MORGRIDGE

INSTITUTE FOR RESEARCH

AT THE UNIVERSITY OF WISCONSIN-MADISON

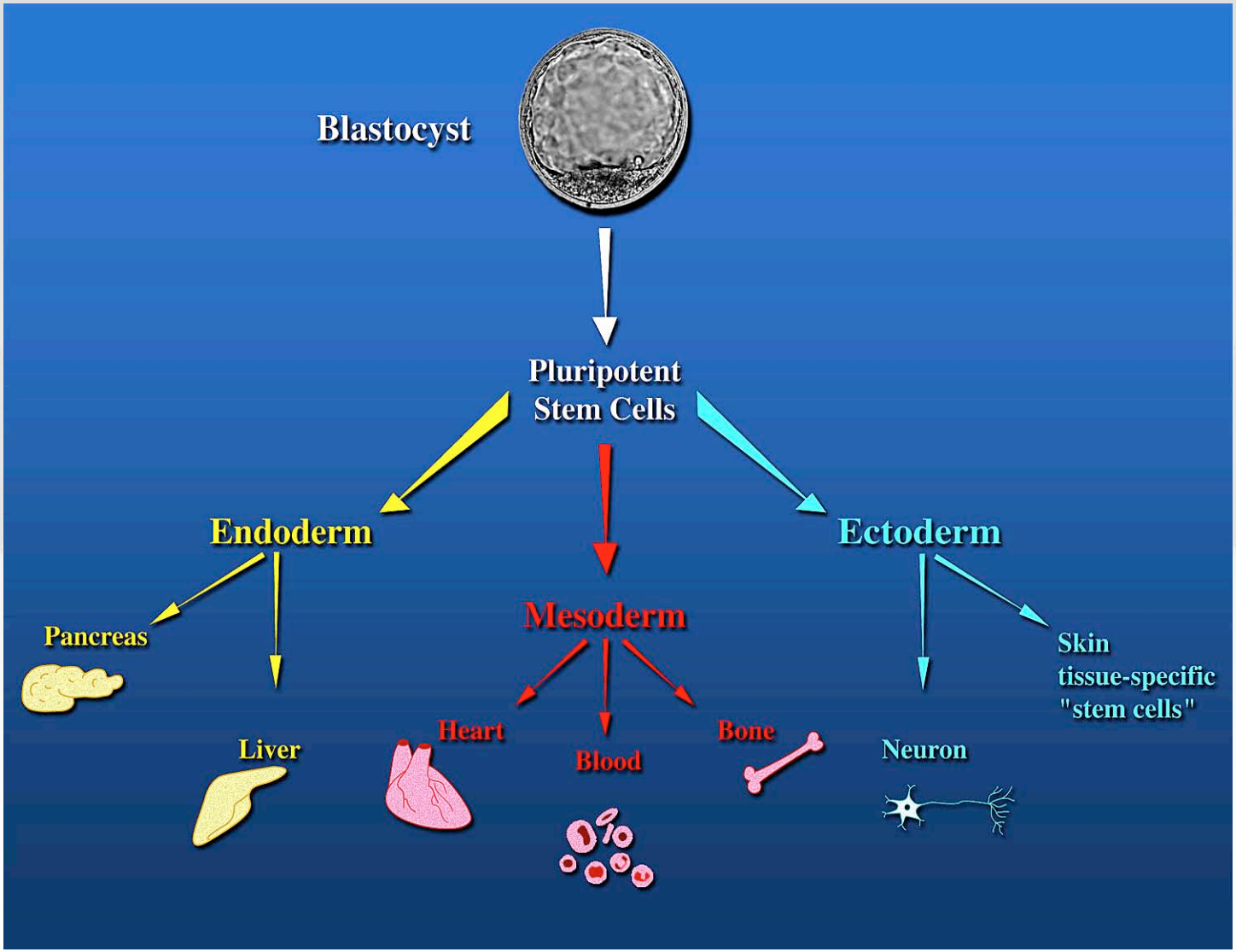
Cyberinfrastructure for Regenerative Personalized Medicine: The Vision and Challenges

Sangtae Kim

Morgridge Institute for Research

Presentation at HUBbub2011 (Indianapolis), Apr. 6, 2011

Differentiation Potential of Stem Cells



Slide courtesy of R. Shevde

STEM CELL SCIENCE
A Landscape Created by Many Currents

THE UNIVERSITY of WISCONSIN MADISON

University of Wisconsin–Madison
Department of Medical History and Bioethics
Linda Hogle, Ph.D., Benjamin Nisler and Sarah Wynn

EVENTS KEY

- SCIENTIFIC DISCOVERY
- ORGANIZATIONAL ACTION
- GOVERNANCE ACTION
- SOCIAL/CULTURAL TRENDS
- UW–MADISON

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How will the landscape change?

Human Embryonic Stem Cells, 1998

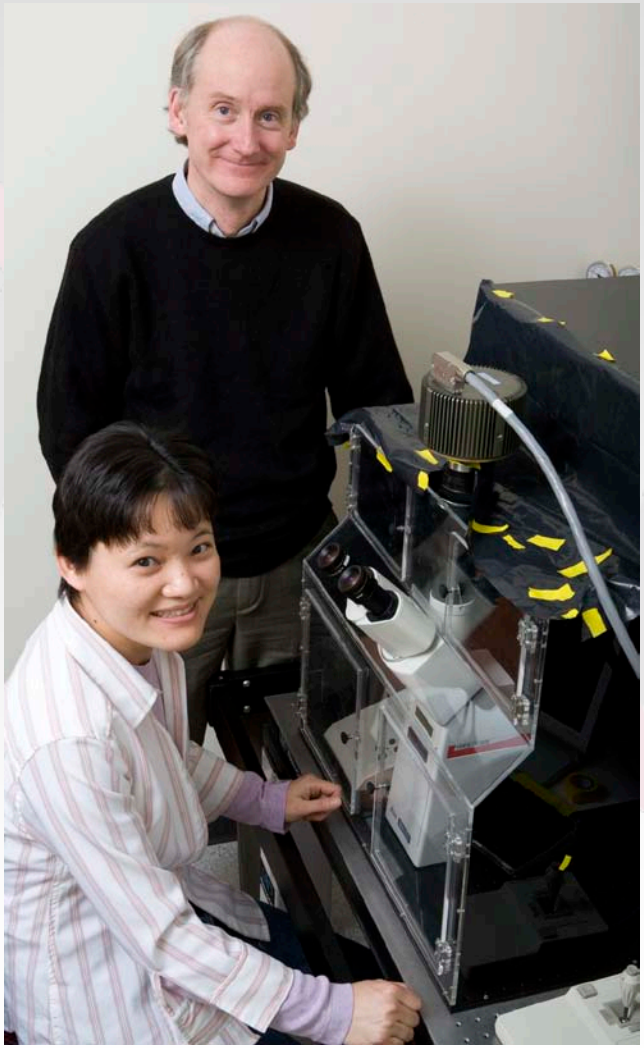
"The development of cell lines that may produce almost every tissue of the human body is an unprecedented scientific breakthrough. It is not too unrealistic to say that this research has the potential to revolutionize the practice of medicine and improve the quality and length of life".

NIH Director Harold Varmus

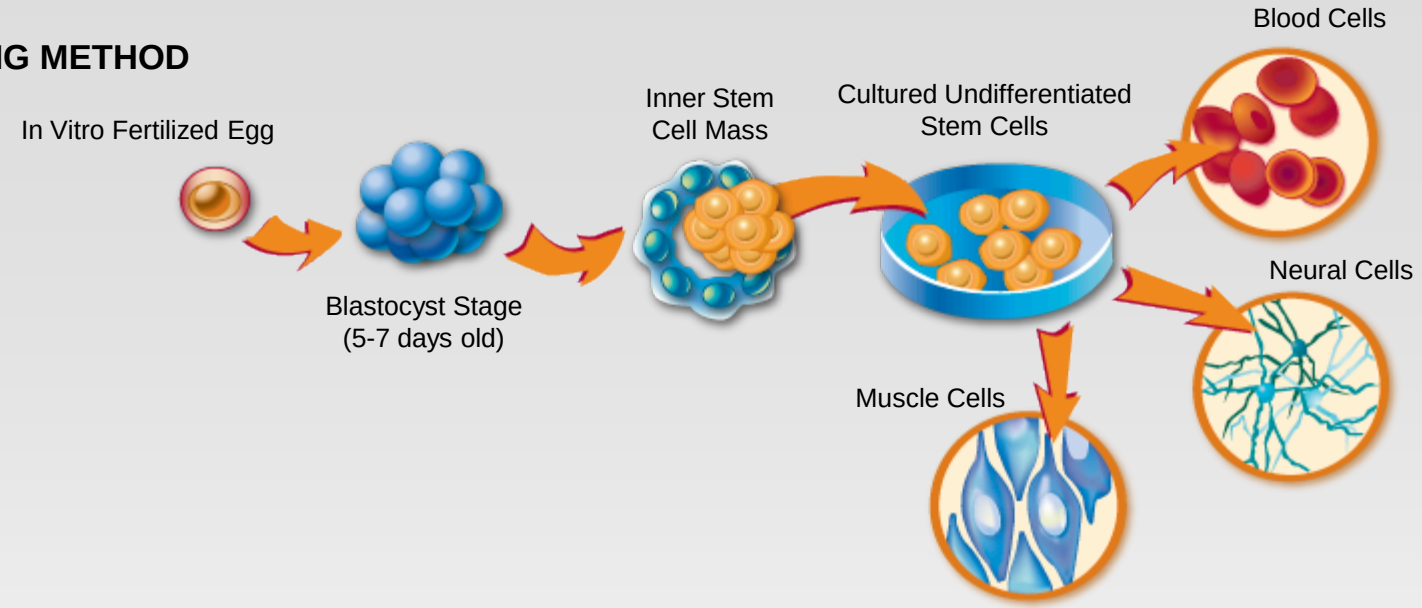
Before the United States Senate Subcommittee on Labor, Health, and Human Services, Education and Related Agencies, December 2, 1998.

The Isolation of Human Embryonic Stem Cells was listed among the most significant scientific advances of 1998 in *Science, Time, The London Times, and Discover Magazine*, and was featured in *Science's* "Breakthrough of the Year" in 1999.

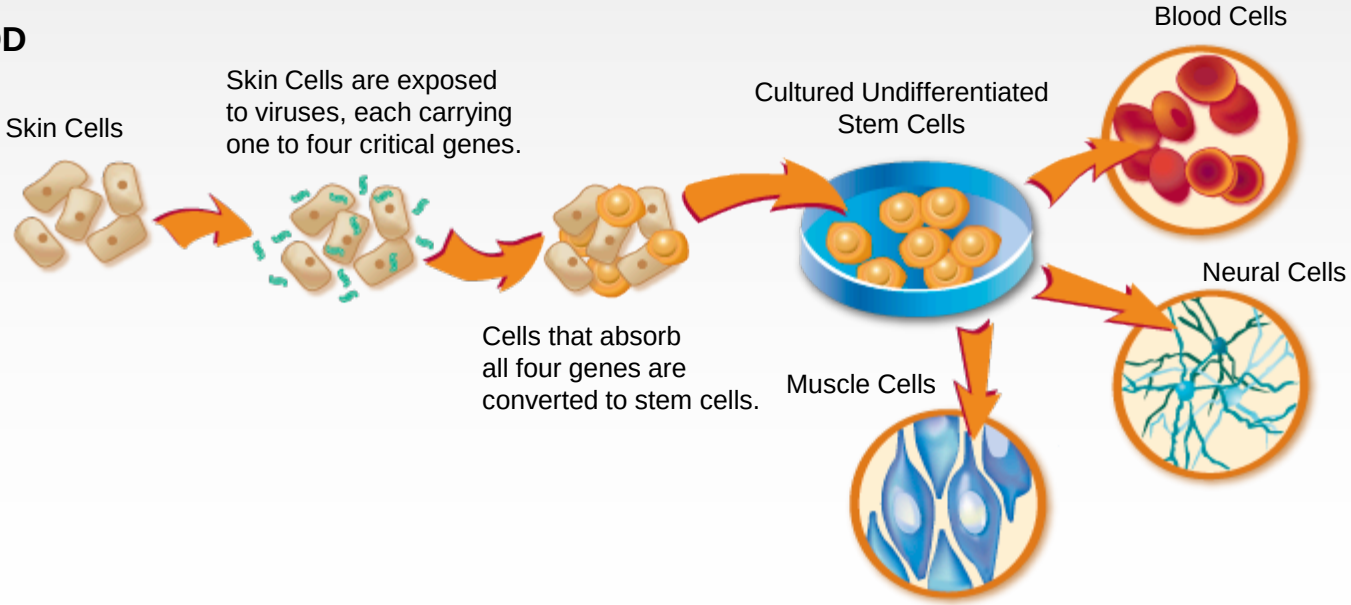
Human iPS Cells, 2007



EXISTING METHOD



NEW METHOD



Twin institutes under one roof on the UW-Madison campus

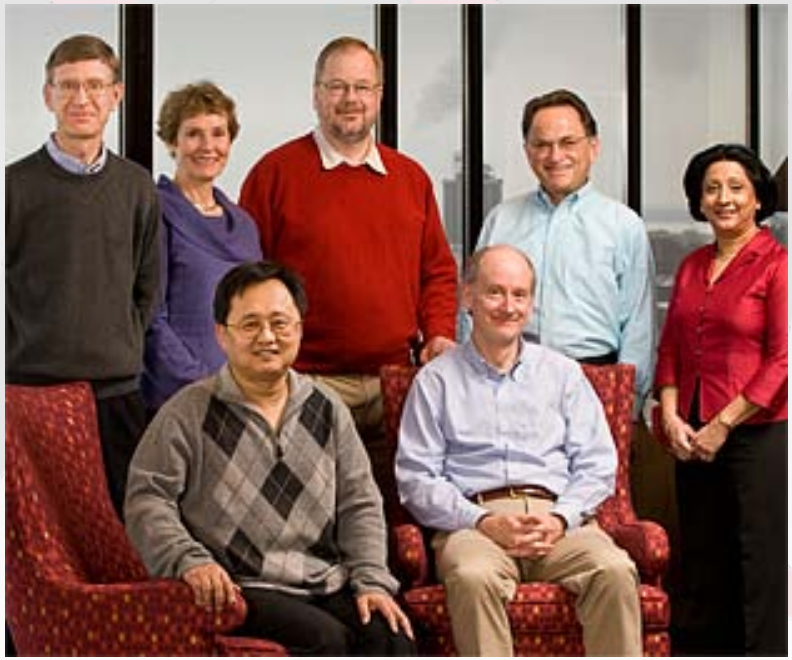
MIR Discovery to Delivery Team

Susan Millar
education research

Rock Mackie
medical devices

Miron Livny, CTO

Paul Ahlquist
virology/oncology



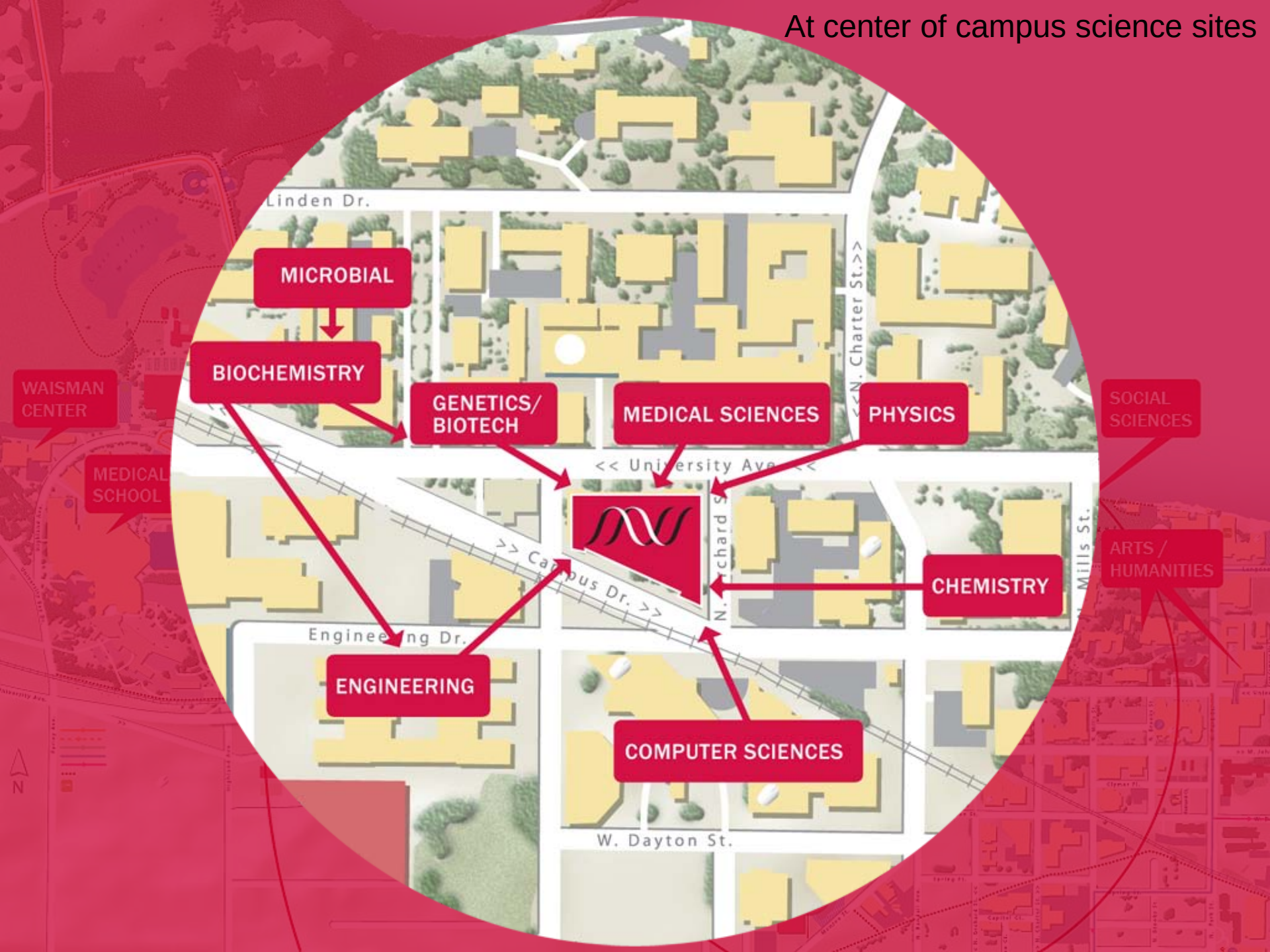
Rupa Shevde
outreach experiences

Sang Kim
pharma-informatics

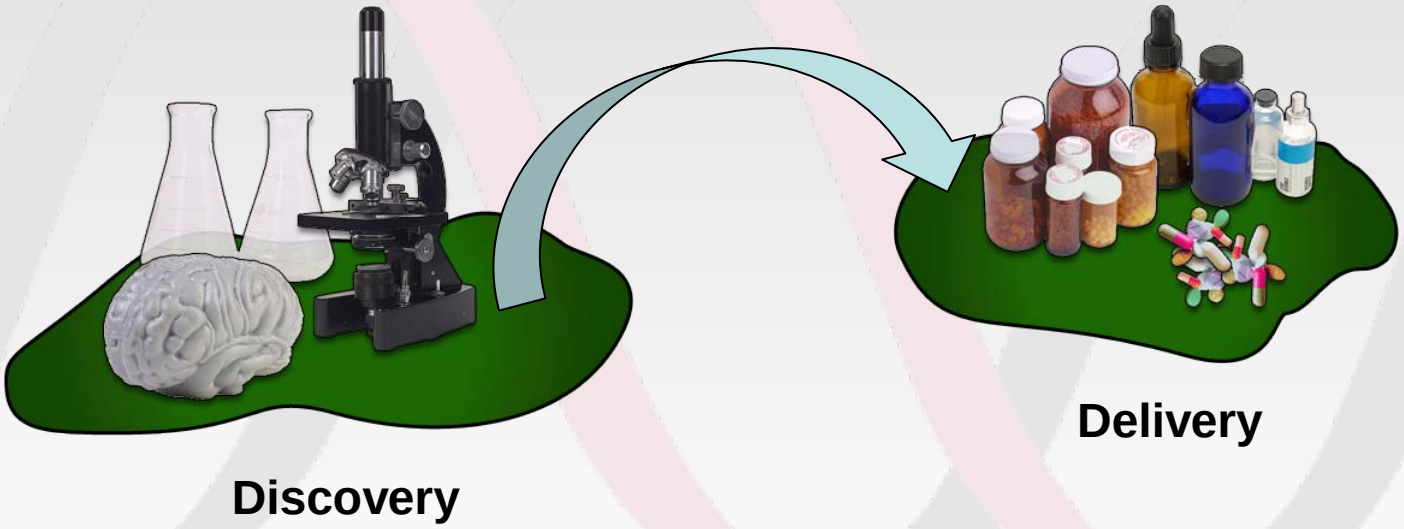
Jamie Thomson
regenerative biology

WISCONSIN INSTITUTES FOR DISCOVERY

At center of campus science sites

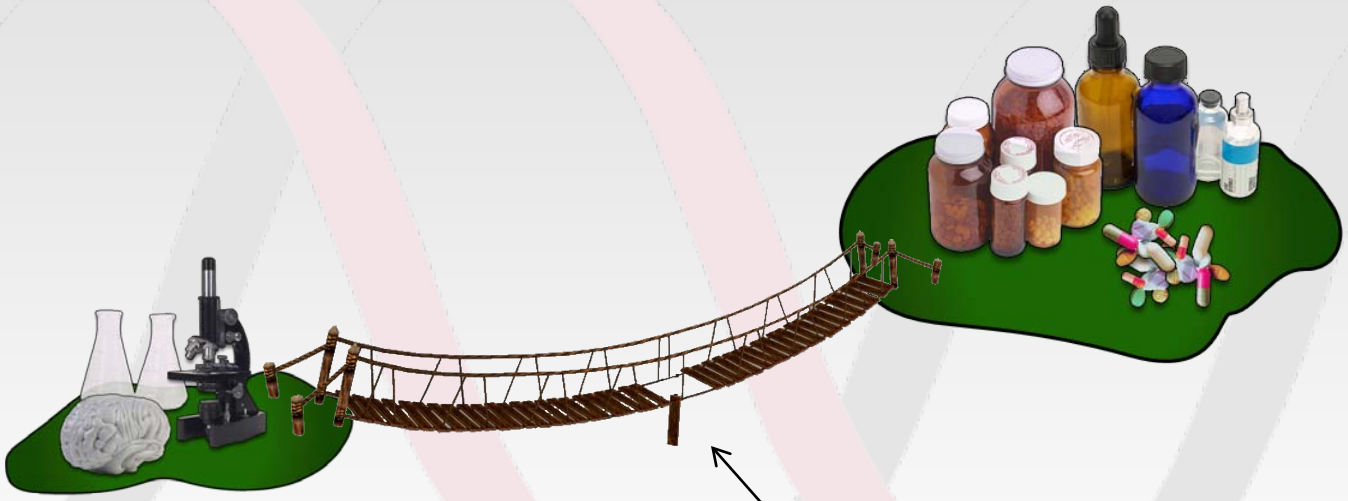


UW/WARF History: Discovery to Delivery



WISCONSIN INSTITUTES FOR DISCOVERY

Global Reality: the Past Decade



Universities' IP portfolios decline in market value

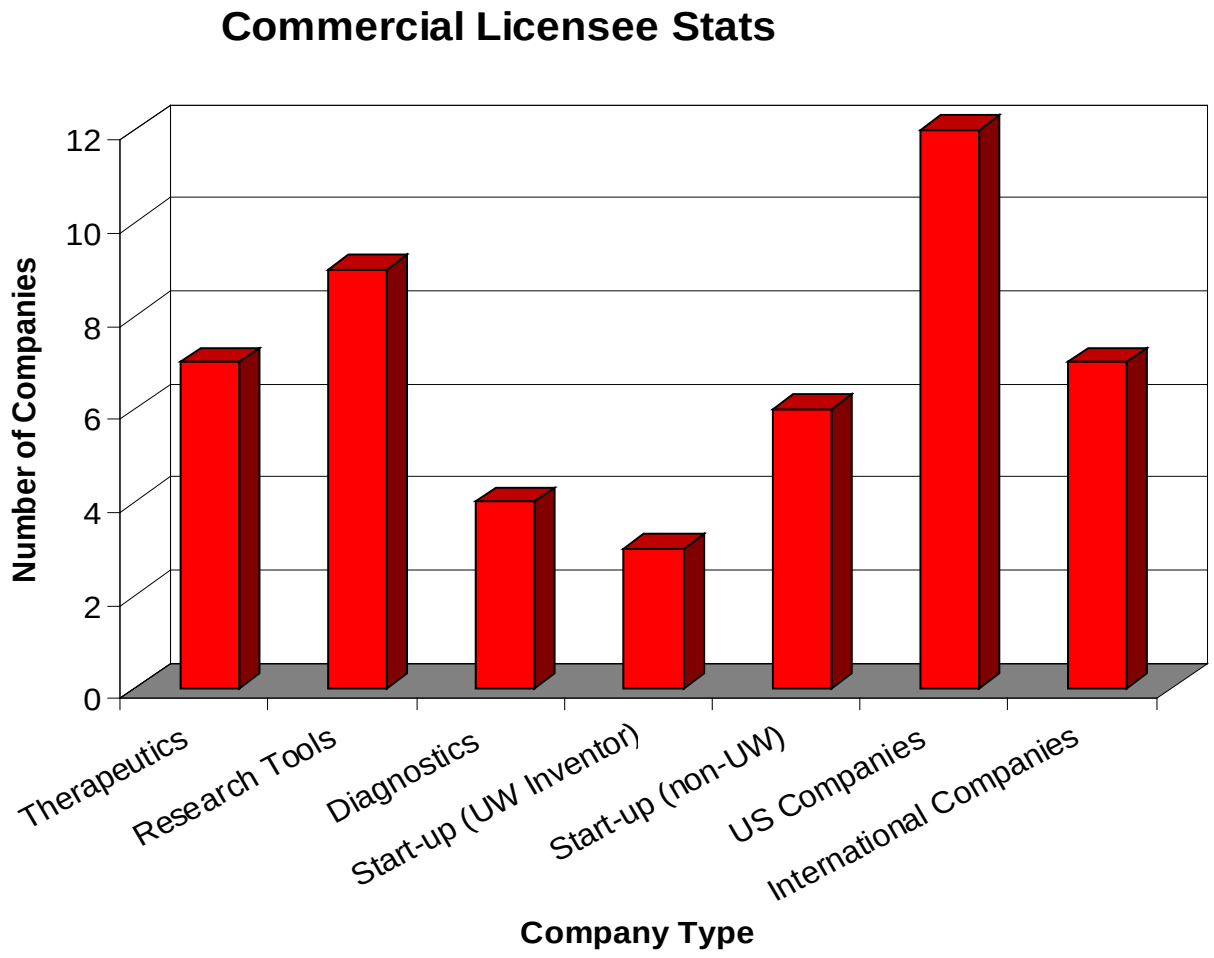
Longer, riskier path

MIR Vision: Discovery to Delivery

IP portfolio grows in value, responding to market forces

WISCONSIN INSTITUTES FOR DISCOVERY

Commercial Program Profile



Stem Cell Therapeutic Applications

- Immediate Applications
  - Diabetes
  - Cardiovascular Disease
  - Autoimmune Disease
  - Alzheimer's Disease
  - Parkinson's Disease
  - Spinal Cord Injury
- Other Applications
  - Osteoperosis
  - Cancer
  - Burns and Skin Grafts

Stem Cell Therapeutics Market

- Market expected to reach $11.5B by 2015
- 50% growth rate over next ten years
- 116 companies involved in stem cell therapy
- *Need data provenance from the start – long before the clinical phases!*

Source: MedMarket Diligence, MII News, Global Industry Analysts, TFG Analysis

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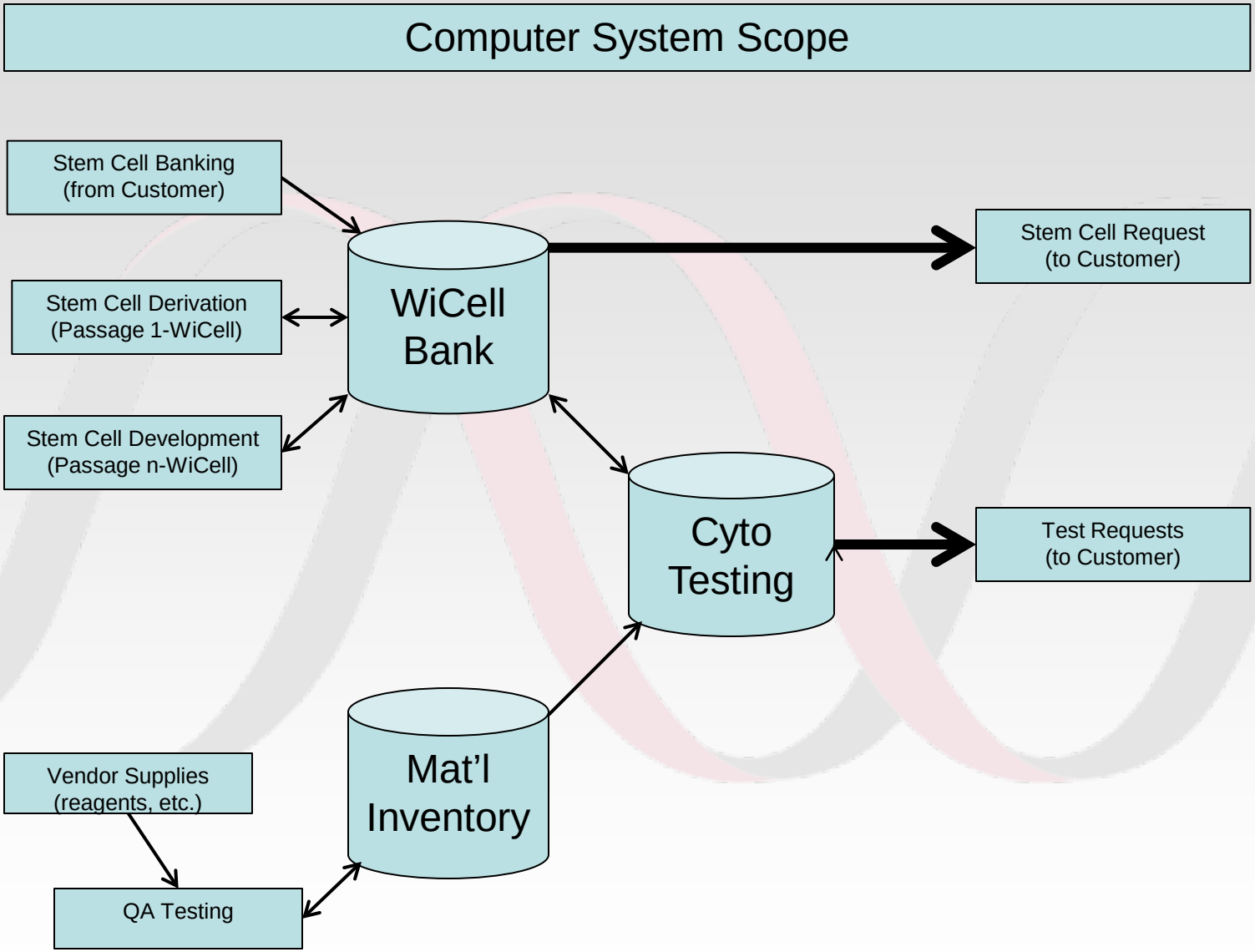
WiCell Process



CytoGenetics Database (Dave Feryus)

Active Request	Accession	Fund/Proj	Cell Line	Label	From	Num Days	Rec Date	Harv	Drop	GBand	FISH	SKY	Fast Fish	RNA	DNA	CGH	STR	HLA	ABO	SNP
3490	1007735	/	HDFa-TK4 p35	-	Kristen Martins-Taylor(UCHC)	53	Jul22								Aug02	Queue				
3492	1007737	/	HDFa-TK7 p34	-	Kristen Martins-Taylor(UCHC)	53	Jul22								Aug02	Queue				
3455	1007542	000/221	WA07 p32	WISC9488	Lisa Kesler(WiCell Distribution)	52	Jul23	Jul23	Jul23	Aug05					Jul23		REC			
3489	1007705	000/221	iPS(Foreskin)-4-WB0038 p20	WISC 5021	Lisa Kesler(WiCell Distribution)	45	Jul30	Jul30	Jul30	Aug09					Jul30		REC			
3528	1007958	000/221	WA19 p10	WISC 8841	Lisa Kesler(WiCell Distribution)	35	Aug09	Aug09	Aug09	Aug16					Aug12		REC			
3609	1008378	099/1230	WA22 (WISC 6081) p8	WISC 6081	Nicole George(WiCell Derivation)	18	Aug26	Aug27	Aug27	Sep02				Aug27	Aug26		REC			
3627	1008521	000/221	iPS(IMR90)-3 p23+23(5)	WISC 6942	Lisa Kesler(WiCell Distribution)	18	Aug26								Aug26		REC			
3607	1008376	000/221	WA22 (WISC 8432) p	WISC 8432	Dan Felkner(Distribution)	17	Aug27	Aug27	Aug27	Sep02				Aug27	Aug26		REC	REC		
3629	1008524	/	ECp1 p50/25	-	Rachel Lewis(CDI)	13	Aug31	Sep01	Sep01	Sep09										
3630	1008525	/	MB TeSR (1 control) p45	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	DIR										
3632	1008527	/	MB TeSR (3 +PEDF +bFGF) p45(11)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	1 REV										
3633	1008528	/	6.1 p76(56)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	1 REV										
3634	1008529	/	MB Other (1 control) p45(11)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	1 REV										
3635	1008530	/	MB Other (2 +pleo) p45(11)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	1 REV										
3636	1008531	/	MB Other (3 +PEDF +bFGF) p45(11)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	1 REV										
3637	1008532	/	MRB Other (1 control) p51(12)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	1 REV										
3638	1008533	/	MRB Other (2 +pleo) p51(12)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	Sep09										
3639	1008534	/	MRB Other (3 +PEDF +bFGF) p51(12)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	Sep09										
3640	1008535	/	MRB TeSR (1 control) p51(12)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	DIR										
3641	1008536	/	MRB TeSR (2 +pleo) p51(12)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	2 REV										
3642	1008537	/	MRB TeSR (3 +PEDF +bFGF) p51(12)	-	Sarah Burton(CDI)	13	Aug31	Sep03	Sep03	2 REV										
3643	1008538	000/221	WA15.02 p21	-	Marybeth Witkowski(Distribution)	12	Sep01						Sep02							
3644	1008543	000/221	WA15.20 p21	-	Marybeth Witkowski(Distribution)	12	Sep01						Sep02							
3645	1008604	/	hESC01 p14	-	Nick Strelchenko(Cybrid Cell Genetics)	11	Sep02	Sep03	Sep03	DIR										
3646	1008605	/	hESC31 p28	-	Nick Strelchenko(Cybrid Cell Genetics)	11	Sep02	Sep03	Sep03	DIR										
3647	1008606	/	OAT p11	-	Sara Howden(Thomson Lab)	11	Sep02								Sep02	OZ87				
3648	1008607	/	OAT iPS 12.4 p18	-	Sara Howden(Thomson Lab)	11	Sep02								Sep02	OZ87				
3649	1008608	/	iPS 6.1 p55/31/12	-	Christine Daigh(CDI)	11	Sep02	Sep04	Sep08	1 REV										
3650	1008679	099/1230	WA21-WB0006 p12	WISC 8421	Nicole George(WiCell Derivation)	10	Sep03	Sep03	Sep03	1 REV										
3651	1008691	/	6.1 p35/13	-	Rachel Lewis(CDI)	10	Sep03	Sep04	Sep08	1 REV										
3652	1008741	000/221	TE04-MCB-02 p45	WISC 0116	Marybeth Witowski(WiCell Distribution)	5	Sep08								Sep08		SHIP			
3653	1008743	/	2.008cd other +pleo p	-	Sarah Burton(Cellular Dynamics International)	5	Sep08	Sep10	Sep10	1 REV										
3654	1008744	/	2.008cd, other +PEDF +bFGF p	-	Sarah Burton(Cellular Dynamics International)	5	Sep08	Sep10	Sep10	1 REV										
3655	1008745	/	2.008cd, other, control p	-	Sarah Burton(Cellular Dynamics International)	5	Sep08	Sep10	Sep10	1 REV										
3656	1008746	/	2.008cd, TeSR, control p	-	Sarah Burton(Cellular Dynamics International)	5	Sep08	Sep10	Sep10	1 REV										
3657	1008747	/	2.008cd, TeSR, +Pleo p	-	Sarah Burton(Cellular Dynamics International)	5	Sep08	Sep10	Sep10	1 REV										
3658	1008748	/	2.008cd, TeSR +PEDF +bFGF p	-	Sarah Burton(Cellular Dynamics International)	5	Sep08	Sep10	Sep10	1 REV										
3665	1008813	/	H1 p59	-	Tania Hennessy(Stemcell Technologies)	4	Sep09	Sep13	DROP	-										
3660	1008785	000/210	WA01 p46(22)	-	Kim Leonhard(WiCell Cytogenetics)	3	Sep10						HYBR							
3659	1008749	000/221	H9-hTnnTZ-pGZ-D2 p40	WISC 3166	Lisa Kesler(WiCell Distribution)	3	Sep10	Sep10	Sep10	1 REV					Sep10		SHIP			
3661	1008788	/	MRB(5) mTeSR1 p65	-	Brian Riley(CDI)	3	Sep10	Sep10	Sep10	1 REV										
3662	1008789	/	MRB(6) TeSR 10F p45	-	Brian Riley(CDI)	3	Sep10	Sep10	Sep10	1 REV										
3663	1008800	/	H1-VP2 Clone 1 p6	-	Maksym Vodyanyk(CDI)	3	Sep10	Sep10	Sep10	1 REV										
3664	1008806	/	H1-VP2 Clone 2 p6	-	Maksym Vodyanyk(CDI)	3	Sep10	Sep10	Sep10	1 REV										
3666	1008814	099/1230	WA22 p	WISC 5971	Jeff Jones(WiCell Derivation)	0	Sep13	Sep13	DROP	-										

Returned 45 Rows

Active Request	Pending=White	Warning=Yellow	Overdue=Red	Complete=Date

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AT THE UNIVERSITY OF WISCONSIN-MADISON

Discovery Regenerative Biology, Virology

Delivery Medical Devices, Pharmaceutical Informatics

Personalized – Provenance

Questions or Comments?

Morgridge Institute Mission

Accelerating Discovery to Delivery to Improve Human Health

- Move biomedical discoveries from benchtops of researchers to bedsides of patients . . . from point of discovery to application
- Impact society through new treatments, tools and scientific insight
- Scientific Areas

  Discovery Regenerative Biology, Virology

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How will the landscape change?

Stem Cell Research Tools

- Cell Culture Media
- ADME/Toxicology
- Cryopreservation
- Drug Discovery Assays
- Karyotyping
- hESC Characterization Kits
- Gene Expression Systems
- Differentiated Cell Characterization Kits

WISCONSIN INSTITUTES FOR DISCOVERY

Stem Cell Diagnostics

- Least developed market
- Will require enabling technologies (e.g. cost effective cell culture)
- Will compete with genetic and molecular diagnostics
- *Promising applications in personalized medicine*