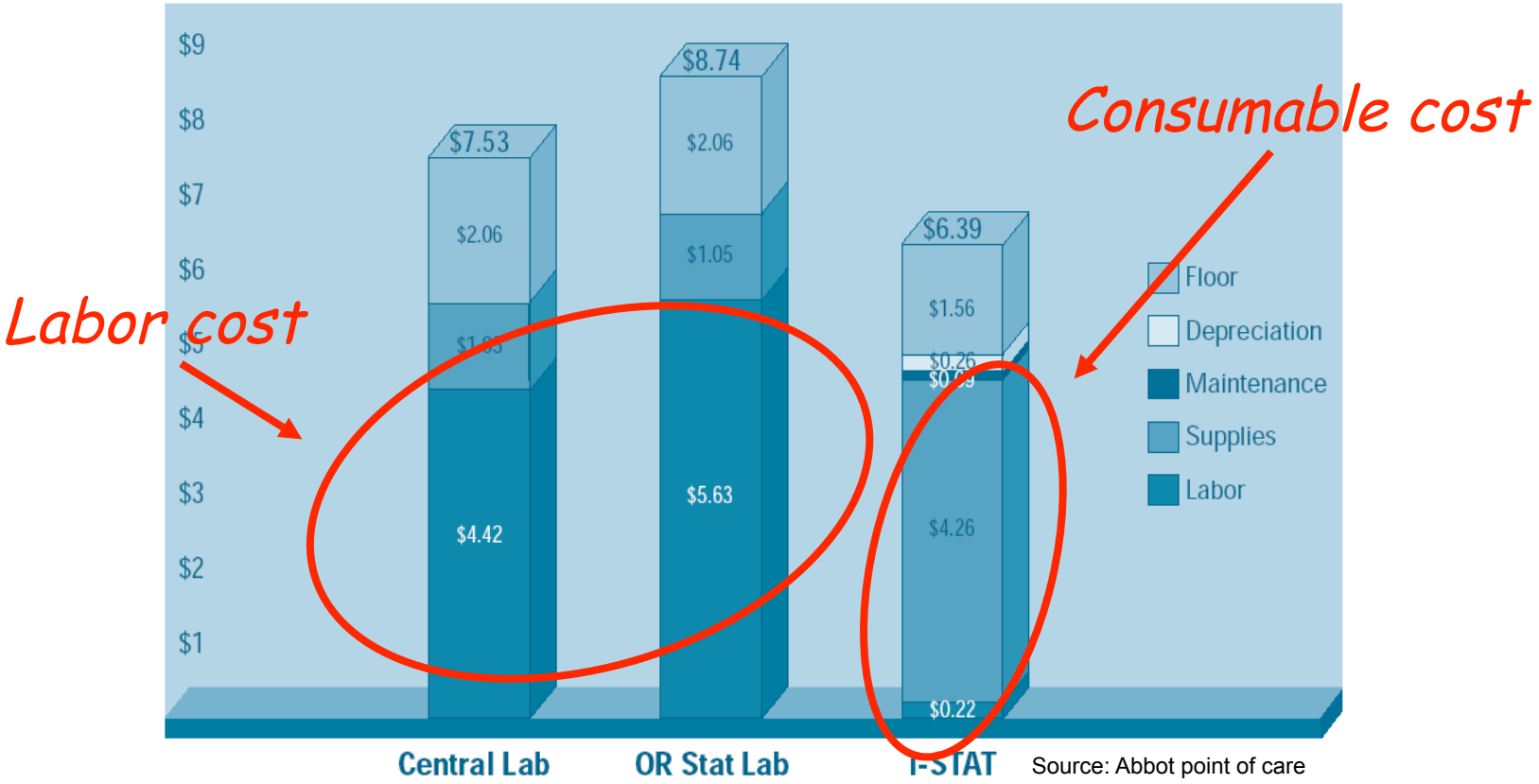
HemoCue:

- Hemoglobin
- Plasma
- Glucose
- Albumin

Genzyme “Osom”

Point-of-care cost per test

Example: gas contents in blood



Source: Abbot point of care

Consumer genetics

Now, you can find out if you're having a Boy or a Girl as early as week 7 during your pregnancy. See our **Pink or Blue® Gender Test** for more information.

Recent discoveries show that the amount of FAEE found in hair correlates with amount of alcohol consumption over time. Read more: **AbuseCheck™ Alcohol & Drug Abuse Test.**

Paternity is a commonly asked question. Today's technologies provide accuracies of greater than 99%. See more about **DNA Paternity Testing**.

Personalized medicine is now a reality. Genes affect the way individuals respond to many medications. Read more about the **AsthmaGEN™ DNA test.**

Your current caffeine intake may put you at risk of heart attack or decrease your fertility. See our **Caffeine Metabolizm DNA test** to learn more.

Genetic studies have revealed that, for some people, drinking moderately can lower cholesterol levels and risk of heart attacks. See more about **Alcohol Metabolizm** testing.

Today, many people are using DNA to verify biological relationships, such as **siblingship, grandparentage, or twin zygosity**.

The **Pink or Blue Pregnancy Test w/ Early Gender Kit** is used to first test for pregnancy and then designed to be used to determine gender shortly after a positive pregnancy test.

Personal full genomic profile

Illumina DNA sequencing available, if not affordable, to the consumer

By Thomas Kupper
UNION-TRIBUNE STAFF WRITER
2:00 a.m. June 11, 2009

The San Diego biotechnology company Illumina is launching a futuristic service that will give consumers the chance to get their DNA sequenced.

But it's not cheap: $48,000.

The company, which specializes in DNA research tools for scientists, thinks consumer gene sequencing could become widespread within a few years. That could give patients quick access to personalized information as the role of specific genes in disease becomes better understood.

For now, the company hopes to attract a few early adopters to use the service and in the process help it build the infrastructure and physician network necessary for wider use.

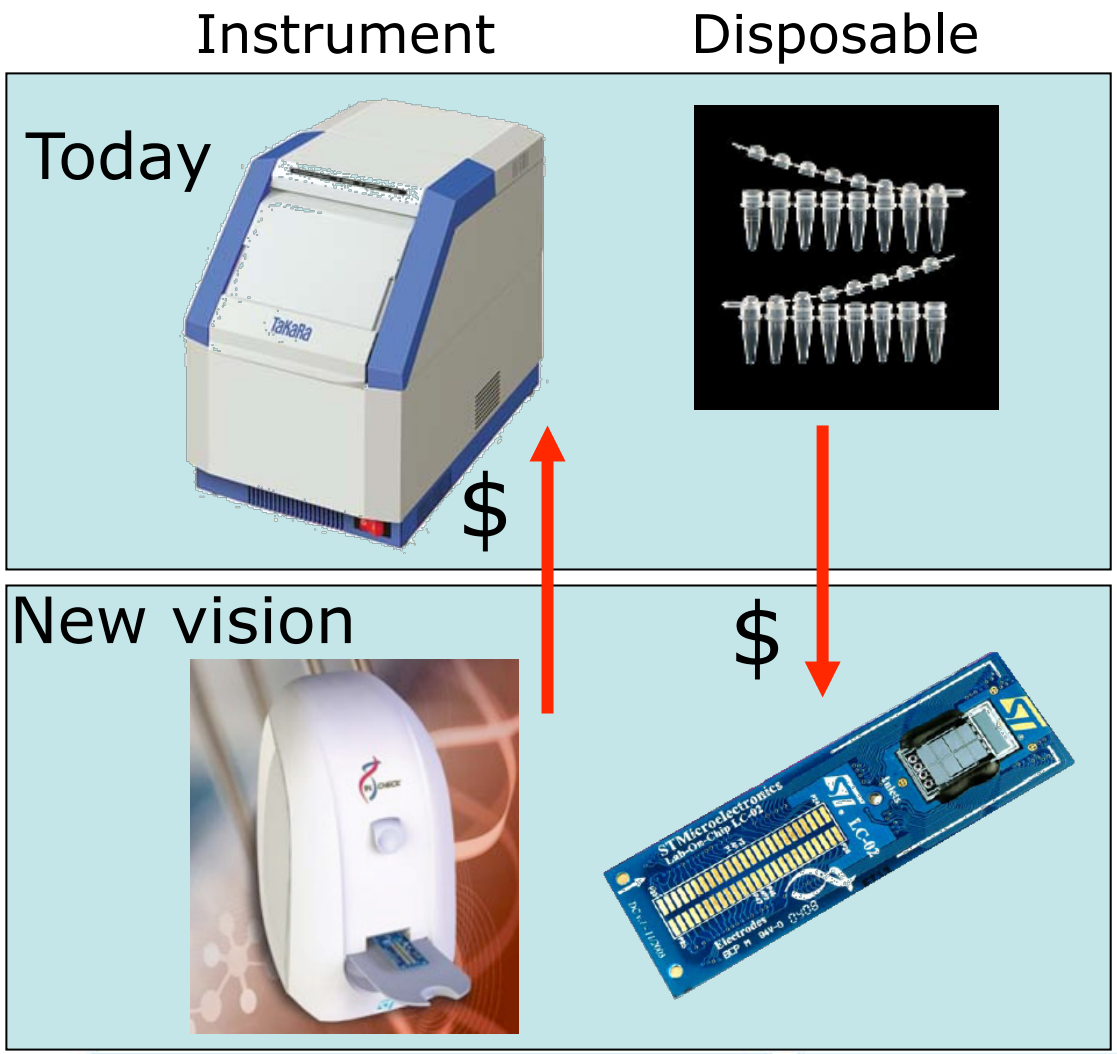
"Obviously it's not a big market at $48,000," said chief executive Jay Flatley, who announced the service yesterday at a Consumer Genetics show in Boston. "But it's a price at which at least a few people will do this."

The company hopes consumer genetics will help it build on the quick success it has achieved with research tools. Last year Illumina reported $50.5 million in net income as sales grew 56 percent to $573.2 million, making it one of San Diego's largest biotech companies.

One other company, Massachusetts-based Knome, already offers a sequencing service but charges $99,000. Several companies also offer services, some for a few hundred dollars and in some cases using Illumina technology, that test for specific genetic markers that are linked to disease.

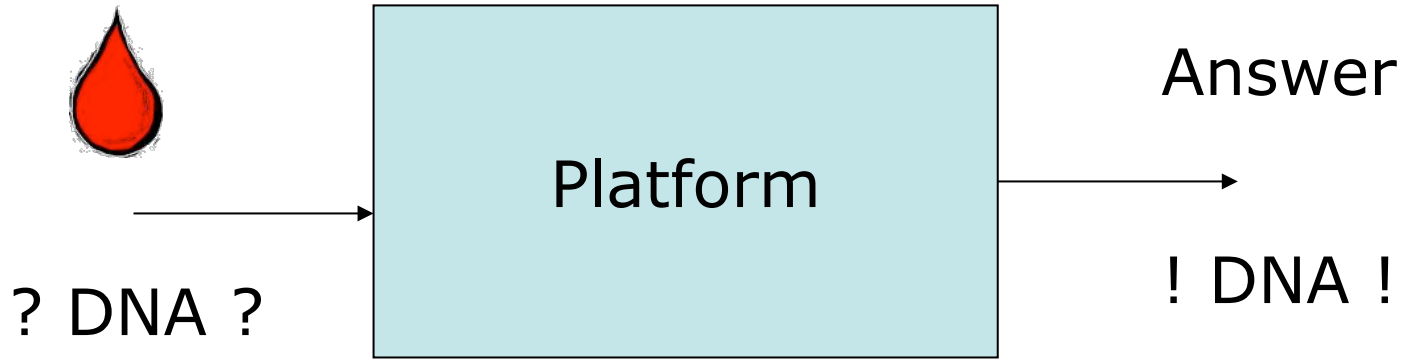
The advantage of a full genome sequence is that a patient need not undergo repeated tests for specific gene markers as more becomes understood about them, because the patient's genetic information has already been captured.

A new system partition



- Low instrument cost:
  - no need for huge initial investment
- Pay per use:
  - No need to perform a minimal number of tests to be cost effective
- Simpler use:
  - The disposable is pre-activated and has the highest industry quality standards
  - Less trained personnel

The dream platform



- Cheap
- Portable
- Simple to use it

Another lesson from the past

"These instruments all were being designed for the doctor's office. The ability of a physician to screen patients is something physicians are interested in"

"The developing concept was quite good, but as physicians started to buy and use them there was the strong suggestion that patients might be able to use things and do them on their own"

Anton H. Clemens
Inventor of the Ames Reflectance Meter
(The first blood glucose meter) in 1970

Thank You