Where Science means Business:
Transforming Basic Researchers into Entrepreneurs along the Tech Transfer Process

Y. Yarmut, Executive VP, Licensing & IP

The Technion – 25-Dec-2008
When it comes to the future, our task is not to foresee it, but rather to enable it to happen.

Antoine de Saint-Exupery (1900-1944)
The Technology Transfer Process

HUJI researchers discover new invention & submits disclosure

Yissum protects the IP and commercialises

Yissum pays royalties to the researchers and HUJI

The Industry partner pays for the use of IP to Yissum
1. Research in HUJI
The Hebrew University of Jerusalem

- 4 Campuses
- Over 400 Researchers in Applied Sciences
- 5 Affiliated Hospitals
- 1,600 Post-Graduate Students in Biotechnology
- 3,500 Research Projects
- 1,000 Researchers (Staff Members)
- >100 Research Centres
- 24,000 Students

- 30% of all Israeli academic scientific research
- 43% of Israel’s biotechnology research
- >1/3 of PhD students in Israel
A Broad Range of Technologies
Excellence at Hebrew University

A Nobel Heritage

• 2002 Nobel Prize in Economics
  – Daniel Kahneman, HUJI/Princeton

• 2004 Nobel Prize in Physics
  – David J. Gross, (Alumni)

• 2004 Nobel Prize in Chemistry
  – Avram Hershko, (Alumni-MD)
  – Aaron Ciechanover, (Alumni-MD)

• 2005 Nobel Prize in Economics
  – Robert J. Aumann,

• 2006 Nobel Prize in Chemistry
  – Roger Kornberg, Stanford/HUJI

Math & CS Excellence

• 1976 Turing Award
  – Michael Rabin

• 1994 Nevanlinna Prize
  – A. Wigderson

• 1997 Science Magazine
  – Israeli CS: First in the World

• 1988 First Virus Outbreak
  – First Antivirus Developed

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The Hebrew University of Jerusalem
HUJ World Ranking

- U of Texas for Institute of Higher Education, Shanghai Jiaotong University
  - Israel 12\textsuperscript{th} worldwide in academic research
  - Hebrew University no. 1 in Israel
  - 60\textsuperscript{th} worldwide
  - Only Israeli university in top 100
**Patent filings**

Patent applications*, per $1bn of GDP†, 2007 estimate

- **Israel**
- Switzerland
- Finland
- Sweden
- South Korea
- Japan
- Germany
- Netherlands
- United States
- **World total**
- France
- Australia
- Britain
- Canada
- China
- Italy
- Other

*Under the Patent Co-operation Treaty  †At 2007 prices

Source: World Intellectual Property Organisation
2. Yissum
Where Science Means Business

The Hebrew University
Non-profit Organization
Founded 1925

Yissum Board of Directors
Business leaders

Yissum Business-oriented organization
Founded 1964
<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giora Yaron, PhD - Chairman</td>
<td>Chairman, Mercury; founder, P-Cube, Exanet, Qumranet</td>
</tr>
<tr>
<td>Reuven Behar</td>
<td>Managing Partner, FBC&amp;Co.; chairman, Netafim</td>
</tr>
<tr>
<td>Hervé Bercovier, PhD</td>
<td>Hebrew University, VP R&amp;D</td>
</tr>
<tr>
<td>S. Morry Blumenfeld, PhD</td>
<td>VC, ex-CEO GE Medical, Israel</td>
</tr>
<tr>
<td>Martin Gerstel</td>
<td>Ex-CEO Alza; chairman, Compugen, Evogene</td>
</tr>
<tr>
<td>Elhanan Hacohen</td>
<td>Hebrew University, VP &amp; Director General</td>
</tr>
<tr>
<td>Amos Mar-Haim</td>
<td>Director, JDA; Ex-CEO Clal Industries</td>
</tr>
<tr>
<td>Hadar Ron, MD</td>
<td>Managing Director, Israel Healthcare Ventures</td>
</tr>
<tr>
<td>Hermona Soreq, Prof.</td>
<td>Hebrew University, Faculty of Science</td>
</tr>
<tr>
<td>Moshe Vigdor</td>
<td>Director General, Jewish Agency</td>
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</table>

Non-Profit | Academia | Investments | Industry

The Hebrew University of Jerusalem
Yissum, Licensing & IP Group Organization

Exec. VP License & IP

CEO

CFO

General Counsel

Exec. VP License & IP

VP Scientific Services (PT)

VP Licensing Agri. & Nat. Science

VP IP

Assistant (50%)

Assistant

Assistant (33%)

Assistant

IP Department

Patent Attorney

IP & Bus. Intelligence Officer

Licensing Officer Healthcare

Licensing Officer Healthcare

Licensing Officer Physical Sciences & IT (PT)

VP Scientific Services (PT)

Consultants

Assistant

Assistant (50%)

Assistant (33%)

Licensing Officer

Physical Sciences & IT (PT)

Consultants

Internship

Assistant

Assistant (33%)

Assistant (50%)
Top Notch, Business-Focused Team

- 22 employees creating hundreds of opportunities for thousands of people
- Experienced personnel with relevant industry experience
  - Licensing
  - Scientific services & sponsored research
  - Patents
  - Legal
  - Finance & admin
- Industry-standard employment and compensation structures
The Challenge

**Industry vs. Academia**

- **Product-based** vs. **Knowledge-based**
- **Business-oriented** vs. **Research driven**
- **Mission/project focused** vs. **Broad scope**
- **Confidentiality essential** vs. **Publications**
- **Timeframes & milestones** vs. **Loose time limits**
- **Economic role** vs. **Educational & Research role**
3. Intellectual Property (IP)
Intellectual Property

Intellectual Property at HU
• Yissum owns all IP developed at HU

2007 Snapshot
• 121 new inventions
• 93 new patents applications
• 64 new patents granted
IP Management

5,500 patents ≠ 1 patent \times 5,500

Responsibility for IP:
1. IP Protection:
   IP Strategy, Maintenance, Administration & Follow-up

2. To serve as professional counseling in IP matters to:
   • Licensing Department and other departments in Yissum.
   • HUJI – researchers & HUJI Authority for R&D (ARD).
   • IP matters in agreements.
   • External Patent Counsels (supervise Quality, Costs & Work division).
   • Work with Yissum’s Licensees & Partners
### Founders’ Equity

<table>
<thead>
<tr>
<th></th>
<th>Start-up</th>
<th>Incubation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researcher’s lab:</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Yissum &amp; HUJI:</td>
<td>40%</td>
<td></td>
</tr>
</tbody>
</table>

The Researchers have a real, direct and fair INCENTIVE PLAN.
4. Project/s
The Circles Model

- IP & Management
- Projects “Creation” and Planning
- Licensing & IP
- Day-to-Day Management
- Capital Raising
- Researcher’s Education
- Licensing & Startup Establish.
5. Business Development
**Patent & Project**

**Project** is the asset for commercialization.

**Project** may consist of:
- Part of a **patent**
- Several **patents**

- Patent 1 → **Project 1**
- Patent 2 → **Project 2**
- Patent 3 → **Project 3**
- Patent 4
- Patent x → **Project n**
Licensing & IP: The Strategic Model & Business Structure

Capabilities
- IP & Patents
- Proj. “Creation” and Screen
- Planning
- Raising Capital
- Licensing & Startup Est.
- Project Committees

Markets
- North America
- Western Europe
- Far East
- South America
- Middle East
- Eastern Europe

Exec. VP & Licensing
- Medical Sciences
- Agri & Nat. Sciences
- Physical Sciences
- IT & Comp Sciences
- Scientific Services
- MarCom
6. Licensing & Scientific Services

Licence

In consideration of payment
Spiral hereby grants to
exclusive, non-transferable
Software on the Equi
by licensee with re

# The “Contribution Matrix”

<table>
<thead>
<tr>
<th>Activity</th>
<th>Yissum</th>
<th>Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project “Creation”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project screening, Technology assessment, Tech. feasibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic plans</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R&amp;D and Day-to-Day management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intelligence, Information, Market research, Strategic alliances</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raising capital</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Yissum: Operational Objectives

1. Locate “all” potential projects within the HU
2. Professional evaluation and sorting of projects
3. Focus on high potential projects
4. Focus on quality vs. quantity (improve “hit rate”)
5. Increase no. of successful projects
6. Increase short & long term revenues
7. Provide appropriate services to researchers
8. Provide appropriate services to industry
9. Emphasis on licensing
10. Keep renewing
Using the WEB as a marketing tool
Drug Development Timeline

Standard time to start Phase 3 can be up to 11 years. Early exits feasible after Phase 2 trials

- Research (in vitro/lab): 2-4 years
- Development (animal trials): 2-3 years
- Clinical Trials (Phase 1 and 2): 3-4 years

“Valley of Death”

Investments Made

Potential Exits
Ag Biotech Product Development Process And Related Expense*

- **Discovery**
  - $2-5M (5%)
  - High throughput screening
  - Model crop testing

- **Year 0**

- **Year 1**
  - Proof-of-Concept
  - $5-10M (25%)
  - Gene optimization
  - Crop transformation
  - Bio-evaluation
  - Greenhouse and field trials

- **Year 2**
  - Early Development
  - $10-15M (50%)
  - Trait development
  - Bio-evaluation
  - Field trials
  - Pre-regulatory data
  - Large scale transformation

- **Year 3-5**
  - Advanced Development
  - $15-30M (75%)
  - Trait integration
  - Field testing
  - Agronomic evaluation
  - Regulatory data generation

- **Year 6-8**
  - Regulatory Submission
  - $20-40M (90%)
  - Regulatory submission
  - Seed bulk-up

*Numbers (time duration, spending, and probability of success) are all estimates. The actual for individual projects could vary.*

*Source: Crop Biotechnology Advances Monsanto, ABIC2004*
Technology Transfer Management

Patents

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IP Type</td>
<td>Type</td>
<td>Status</td>
<td>Country</td>
<td>Publication No.</td>
</tr>
<tr>
<td>0001-00</td>
<td>Israel</td>
<td>Abandoned</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0001-01</td>
<td>US</td>
<td>Expired</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0001-02</td>
<td>Europe</td>
<td>Not Renewed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Family

Number of records: 5

Go
7. Value Creation & Income
The Invention Life Cycle

Yissum receives innovation disclosures

The invention review by the LO (License Officer) & IP Department.

Preparation of prepare and sign a DOI

Invention clearance & evaluates

Locating target of potential partners

Formulated the Project Integrated Strategy. (IP & Licensing strategy)

Internal Project Plan

Definition of the commercialization strategy

IP Protection decision

Start the licensing process

Agreement negotiation and closing

Monitor & follow-up the performance of the agreement
Strategic Supporting Plans

**Current**

- **“Baby Seed”**
  - $500k/year to seed promising technologies
- **Cleantech Fund**
  - Recycling proceeds of partial exit from $130M investment in MobilEye to support proof of concept work in cleantech
- **Expanding client base beyond HU**
  - Al Quds University
  - Other

**In Process**

- **Proof of Concept Fund**
  - Pool of capital to support promising early stage projects through proof of concept
- **Yissum Holdings**
  - Aggregate Yissum share in life science companies past proof of concept, with external validation, but still requiring support to unleash potential and raise capital to do so
Value Creation Yissum & Partner (Bottleneck stays with the Partner!)

**Preparation**
- Define strategic project profile
- Prepare non-confidential information
- Develop valuation of projects
- Put on Yissum website

**Option Evaluation**
- Prepare confidential
- Identify potential partners and prioritize
- Pursue targeted companies

**Review by Interested companies**
- Collect proposals
- Confirm capabilities of interested parties
- Discuss terms with interested partners

**Negotiation and diligence**
- Finalize term sheet
- Support internal evaluations
- Facilitate diligence reviews
- Close Option/MOU

**Close Contract**
- Manage legal reviews
- Drive contract to definitive agreement & SL

Time for Licensing: 6-24 months!
## Business Model with Yissum (Life Sci.)

<table>
<thead>
<tr>
<th>Consideration Type</th>
<th>Start-up</th>
<th>SME's</th>
<th>Big Entities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Licensing Fees</td>
<td>Negotiable</td>
<td>Must</td>
<td>Must</td>
</tr>
<tr>
<td>Equity / Exit Fees</td>
<td>Must</td>
<td>Negotiable</td>
<td>-</td>
</tr>
<tr>
<td>Licensing Maintenance / Minimum Royalties</td>
<td>Must</td>
<td>Must</td>
<td>Must</td>
</tr>
<tr>
<td>Royalties on final product sales</td>
<td>Must</td>
<td>Must</td>
<td>Must</td>
</tr>
<tr>
<td>Sub-License Fees / Milestone Payments</td>
<td>Must</td>
<td>Must</td>
<td>Must</td>
</tr>
<tr>
<td>Patent Reimbursement &amp; Expenses</td>
<td>Must</td>
<td>Must</td>
<td>Must</td>
</tr>
<tr>
<td>Sponsored Research</td>
<td>If required by the Licensee</td>
<td>If required by the Licensee</td>
<td>If required by the Licensee</td>
</tr>
<tr>
<td>Scientific Services</td>
<td>If required by the Licensee</td>
<td>If required by the Licensee</td>
<td>If required by the Licensee</td>
</tr>
<tr>
<td>Consulting</td>
<td>If required by the Licensee</td>
<td>If required by the Licensee</td>
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## Business Model with Yissum (IT&CS)

<table>
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<tr>
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<td>Negotiable</td>
<td>Must</td>
<td>Must</td>
</tr>
<tr>
<td>Equity / Exit Fees</td>
<td>Must</td>
<td>Negotiable mostly yes</td>
<td>-</td>
</tr>
<tr>
<td>Licensing Maintenance / Minimum Royalties</td>
<td>Must</td>
<td>Must</td>
<td>Must</td>
</tr>
<tr>
<td>Royalties on final product sales</td>
<td>Rarely</td>
<td>Rarely</td>
<td>Rarely</td>
</tr>
<tr>
<td>Sub-License Fees / Milestone Payments</td>
<td>Must</td>
<td>Must</td>
<td>Must</td>
</tr>
<tr>
<td>Patent Reimbursement &amp; Expenses</td>
<td>Must</td>
<td>Must</td>
<td>Must</td>
</tr>
<tr>
<td>Sponsored Research</td>
<td>Rarely</td>
<td>Rarely required by the Licensee</td>
<td>Rarely required by the Licensee</td>
</tr>
<tr>
<td>Scientific Services</td>
<td>Rarely</td>
<td>Rarely required by the Licensee</td>
<td>Rarely required by the Licensee</td>
</tr>
<tr>
<td>Consulting by Researcher (=inventor)</td>
<td>Almost always required by the Licensee</td>
<td>Almost Always Required by the Licensee</td>
<td>Almost Always required by the Licensee</td>
</tr>
</tbody>
</table>
Success Stories

Advanced Warning System
Vision based Driver Assistance system for accident prevention and mitigation

Prof. Amnon Shashua
Computer Science & Engineering
Faculty of Science

2007 Valuation of $600 million (investment by Goldman Sacks)

DOXIL®
Doxorubicin HCl liposome injection (Oncology)

Prof. Yechezkel Barenholz
Department of Biochemistry
Faculty of Medicine

2007 sales $420 million

For Treatment of Alzheimer’s Disease and Dementia

Prof. Marta Weinstock-Rosin
Department of Pharmacology
Faculty of Medicine

2007 sales $632 million

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## Comparison of Technology Transfer (Per $1Bn Research)

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<thead>
<tr>
<th></th>
<th>US</th>
<th>HUJ</th>
<th>UK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spin-outs created</strong></td>
<td>50</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td><strong>Licensing income</strong></td>
<td>$31.1M</td>
<td>$120M</td>
<td>$12.4M</td>
</tr>
<tr>
<td><strong>Licenses signed / year</strong></td>
<td>206</td>
<td>160</td>
<td>120</td>
</tr>
<tr>
<td><strong>Invention disclosure</strong></td>
<td>440</td>
<td>520</td>
<td>399</td>
</tr>
</tbody>
</table>
Yissum: Annual Revenues (M$)

Year: 1997 to 2007

- 1997: $13.7
- 1998: $14
- 1999: $17
- 2000: $17.3
- 2001: $22
- 2002: $29
- 2003: $32
- 2004: $34
- 2005: $37
- 2006: $40
- 2007: $51
Strategic Principles to the Success of Yissum as a Tech Transfer

- Unique & Clear Vision
- Building Strategic Capabilities
- Building a “Learning Organization”
- Flexible Organization
- Understanding the stakeholders’ needs and Value creation
- Building Collaboration & Alliances

Summary:
To build a sustainable competitive advantage in the domestic and global market

- Main stream: Academia
- Multi-national view

Yissum Technology Transfer
Strategic Model:

Inter-Organization Entrepreneurship

1. **Entrepreneurs** and Managers training

2. Case Study Experience

3. **Projects Creation**

4. Projects’ Strategic Management
Current Snapshot

- Over $1.2 Billion annual sales of Hebrew University-based products
- 5,500 patents
- 1,600 inventions
- >500 licenses
- 65 spin-offs
  - Raised over $165 mil in 2007 from leading VCs and private investors
The Collaboration Principle
When there is a Will – There is a Solution
Thank You!

Yehuda Yarmut
yarmut@yissum.co.il