

Opportunities for Working With or Creating Industry

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Disclosure and Potential Conflicts of Interest Statement



• I am a board member and investor in Shine Medical Technologies, a company developing a new technology for high specific activity medical radiotopes.



• I am a co-founder of HealthMyne™, a company developing a platform for decision support based on quantitative imaging. I am Chairman of the Board of Directors, obtain a salary and have ownership in the company.



• I am a co-founder of Astro CT™, a company developing an equine CT scanner. I am Chairman of the Board of Directors, and have ownership in the company.



• I am a co-founder of OnLume™, a company developing a fluorescent guided surgical system. I am Chairman of the Board of Directors, and have ownership in the company.



• I am a board member and investor in Leo Cancer Care, a company developing an upright radiotherapy system for proton and x-ray radiotherapy.



• I am an investor in ImageMoverMD™, a medical image connectivity solution company.



• I am an investor in Oncora™, a company developing predictive analytics for radiation oncology.

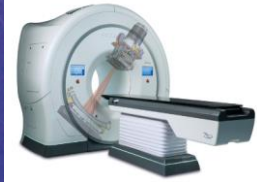
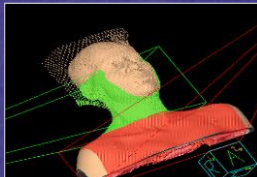
Geometrics and TomoTherapy

Geometrics (1992-1996)
Gehring (CEO),
Reckwerdt, Sanders,
Mackie (Chairman)

- Pinnacle³ Radiation treatment planning.
- ~1/4 of cancer patients planned with this software for ~20 years

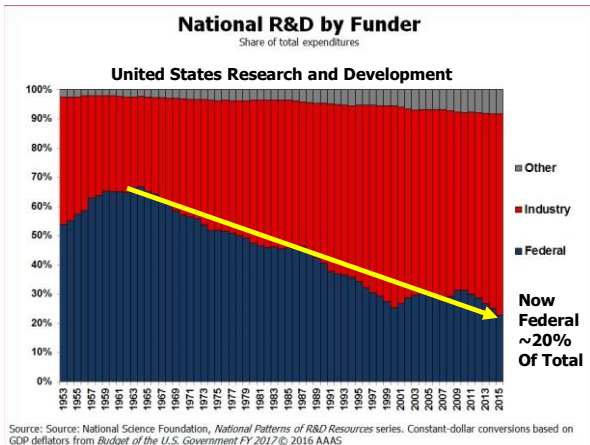
TomoTherapy (1997-2011)
Mackie (Chairman),
Reckwerdt (President)

- Radiation treatment planning and delivery.
- \$1.0 B IPO (2007).
- > 1 million patients treated



Role of Industry in Innovation

- Technical solutions to solve a problem usually indirectly or directly involve a company.
- For example, climate change will not be solved by social consciousness alone but by companies developing convenient and affordable energy technologies that do not involve fossil fuels.
- Medical innovations are the same, if only because regulatory clearances usually require resources only affordable by the private sector.



Few Pure Basic or Pure Applied Faculty

Table 6 Basic and applied research orientation classifications, percentages within discipline of current academic unit

	Pure basic	Lean towards basic	Equally basic and applied	Lean towards applied	Pure applied	Total	<i>n</i>
Teacher training and education	7	12	32	29	19	100	677
Humanities	28	21	26	16	9	100	1,347
Social/behavioural sciences	19	19	24	23	16	100	1,127
Business and economics	8	15	31	28	18	100	980
Law	18	20	34	18	10	100	301
Life sciences	22	26	23	17	12	100	694
Physical sciences, mathematics, computer sciences	18	24	29	19	10	100	1,809
Engineering, architecture	3	13	32	32	21	100	1,667
Agriculture	4	8	23	31	35	100	305
Medical and health sciences	9	16	18	27	30	100	1,322
Other	8	15	33	24	20	100	334
Total	14	18	27	24	17	100	10,563

Bentley, Gulbrandsen, Kuvik. The relationship between basic and applied science in universities. *High Educ* (2015) 70:689-709

Public Vs Private Funding

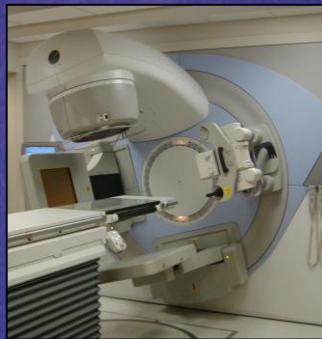
Public	Private
Limited money	Unlimited money
Decision by your peers	Decision by investors
Basic ideas OK, but applied more successful	Only applied ideas will be funded by industry
Results in publications, training, and more grants	Results in use by society and more investment
Limited funding for regulatory efforts	Funding always includes regulatory considerations

Working With Industry

David Jaffray developed cone beam CT at Beaumont Hospital Hospital in Michigan. This would not have been a good environment for Jaffray except for enlightened management and the presence of John Wong.



David Jaffray



Elekta Synergy

Starting Startups

- Stanford Linear Accelerator lab was one of the preeminent linac labs in the world.
- Stanford had large and exceptional engineering programs.
- Stanford capitalized on the linac with a partnership with Varian and later developed the CyberKnife.
- Stanford understands the value of entrepreneurship.



John Adler



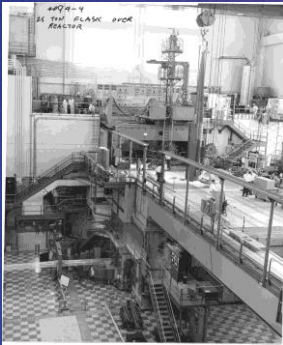
CyberKnife

Steps for Industrial Engagement



- Identify a important problem.
- Arrive at a technical solution to the problem.
- Protect your intellectual property.
- Ensure that there are customers for the solution.
- Pitch your solution to a company or start your own company.

Mo-99 Made in Aging Reactors

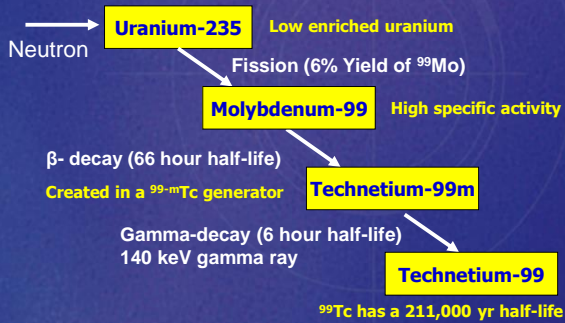


NRU Reactor, Chalk River, Canada – now shut down

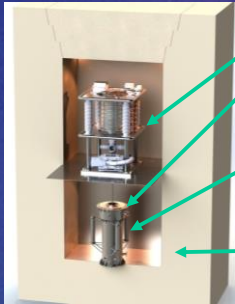
HFR Petton Reactor, Holland – soon to be shut down



Nuclear Physics of $^{99}\text{Mo}/^{99\text{m}}\text{Tc}$



Mo-99 Production with a Sub-Critical Assembly ~\$300 M

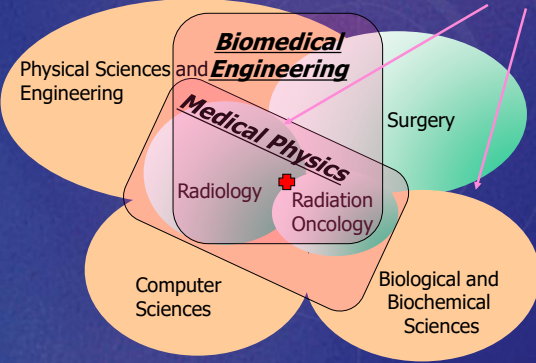


- Neutron Driver
 - Subcritical Assembly
 - Neutron Flux Detector
 - Reinforced Concrete Irradiation Cell
- * An Irradiation Unit consists of:
 - * D-T Neutron Driver
 - * Subcritical Assembly
 - * Concrete confinement structure (Irradiation Cell)
 - * Supporting systems and components (e.g. Target Solution Dump Tank, Cooling Systems, Neutron Flux Monitor)

Courtesy Shine Medical Systems, Janesville WI

Our Universe

Opportunities at Edges and Gaps



You Are The Future!



If you want to make a big impact then work with a company or create a company.

Conclusions

- You don't predict the future you make the future.
- If you consider yourself an applied scientist then maximize your impact by driving your ideas into practical use.
- Look for the gaps and operate at the edge.
- Funding from public and private sources is fundamentally different.
- Nothing is too big to take on with the private sector.
- Entrepreneurism may be the highest form of academic engagement with society.
