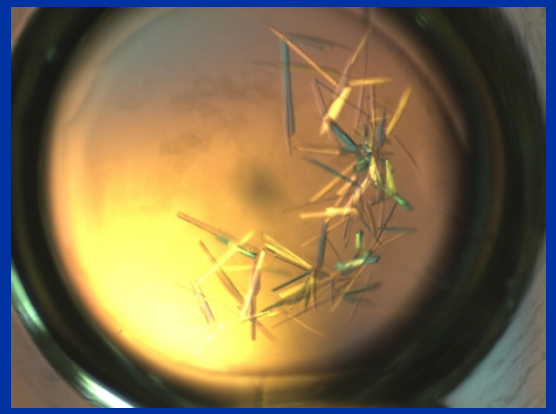
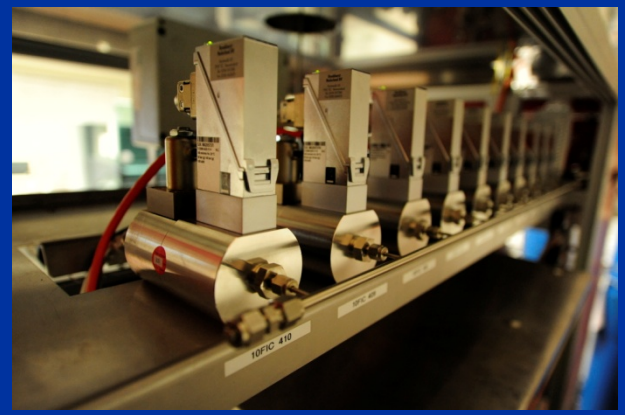
Advanced starter seminar
07/11/2019

Technology transfer @ VUB
Hugo Loosvelt





VUB TECHTRANSFER

SCIENCE ⟷ connecting ⟷ SOCIETY

- ***Connecting science & society***

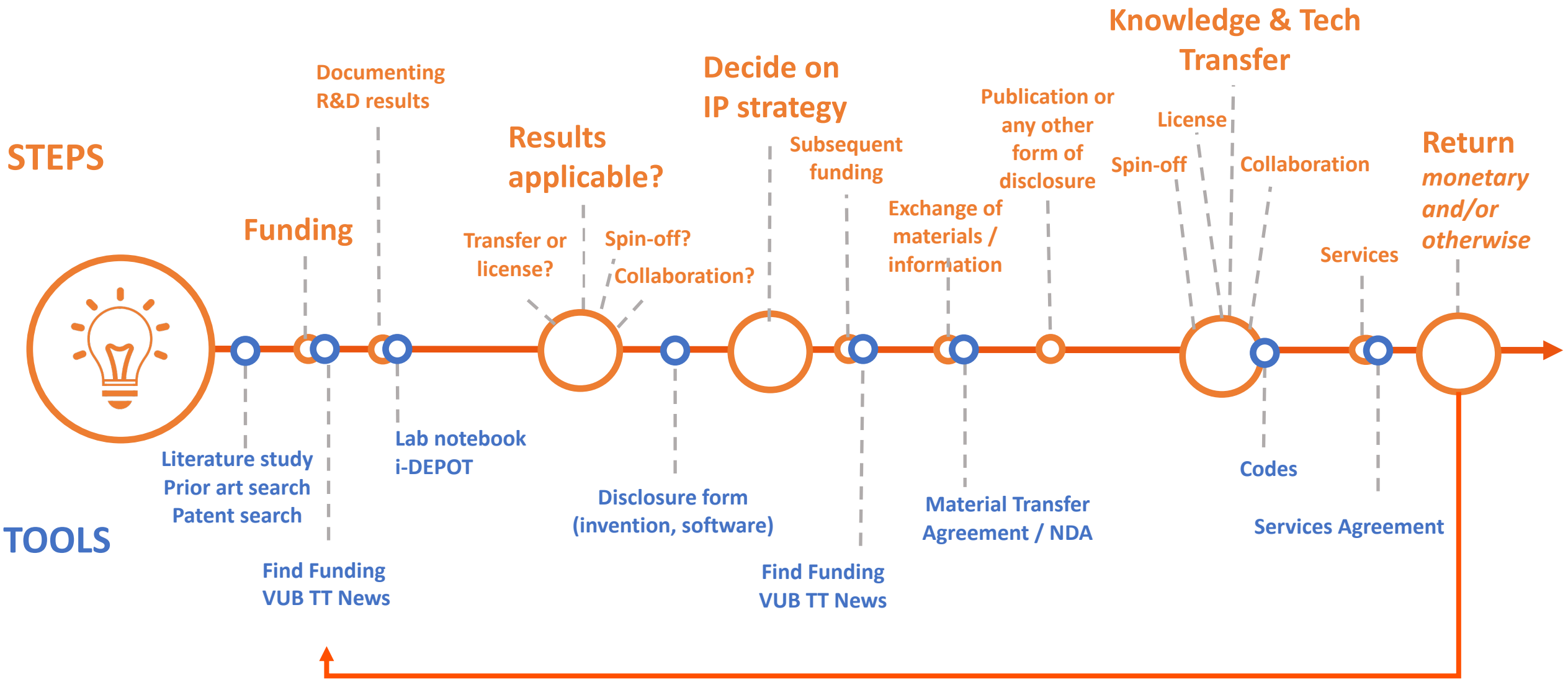
Technology transfer is the process by which new ideas, early stage technologies arising from the university are identified, protected, developed and commercialized

- ***Valorization of research***

Knowledge transfer to *society & industry*, reinvest return in excellent research

Knowledge & Technology Transfer Interface as entry point
Academic responsibility
Vicerector Innovation & Valorization Hugo Thienpont

FROM RESEARCH TO KNOWLEDGE & TECHNOLOGY TRANSFER



IP @ THE UNIVERSITY: WHY?

Challenge: huge gap between research findings and product on the market

→ High (financial) investment needed

To guarantee return on investment, and promote investment in R&D

↓

IP RIGHTS PROVIDE THE OWNER THE RIGHT TO PREVENT THIRD PARTIES FROM

MAKING, USING, OFFERING FOR SALE, SELLING OR IMPORTING

INFRINGING PRODUCTS

IN THE COUNTRY

WHERE THE IP RIGHTS ARE GRANTED

AND AS LONG AS THE IP RIGHTS ARE VALID

ALLOW THE OWNER TO SELL THESE RIGHTS OR CONCLUDE LICENSING CONTRACTS

IP: WHAT?

WIPO-treaty 14.07.1967 (art. 2, viii)

“For the purposes of this Convention:

(…)

(viii) “intellectual property” shall include the rights relating to:

– literary, artistic and scientific works,

– performances of performing artists, phonograms, and broadcasts,

– inventions in all fields of human endeavor,

– scientific discoveries,

– industrial designs,

– trademarks, service marks, and commercial names and designations,

– protection against unfair competition,

and all other rights resulting from intellectual activity in the industrial, scientific, literary or artistic fields.”

WHO OWNS THESE RIGHTS?

You:

When you have created the work

When you were hired as a freelancer / consultant

Your employer:

When the work was created on the job

Need to check / arrange terms and conditions in contracts & regulations !!

CONTRACTS & PROJECTS: IP ISSUES

- Confidentiality and publication rights
- It is important to be able to define precisely the state of your/VUB *background knowledge and sideground knowledge*

  Background/ sideground knowledge = know how and IP present before start of the project or *developed paralllel to the project*
- Ownership / joint ownership of results (foreground)

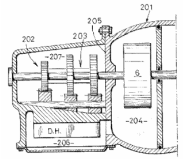
  *Foreground = know how and IP developed **during** the project*
- Legal protection of results
- Commercial exploitation of results and any necessary access rights to foreground / background

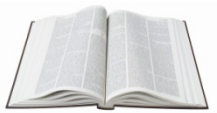
→ IP terms should fit the economic/social exploitation strategy of the partners and the project !

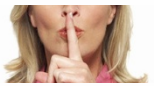
→ Contact VUB TechTransfer in time / before submitting project application / do not wait with these issues until negociation of consortium agreement

VARIOUS IP RIGHTS

LEGAL RIGHT	WHAT FOR?	HOW?
• Patents • Copyright • Trade marks • Registered designs • Trade secrets	• New inventions • Original creative of artistic forms • Distinctive identification of products or services • External appearance • Valuable information not know to the public	• Application and examination • Exists automatically • Use and/or registration • Registration* • Reasonable efoorts to keep secret







IP: WHAT, WHY, FORMS OF IP

Trade marks:

- “iPhone 6"
- Software “iOS 10”
- ….

Patents:

- Data-processing methods
- Semiconductor circuits
- Chemical compounds
- …

Copyrights:

- Software code
- Instruction manual
- Ringtone
- …

Trade secrets:

?

Designs (some of them registered):

- Form of overall phone
- Arrangement of buttons in oval shape
- Three-dimensional wave form of buttons
- …

More info on trademarks and designs

- WORLD INTELLECTUAL PROPERTY ORGANISATION (WIPO)

  HTTP://WWW.**WIPO**.INT

- EUROPE: OFFICE OF HARMONIZATION FOR THE INTERNAL MARKET (OHIM) IS THE OFFICIAL TRADE MARKS AND DESIGNS REGISTRATION OFFICE OF THE EUROPEAN UNION

  HTTP://OAMI.EUROPA.EU/OWS/RW/PAGES/INDEX.EN.DO

- BENELUX: BENELUX-BUREAU VOOR DE INTELLECTUELE EIGENDOM (BBIE)

  HTTP://WWW.BOIP.INT/NL/HOMEPAGE.PHP

- NATIONAL IP OFFICES

COPYRIGHT VS PATENTS

	Copyright	Patent
Protection for	Form (source code)	Functionality (algorithm)
No protection for	Functionality (work around, reprogram)	Form (source code)
Ownership	Creator / author	Applicant <-> inventor
Registration	Not required, burdon of proof !!	First to file / register
Validity	70y after death author	20 years from date of filing

In both cases:

- Transfer of right / license is required for third party use
- No guarantee for freedom to operate
- Right can be used for innovation income reduction
- Published patent application are publications

PATENT? WHEN?

WHEN?

VALUE PATENT + VALUE FREEDOM TO OPERATE

> PATENT COSTS + DISADVANTAGEOF DISCLOSURE

Value patent:

- Potential to technical and commercial success of the technology
- Scope of the patent: geographical, scope of protection claims
- Validity of the patent
- Potential market
- Competition: F2O?, better product/process, alternative solutions, knowhow,
- Visibility: how easily can you detect infringement?
- Licensing: crosslicensing, crucial link?, compulsary license, …

ALTERNATIVES TO PATENTING

INFORMATION DISCLOSURE (PUBLISHING)

- Cheap
- Prevents others from patenting the same invention

- Does not offer exclusivity
- Reveals the invention to competitors

SECRECY (CREATING A TRADE SECRET)

- No protection against reverse-engineering/duplication of invention
- Difficult to enforce
- "Secrets" often leak quite fast

- No protection against reverse-engineering/duplication of invention
- Difficult to enforce
- "Secrets" often leak quite fast

DO NOTHING

- No effort required

- Does not offer exclusivity
- Competitors will often learn details

WHEN TO PUBLISH?

WHEN?

- R&D results: fundamental character, no loss of commercial potential; too far from market
- create exposure; show competence of company
- academic researchers: need to publish
- sufficient protection in place by other patents or limited improvement/alternative to existing technology
- hidden publication: significance/link to product is unclear

WHEN NOT?

- avoid know-how to dissipate
- contains information which contradicts patent position
- contains information on a invention to be patented

Cheap and effective way to dissipate information to society with little commercial value
Combine with patenting in a smart way !!

PATENTS: INFORMATION SOURCE!

AVOID DUPLICATION OF R&D EFFORTS AND SPENDING

- 80% of all technical information in patent documentation (OESO)
- Duplication of R&D efforts: costs 20 billion EURO/year ; 25% of all R&D efforts ... on inventions that have been invented yet (European Commission)
- Define technology trends: what is in a patent application now, is the product of tomorrow…
- Preparing new patent: writing/ studying patentibility

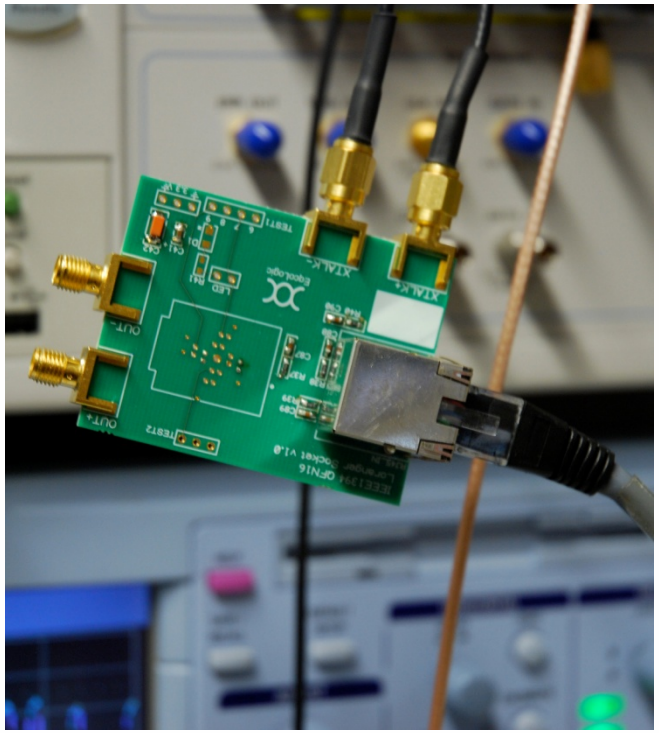
Find solutions to technical problems

- 85% of all patents no longer in force
- Vast number of inventions available for free
- Patent contain reliable information due to exigency of sufficiency of disclosure, enablement, clarity (for person skilled in the art to be able to repeat the experiments)

FREE PATENT DATABASES

- espacenet: http://ep.espacenet.com
- google patents: http://www.google.com/patents
- Japanese Patent Database http://www.ipdl.inpit.go.jp/homepg_e.ipdl
- USPTO database http://www.uspto.gov/patft/index.html
- WIPO patentscope http://www.wipo.int/pctdb/en/search-struct.jsp

PATENT PORTFOLIO OF THE VRIJE UNIVERSITEIT BRUSSEL



142 active patent families

- 39 patent families VUB
- 42 patent families with VIB
- 30 with Imec

Granted US or EP patents 1998-2006:

- 39.5 % licensed/assigned to spin-off

- 31.6 % licensed to other company

~70% patents actively valorized

Biotech: ~50 % of EP patent output 2007-2011

(Big) Data and IP rights: issues

Certain elements of big data lifecycle may fall within the scope of protection of IP rights such as:

- Copyright:
  - originality criterion difficult: no raw data protected? Need to be presented in original way? In deep learning analytics are being done on unstructured data (no author involved) …
  - needs to be presented in tangible form -> what about dynamic datasets?
  - need for authorisation of copyright holder of each individual data …
  - moral rights: cannot be assigned validly in some countries, what rights does the assignee of the data have to use, modify data protectec by copyright?
- Database rights
  - In big data hard to distinguish between generation and obtainment of data … (CJEU rejected rigths for creation of data as such)
- Trade secrets: in big data context requirements may be hard to fulfill
- (Patents: data sharing may have implications for acquisition of patent protection in inventions with respect to novelty and inventive step requirements)

A lot of differences in (case) law between countries, eligibility for protection to be examined case by case, need to arrange terms and conditions in contracts !!

VUB TECHTRANSFER

TECHNOLOGY TRANSFER

TECHNOLOGY TRANSFER IS THE ***PROCESS*** BY WHICH NEW IDEAS, *EARLY STAGE* TECHNOLOGIES ARISING FROM THE UNIVERSITY ARE IDENTIFIED, PROTECTED, DEVELOPED AND COMMERCIALISED.

TT ***assists academics*** to realise knowledge transfer by:

- ***identifying and evaluating*** technology of potential commercial value
- ***Protection***, management and development of the University's intellectual property portfolio
- Identifying and facilitating applications to sources of ***funding*** for development work
- Exploitation of intellectual property, through ***negotiating*** agreements needed for R&D collaboration, licensing and spin-out company formation

IDENTIFYING NEW TECHNOLOGIES

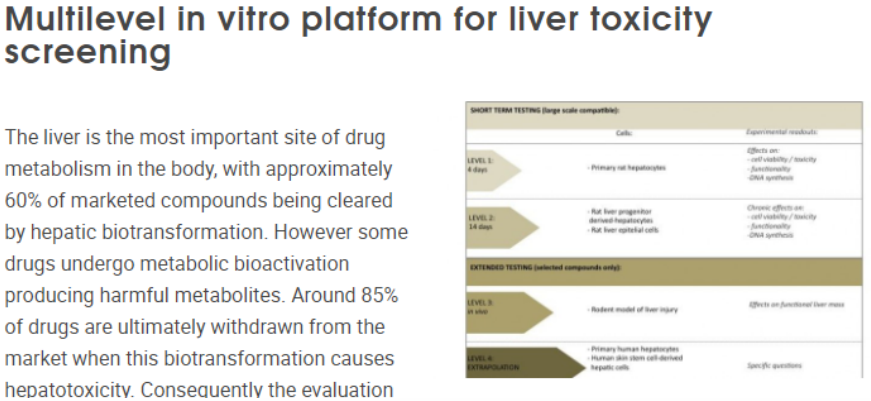
- Awareness creation:
  - materials (calender, introductory guides, …)
  - introductory courses
  - poster campaigns
  - Starter seminars for entrepreneurs
- Performance criteria (IOF)
- Code on valorisation: incentives to individual inventor/ research group
- ROI
- TTI: no entry barriers, ease of access

SCREENING NEW TECHNOLOGIES…

- IP: patentability, freedom to operate, know how
- Commercial value:
  - Scope of applications (niche, platform)
  - Market: small/ large, emerging/ saturated, incremental improvement/ disruptive
  - Competition
  - Stage of development / Distance to market (working prototype, upscaling issues, regulatory affairs, clinical testing, …)
- Scientists team: commitment, complementary skills
- Access to resources: funding, infrastructure, materials

MARKET NEW TECHNOLOGIES

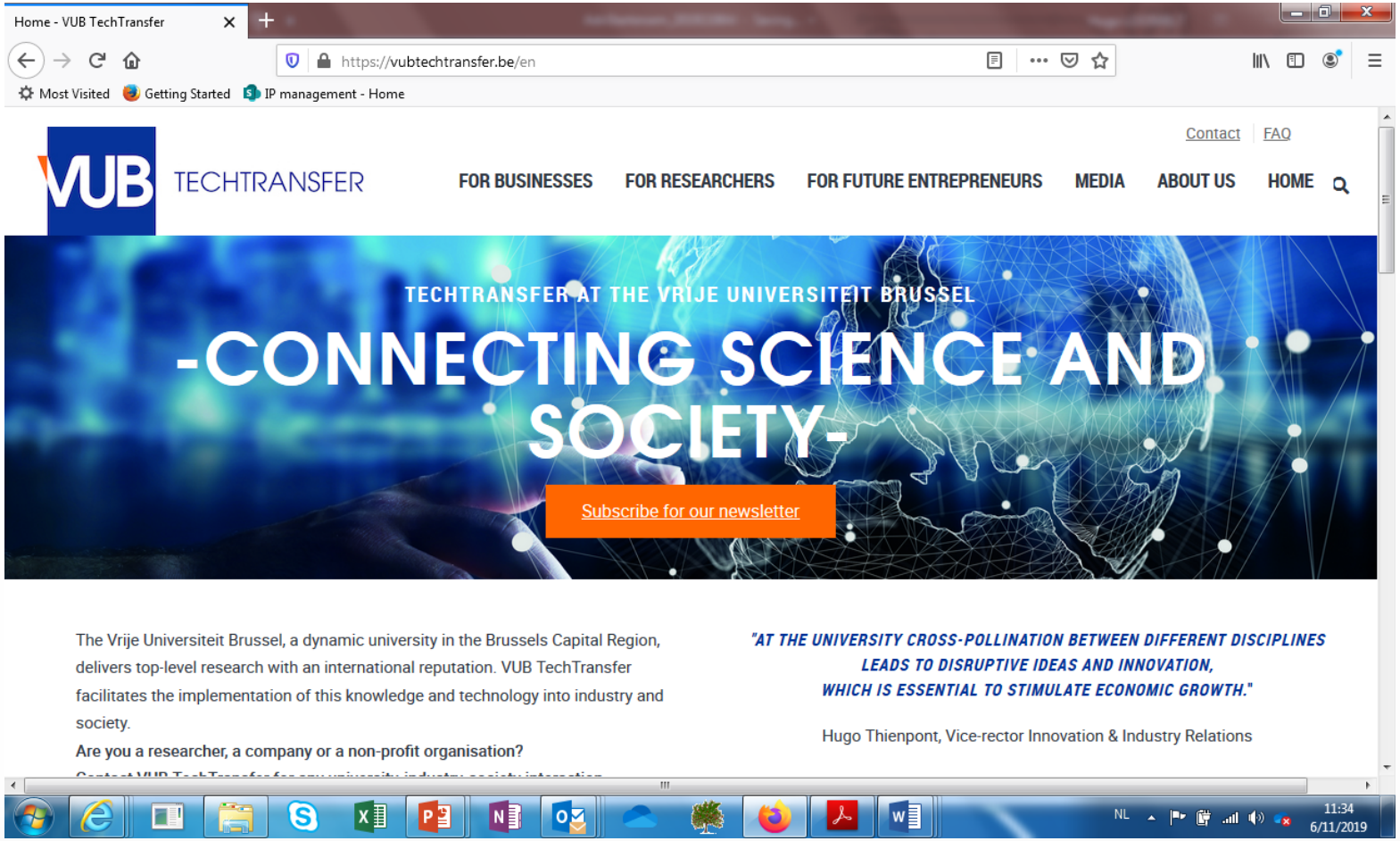
- www.vubtechtransfer.be
- Technology offers



- Topic related R&D brochures: materials, energy and environment, sustainable chemistry
- Partnering events

Best ambassadors: researchers !!

TT PROCES



www.vubtechtransfer.be

PROTECTION & VALORISATON GO HAND IN HAND

Idea evaluation

- Disclosure + interview
- Preliminary patentability study
- Initial exploitation routes

IP protection strategy

- Patent filing+ publication strategy
- PCT decision
- National phase

Valorisation strategy

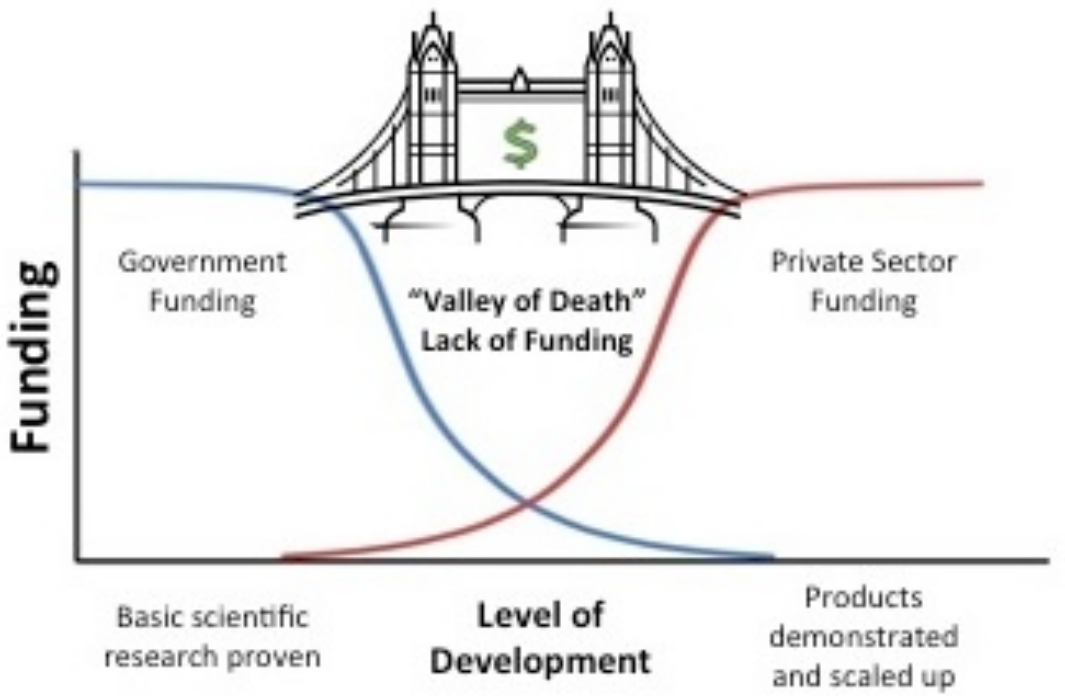
- Licensing route
- Spin-out
- Status prototype / POC?
- Set-up collaboration ?
- Funding sources
- Market the technology: design flyers, website, network, …
- Negociate, follow-up

STRATEGY OR SERENDIPITY?

FINDING INDUSTRIAL PARTNERS / LICENSEES

Strategy	Serendipity
Scouting	Third party scouts
Tech transfer offers	Published article
Contacts & follow-up / Networking	Network / Industrial friends inventors /research team
Strengthen links with research base for forward planning	Company wanting to discuss…
Brochures/ Events	We have already agreed with Prof…
Entrepreneurship: seminars, educational program	Luck!

FUNDING: BRIDGING THE GAP …



http://otm.illinois.edu/POC

FUNDING: BRIDGING THE GAP …

Identifying and facilitating applications to sources of funding for development work: needs professional management

https://vubtechtransfer.be/en/funding

FUNDING: BRIDGING THE GAP

INDUSTRIAL RESEARCH FUND VUB

- strategic and applied research programmes
- proof-of-concept projects
- detailed long-term roadmap and vision
- clear valorization strategy
- application-oriented inventions
- economic and societal value

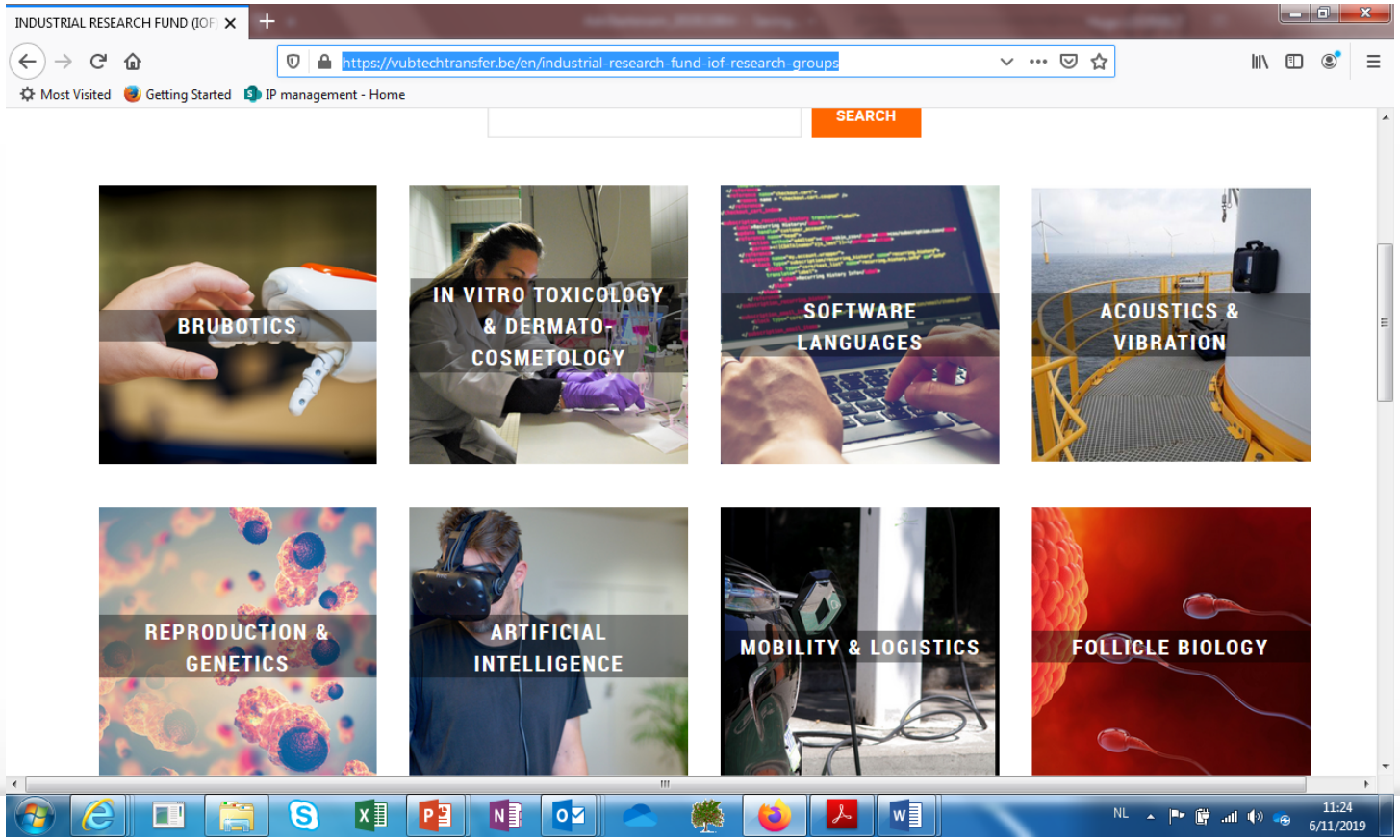
INDUSTRIAL RESEARCH FUND

Key performance indicators:

- Patents
- Industrial income
- Scientific output (publications & citations, PhD’s finished)
- # spin-off
- EU FP7 participation

IOF FUNDED GROUPS

https://vubtechtransfer.be/en/industrial-research-fund-iof-research-groups



RISK CAPITAL

http://www.vlaio.be/content/overzicht-van-de-risicokapitaalverschaffers-vlaanderen

QBIC FUND –
TRANSFORMING KNOWLEDGE

FIRST INTER-UNIVERSITY SEED CAPITAL FUND (°2012):

Qbic Fund is an inter-university venture capital fund focusing on the transformation of technological breakthroughs into sustainable business.

Qbic I was incorporated in 2012, invested in 18 companies and is currently in divestment phase. Qbic II started in December 2016; recent capital increase to total of 58 million euros

http://qbic.be/

VUB is a founding party to Qbic2 and is bound to a right to preview and right to make a lead investor proposal to Qbic2

NEGOCIATING LICENSING DEALS

Key issues to university

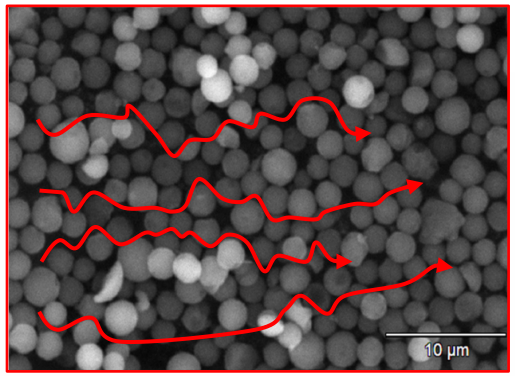
- ensuring right to publish (papers, theses, etc) versus IP protection and confidentiality
- ensuring right to use for continued/joint R&D
- careful about liabilities / indemnifications / warranties to VUB
- fair & reasonable / at market conditions compensation: VUB return = inventor return

→ not one size fits all, finding the right balance

CASE STUDY
UNIVERSITY SPIN-OFF: PHARMAFLUIDICS

THE PROBLEM BEING SOLVED…

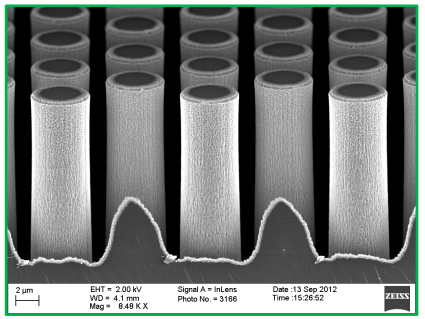
The chromatography column as the bottleneck

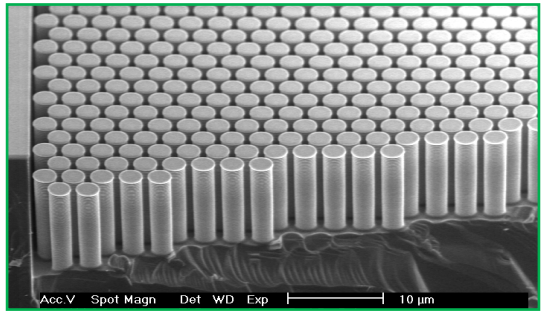


Capillary liquid chromatography is **physically limited** as **a result of the production methods** used.

Limited order
High back pressure

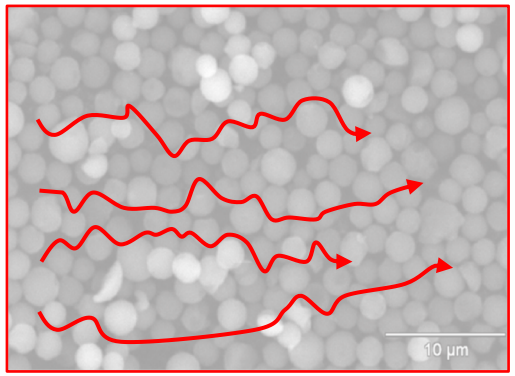
THE PROBLEM BEING SOLVED…



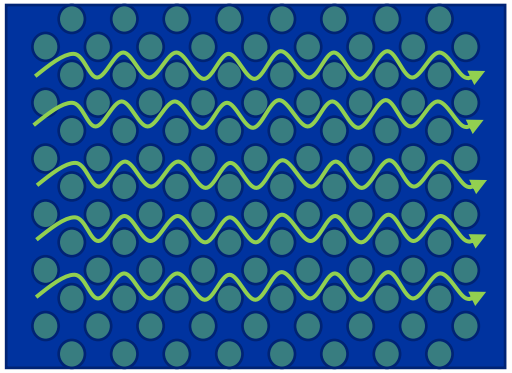


Disruptive Approach

Breakthrough because of microtechnology

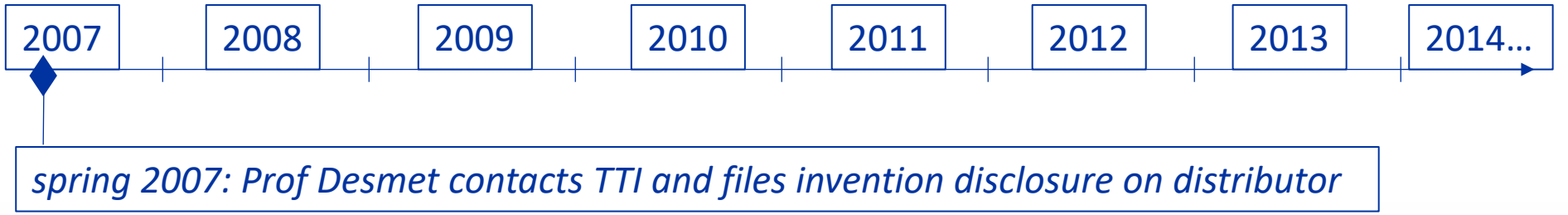


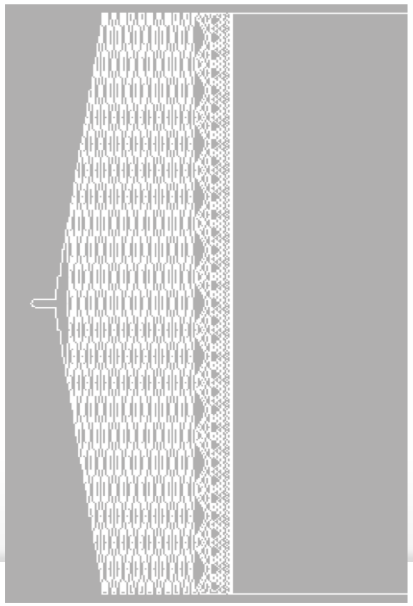
Limited order
High back pressure



Perfect order and uniformity
High permeability

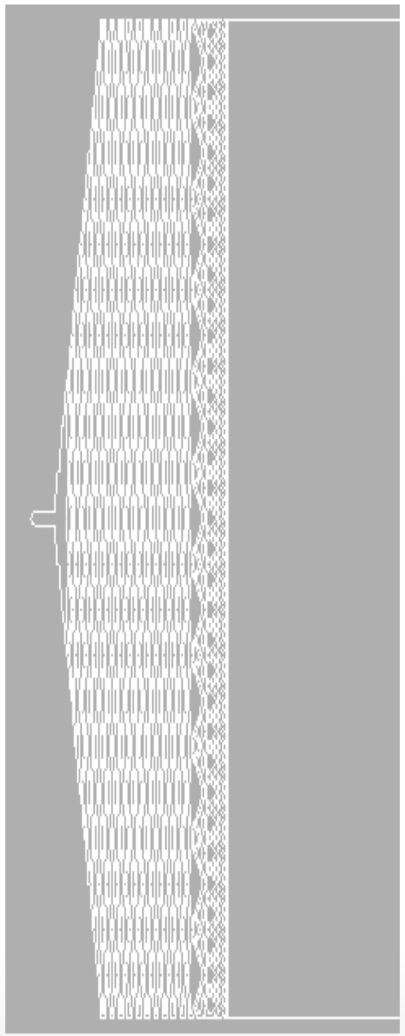
THE INVENTION…





- Results obtained in IWT- SBO project (Imec involved)
- Post-doc researcher on joint FWO project with Imec !!!
- Based upon simulations
- Prof Desmet had been inventor to many previous patent applications, so far with no ROI …
- one pending patent family remained relevant; other patent families were abandoned

THE INVENTION…



Wide and shallow channels:

Minimize diffusion limitations

Maximize contacting interface area

Channel-widening without dispersion

Controlled, uniform flow-velocity

Optimized process efficiency

Matching internal volume to real-life process requirements in critical pharmaceutical and fine chemical processes

Nano- micro- milliliters

Micron millimeter centimeter

Possible applications

Liquid-liquid extraction

Sample preparation

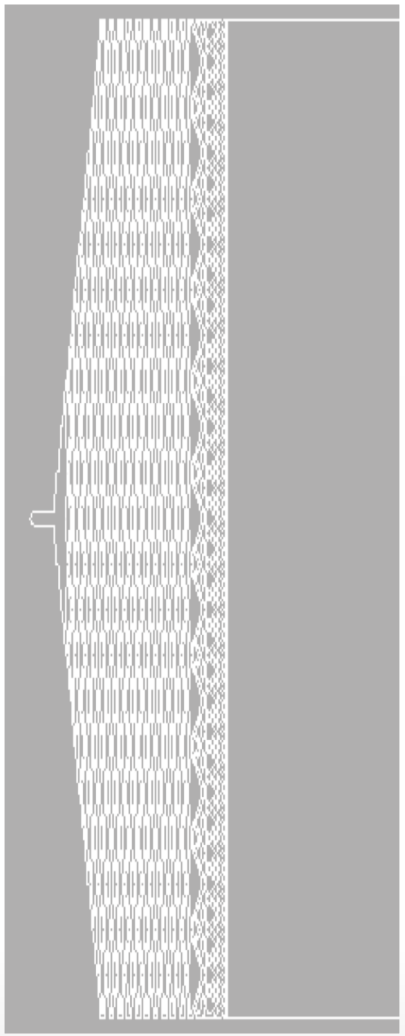
Flow-cells for micro-arrays

Controlled emulsification

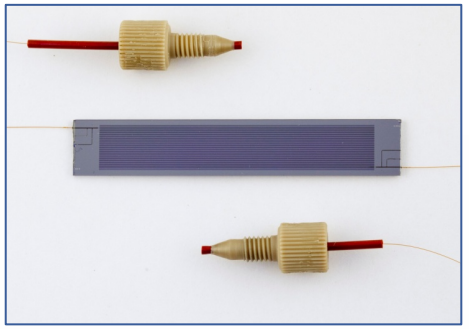
Continuous reactors

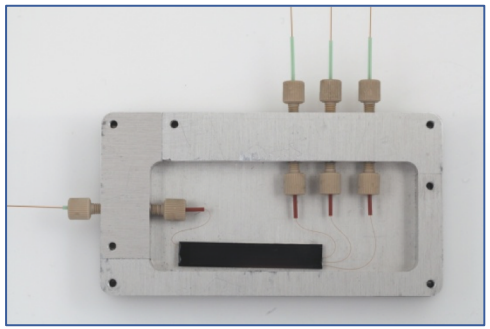
…

THE INVENTION…



Liquid Chromatography





Liquid-Liquid Extraction

COULD A PATENT APPLICATION BE FILED?

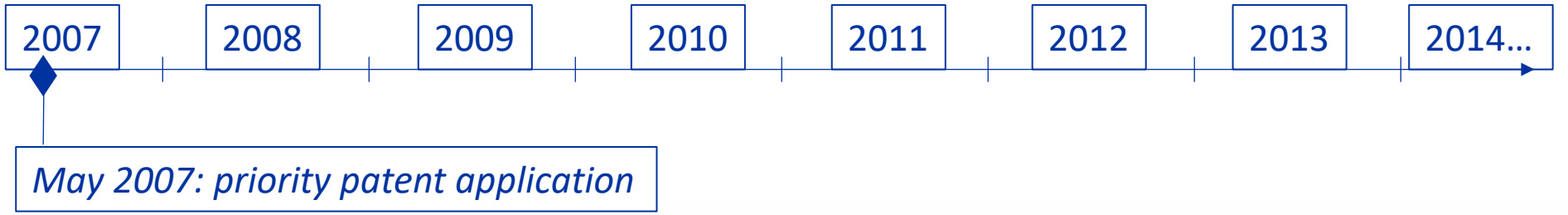
Did the invention meet basic patent requirements?

- new (prior art searches)
- inventive
- industrial application

Did the University have the rights to own the invention?

Need to come to arrangement with Imec on IP rights!!

PRIORITY PATENT APPLICATION FILED (MAY 2007)



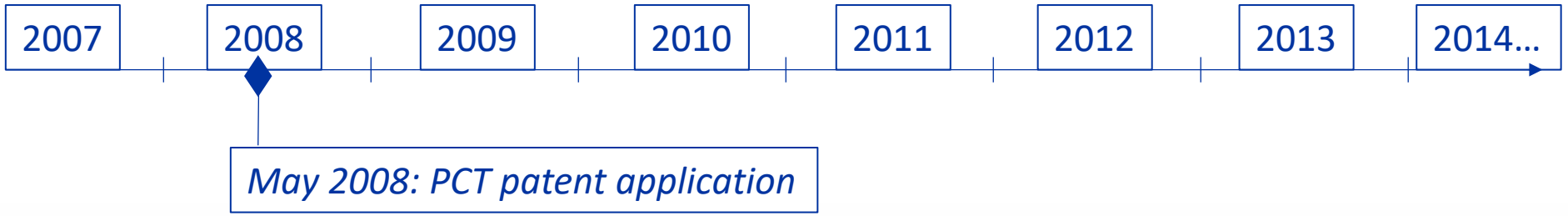
Collaboration of

- inventors
- technology transfer manager
- patent agent

Filed by VUB

After 6 months: EPO search report

DECISION TO PROGRESS TO PCT STAGE

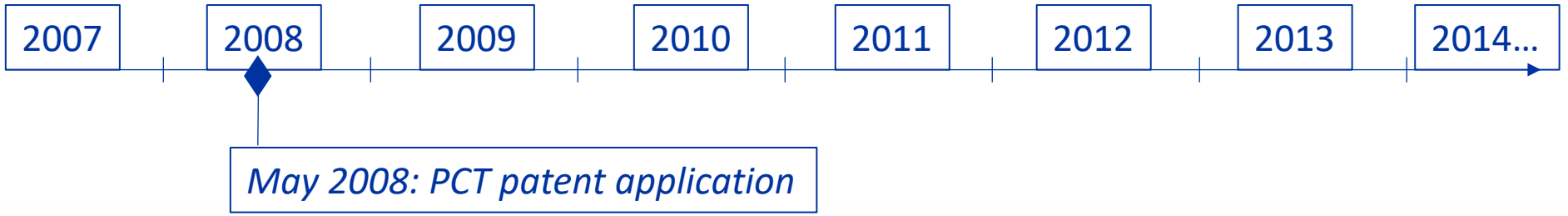


12 months from the initial patent filing

Initial EP Prio application was dropped: additional elements included, elements to defend invention against prior art cited in search report,

International patent application filed (PCT process)

COSTS CONTINUE TO ACCUMULATE (2008-2009-…)



Patent office and patent agent fees at each stage

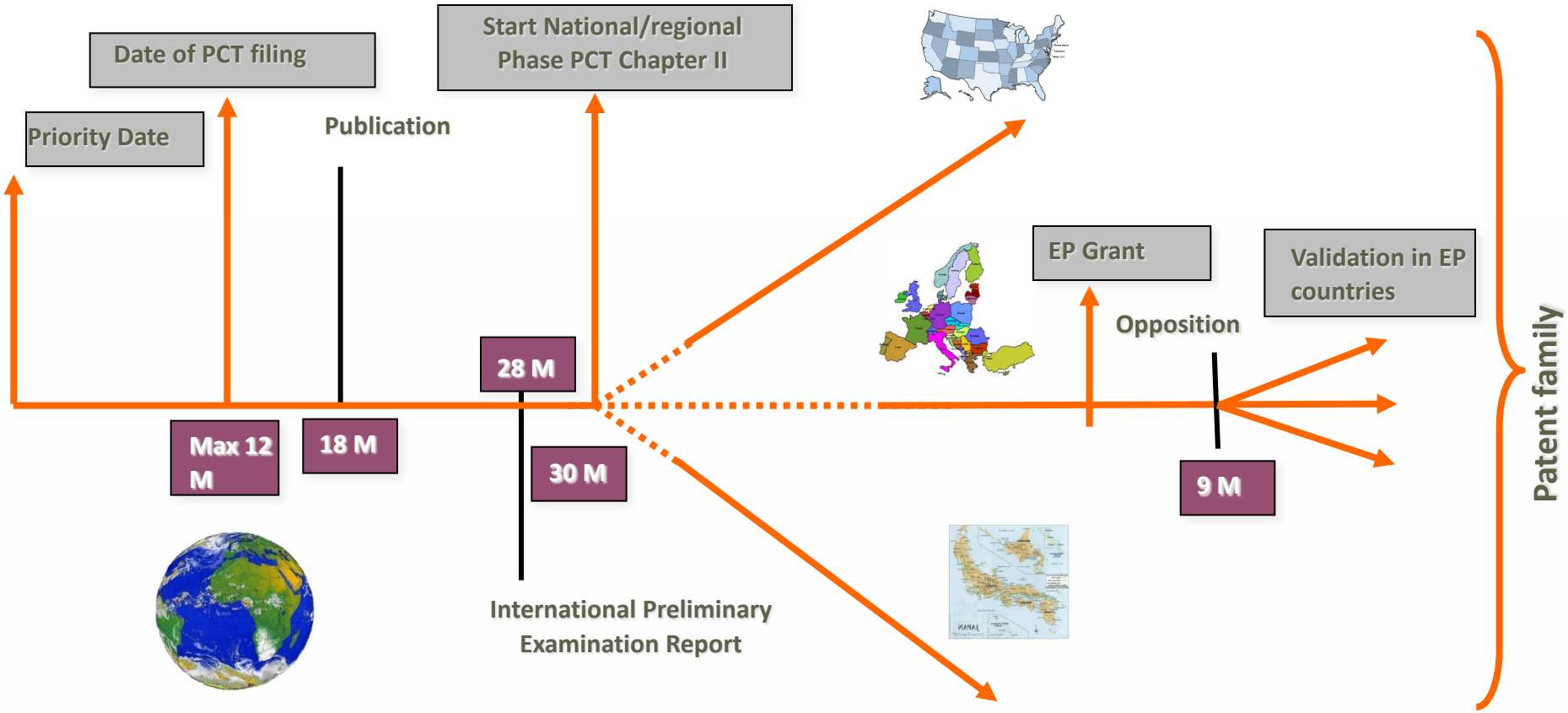
Technical proof-of-principle

Original application (PCT) approaching the national phase

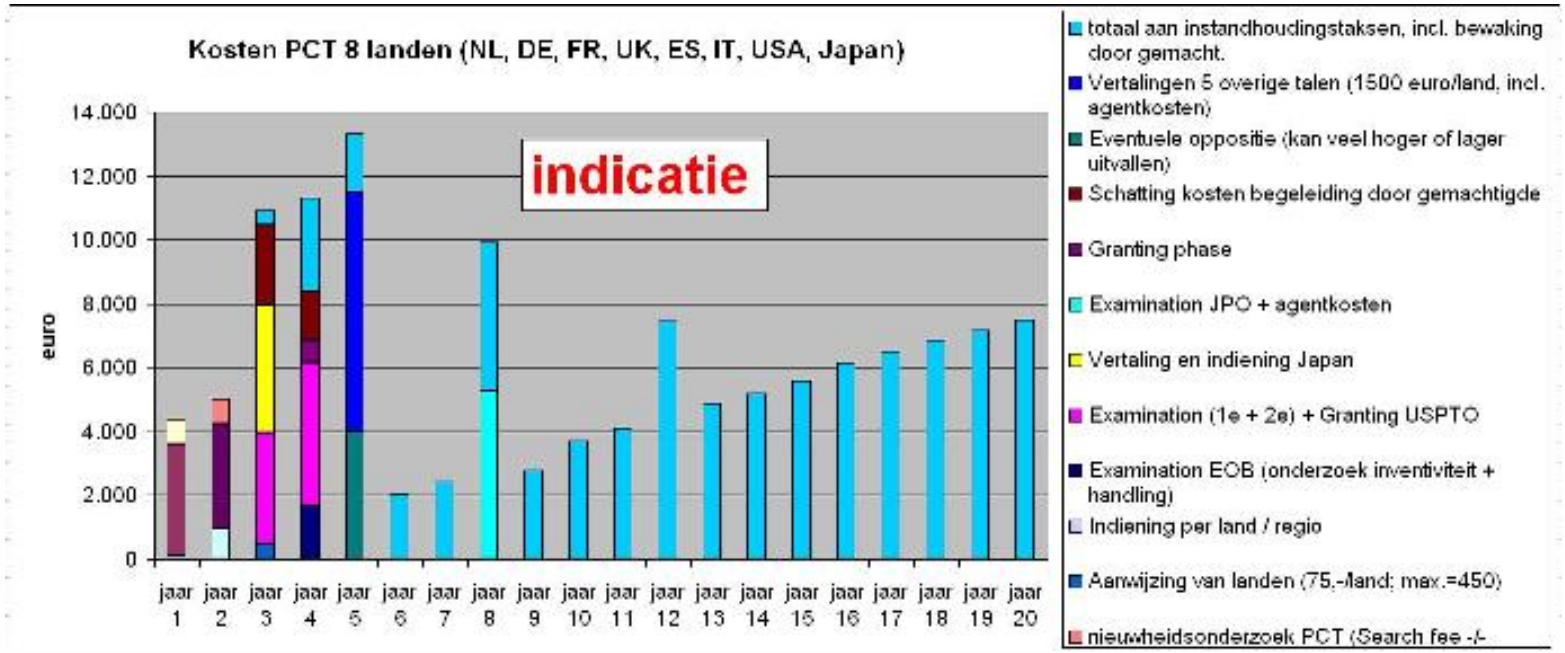
- increasingly expensive!

The university was still funding all costs, but no commercial strategy / team in place

PATENT APPLICATION ROUTE



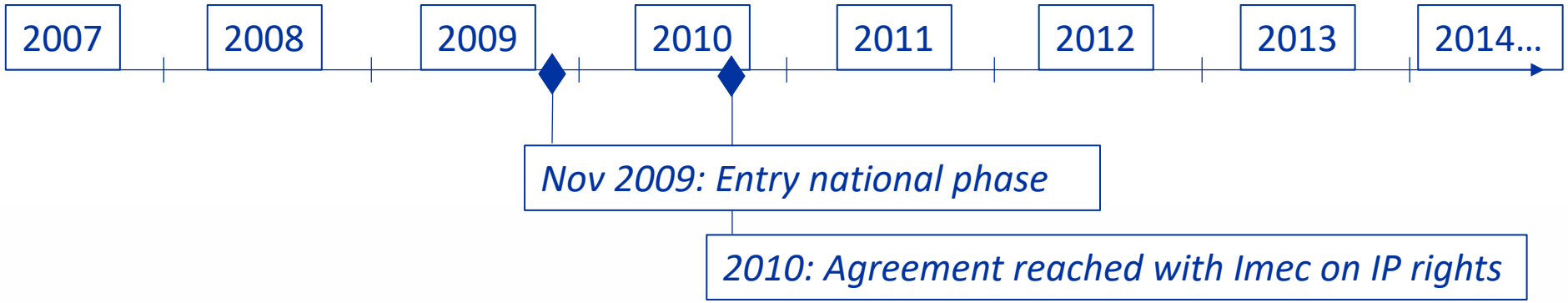
PATENT: COSTS



Kunststof en Rubber | nr. 9 - september 2004

~ 125000 after 20 y / ~ 15000 after international phase: may be more depending on costs patent attorney, opposition costs, # designated countries

EUROPEAN AND NATIONAL PHASE PATENTS



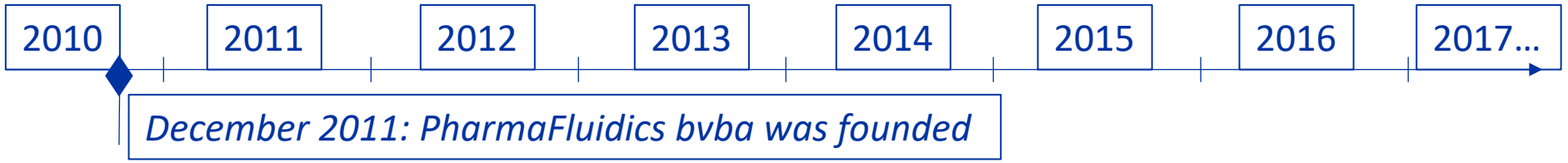
Continue into the EP/ US national phase

Other patent family also still pending in US, granted in EP

At this time none of the patents had been licensed (so no revenues)

2010 : Imec & VUB reach agreement on IP rights generating FTO for chromatography purposes

FORMING A SPIN-OFF COMPANY (2011)



Paul Jacobs joins team

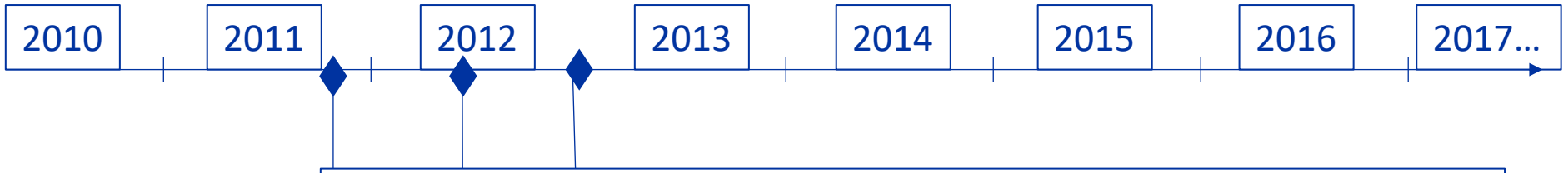
Contacts with industrial parties trigger founders to start company to provide *services* based upon VUB-CHIS know-how: hard to get these service contracts @ VUB (university cannot provide product warranties…)

Founders: Dr. ir. Wim De Malsche; Prof. Dr. ir. Gert Desmet; Prof. Dr. ir. Joeri Denayer; Dr. ir. Paul Jacobs

Spin-off from the Dept. of Chemical Engineering at the VUB

Mission: to become leading innovators in microfluidic separation for analytical and industrial processes in pharma, Biotech and Life-Sciences and fine chemicals

FURTHER DEVELOPMENT

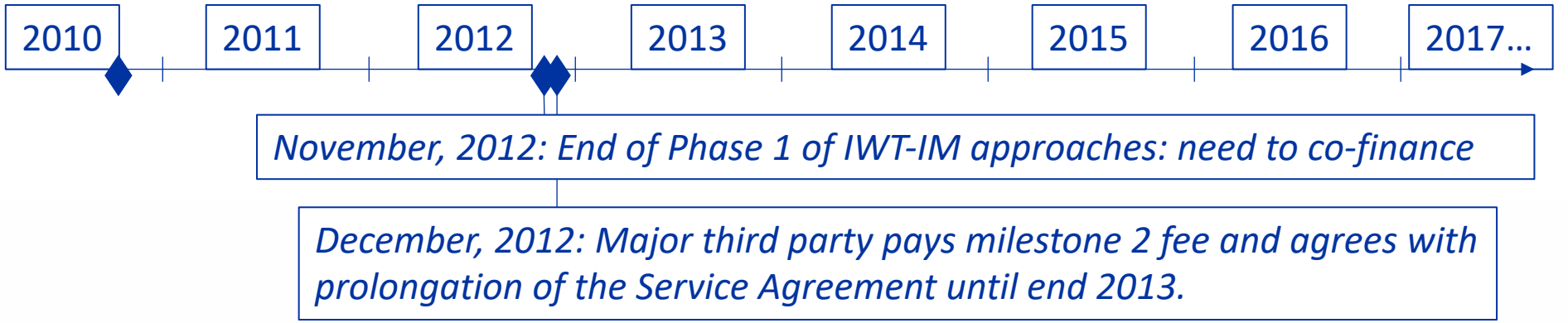


*October 15, 2011: PharmaFluidics and VUB support the submission of the IWT **Innovation Mandate** of Jeff Op de Beeck on the development of µPillar Arrays*

June 15, 2012: PharmaFluidics bvba and major third party sign a Research Services Agreement based on Milestones.

December 20, 2012: PharmaFluidics bvba and VUB sign license agreement
Subject: Flow Distribution Know-how
Compensation: Royalty on net income
↳ PharmaFluidics bvba becomes an official VUB spin-off

FURTHER DEVELOPMENT



- Providing services turns out not sustainable ; developing into a chromatography column production company requires investment
- As PharmaFluidics is convinced of the successful development, the financial challenges switch to a higher gear…

↳ *First discussions with Qbic, joint business plan development*

↳ *Key issues:*

- ↳ *Which market do we focus on? Choice made on proteomics…*
- ↳ *Proof of concept in proteomics?*
- ↳ *Price setting*

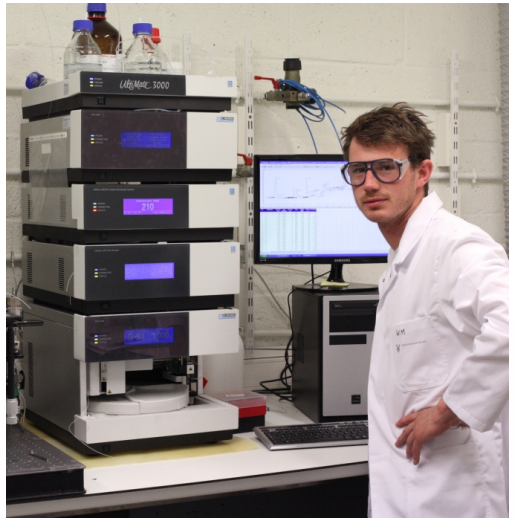
FURTHER DEVELOPMENT

VUB IP and FTO were absolutely essential in the due diligence

Pharmafluidics at the start…

THE TEAM

- General manager:
  - Dr. ir. Paul Jacobs (full-time)
- Application scientist
  - Dr. Jeff Op De Beeck (full-time)
- R&D Engineer
  - Ing. Kurt Van Mol (full-time)
- CTO
  - Wim De Malsche (part-time, Assistant Prof. at VUB)
- Ad Interim
  - Simon Kuipers
    - 1/09/14-31/01/15



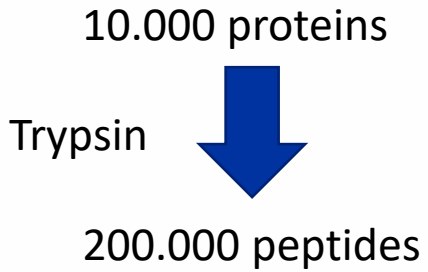
Team focused an technical and engineering skills !!

Market pain: The Proteomics Challenge

It is assumed that there are 10.000 proteins per cell

On average every protein counts 20 tryptic peptides

>200.000 identifiable peptides in the sample to analyse

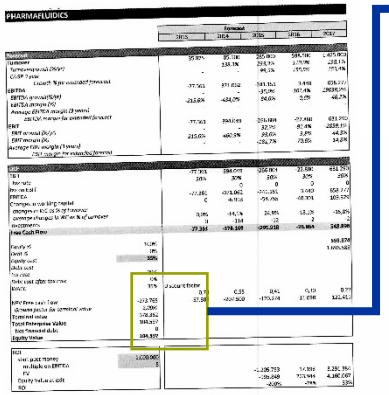


Complexity

BUT… may require many resources to establish proof of concept … conservative market used to standart operating procedures

The investment case at the time

Financial plan / NPV valuation



- Key elements financial plan: highly assumption based!!
  - Break even 2016
  - Upon sales of ~1000 columns : exit potential -> 2017
  - Price setting
  - Gross margin of 80% ?
- Highly dependent on one key production subcontractor
- NPV = negative !
- Asking 750 k€ for company value of 100 k€ ?

BUT:

- Strong support from key opinion leaders
- Strong IP and FTO
- Strong technical – scientific team!

The investment case at the time

Back in 2014:

- joint investment by PMV / Qbic to reach commercial PoC in proteomics in collaboration with key opinion leaders by end of 2015
- Cut down the costs: do more with less
- After successful introduction of first generation product next financing round anticipated
- Seek alternatives to production subcontractor
- Apply for grants: H2020, IWT-IM, IWT KMO innovatiestudie, …
- VUB agrees to transfer its IP to Pharmafluidics

In the meantime…

- additional seed capital was attracted amounting a total of € 1,3 mio (Q1 2014 and Q2 2015 by Flemish Government, PMV and Qbic; in Q2 2016 by Innovation Fund and Theodorus III Fund)
- Jan 2017 2,7 miljoen euro raised early 2017 by existing investment syndicate
- Strategic advisory board installed: key market and strategic information by key opinion leaders confirming enormous potential

-> VUB heavily diluted!

- First sales established in 2017 and lots of market attention generated through presence at key fairs
- Team: senior CEO joined the team in September 2016; senior VP sales and business development attracted.
- Independent director appointed: Fasha Majoor, founder of Phenomenex, a global leader in separation science and chromatography
- New facilities operational
- Further IP generated and protected

In the meantime…

Product:

- Many technical issues requiring substantial resources overcome, but looking good…promising data generated at key opinion leader site in proteomics and proven excellent performance in other fields of application with smaller molecules
- Huge potential for further optimisation of current columns

Some thoughts…on very early stage start-ups

- show your own commitment and persevere !
- premoney value = to be negociated! Negociation position depends upon: team experience, PoC and/ or initial little sales in relevant market , market pain and growth, IP portfolio (patents + know-how) and FTO
  - the higher the premoney value; the more RoI for university / founder / inventor team
  - This case: no lead investor establishing a pre-money valuation; investor syndicate, founders and VUB reached consensus on the amount of fully diluted shares each party received in exchange for its financial / in kind contribution
- PoC / initial sales in relevant market is essential (for high premoney valuation)
- Validate your business plan assumptions
- use grants (non–dilutive funding) to maximise value
- FOCUS

Some thoughts continued…

- contribution in kind versus license:
  - depends upon sales expectation / exit potential
  - what scheme provides VUB with a reasonable RoI without compromising the start-up (too much)?
  - Founders / investors motivation
  - any licensees available: market dominated by big players – disruptive technology
  - Risk perception : FTO, detailed business- and financial plan with 5-year horizon – with monthly details first 18 months, sufficient capital to bridge min. 18 months, paying customers, dedicated operational team

Some thoughts continued…

- VUB contributed in: prefinancing patent portfolio, IOF funding, lab space and infrastructure, services … -> we take a lot of risk !
- VUB wants to be able to follow-up on the spin-offs situation and activities:
  - due diligence clauses including reporting duties,
  - milestones and deliverables
  - occasionally member of the BoD

Conclusions

- Focus on excellence in research
- TT success is based upon good relationship and close collaboration with academics
- VUB TTI focuses on fair return to its research teams, not on maximising licensing income
- Professional management of R&D projects (various funding schemes and R&D partners): managing IP rights
- Stimulate entrepreneurship
- Create awareness and visibility / share experiences

«RIGHTS & OBLIGATIONS OF THE RESEARCHER »

- A Flemish university owns research results
- VUB recognizes rights of inventors
- Inventors have the obligation to collaborate in the valorization procedure
- VUB pre- finances patent procedure and recuperates costs only if there is an income
- Income will be distributed among inventors, the research lab and the VUB

RIGHTS & OBLIGATIONS OF A MASTER STUDENT?

- Master owns the IP rights to his research results
- Ma student gains access to VUB confidential information: need for NDA to be signed
- In case of involvement in third party R&D collaboration and/or VUB valorization file (e.g. pending patent): need to transfer IP rights to VUB!
- Defence: confidential version behind closed doors; external reviewers to sign a NDA / inform VUB TechTransfer to evaluate valorization opportunities / ‘reduced’ version to be publicly available
- Students promotor: best placed and key role !
- Increasing awareness with students ! Good thing!
- Documentation and paper trail is key to discriminate between contribution and IP rights of VUB personnel and Ma student -> lab notebook

TRADE SECRETS

Legal framework: EU trade secrets directive (Directive 2016/943)

Trade secret = piece of information that meets the following :

- It is NOT generally known or readily accessable:
- Has commercial value because it is secret:
- Has been subject to reasonable steps to keep it secret by the person lawfully in control of the information

-> most research data are trade secrets at least for some period of time !
(at least in the early stages of collection / generation and BEFORE any public disclosure / data sharing)

Trade secret are legally protected in instances where the confidential information was obtained illegitimately

Complementary to IP rights:

- Allow for everlasting protection (as long as the conditions remain fulfilled)
- No need for originality, does not discriminate between types of data
- No private or exclusive rights to its use: independent discovery of same information remains possible
- Cannot prevent competitors from copying and using the same solutions -> reverse engineering is lawfull!

PROTECTING SOFTWARE?

- Copyright: concrete shape (source code, user interface, …)

  Fast, cheap, simple

  Does not protect technical solution provided by software

  Can be licensed: e.g. basis for free / open source software…

- Patent right: computer implemented invention (solution to a technical problem, more than just the software)

  Expensive

  Technical aspects of the invention: must be **novel**, needs to involve an **inventive step**

  Can be licensed

- Trade secret ?

- Registration: notary act, i-depot, escrow agent depot

FREE /OPEN SOURCE SOFTWARE

- Based upon copyright
- Many different F/OSS licenses, for overview : http://www.gnu.org/philosophy/license-list.html
- Many different F/OSS licenses incompatible

- The Problem with F/OSS Software:

- F/OSS is typically a joined effort of many different people / grows organically; looking at the source code of many projects, you have:
    - a White zone: code of which the IP is 100% clear; you know because you have written the code yourself.
    - a Gray zone: code that was contributed by others. Where did they get this code? Did they write the code?
    - a Black zone: code that was integrated in the software, but for which there was no license or authorization.

PATENT: WHAT IS IT?

- the right to ***exclude*** others from making, using, selling, offering for sale, or

importing the patented invention

Not the right to practice your invention yourself!! -> one might need a license to obtain freedom to operate

- granted by a ***national*** government to an inventor or their assignee

No global patent exists, only a international or European application procedure !!

- for ***max. 20 years*** (subject to payment of maintenance fees)

- in exchange for the ***public disclosure*** of the invention

The invention cannot be kept secret!! Quid pro quo!!