



ALLIANCE for
Regenerative Medicine



#SOTI15



Edward Lanphier

*President and CEO, Sangamo BioSciences, Inc.
Chairman, Alliance for Regenerative Medicine*

2015

REGEN MED & ADVANCED THERAPIES

State of the Industry
Briefing

JANUARY 12, 2015 | SAN FRANCISCO, CA



Industry overview

Year in review: 2014

Financial performance

Looking ahead: 2015

About ARM



Regenerative Medicine and Advanced Therapies



The regenerative medicine and advanced therapies industry develops revolutionary treatments and cures through the use of transformative scientific discoveries and innovative technologies.

Categories:

- *Cell therapy*
- *Tissue engineering and biomaterials*
- *Gene and gene-modified cell therapies and genome editing*

Major focus areas:

- *Cancer immunotherapy: CAR-T cells, TCRs*
- *Cardiovascular*
- *Genetic disorders*
- *HIV/AIDS*
- *Neuro-degenerative diseases*
- *Ophthalmology*
- *Wound healing*



Gene & Gene-Modified Cell Therapy

- *Gene replacement: AAV, LV, RV, AD, others*
- *Gene replacement (non-viral): electroporation, DNA, oligo, others*
- *Immunotherapies: T-cells, CARs, TCRs, TILs*
- *Genome editing: Zinc finger, CRISPR/Cas9, TALENS*



Cell Therapy

- *Hematopoietic stem cells*
- *Induced Pluripotent Stem Cells, ESCs*
- *Adult Progenitor Cells - neural, liver, cardiac*
- *Mesenchymal Stem Cells*
- *Cord Blood, Placental, Amniotic*



Tissue Engineering

- *Tissue Allografts*
- *Tissue Autografts*
- *Biomaterials, scaffolds and extracellular matrix*
- *Cells, growth factors, cytokines*
- *Bioreactors*



*Global Breakdown of
517 Leading Companies*





340+
Total Cell
Therapy Companies



180+
Total Tissue
Engineering Companies



140+
Total Gene
Therapy Companies



*500+
Total Therapeutic
Companies*



*60+
Approved
Products*



*375+
Total Clinical
Trials*

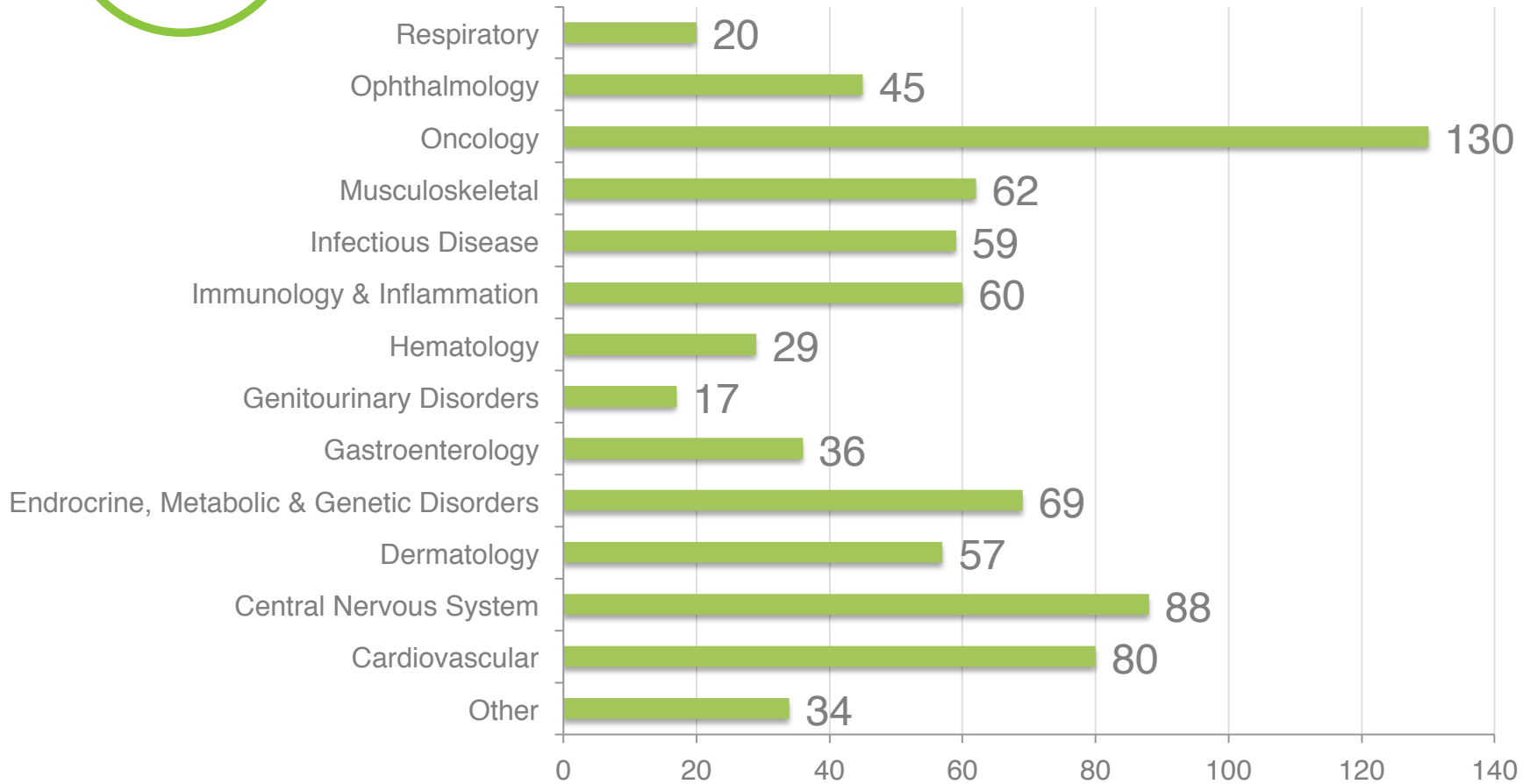


Clinical Trials by Stage

<i>Phase I</i>	<i>Phase II</i>	<i>Phase III</i>	<i>Total in Clinical Development</i>	<i>Approved Products</i>
133	206	39	378	66



Number of Companies by Disease Focus Area



Examples of Major Financial Events

<i>uniQure IPO raises \$91.8M</i>	<i>February 5, 2014</i>
<i>Kite Pharma IPO raises \$146M, plus \$216.4M in follow-on financing</i>	<i>June 20, 2014 December 10, 2014</i>
<i>Avalanche Biotechnologies IPO raises \$109.1M</i>	<i>July 31, 2014</i>
<i>Histogenics IPO raises \$65M</i>	<i>December 3, 2014</i>
<i>Bellicum Pharmaceuticals IPO raises \$160.6M</i>	<i>December 18, 2014</i>
<i>Juno Therapeutics IPO raises \$304.8M</i>	<i>December 19, 2014</i>

Examples of Major Partnerships and Acquisitions

<i>Capricor Therapeutics and Janssen Biotech, Inc. enter into collaboration</i>	<i>January 6, 2014</i>
<i>Sangamo BioSciences and Biogen Idec announce collaboration to develop treatments for hemoglobinopathies</i>	<i>January 9, 2014</i>
<i>TxCell and Ferring International enter collaboration, development and license agreement</i>	<i>March 14, 2014</i>
<i>Baxter acquires Chatham Therapeutics' developmental gene therapy programs</i>	<i>April 2, 2014</i>
<i>Avalanche Biotechnologies announce collaboration to develop gene therapy products in ophthalmology</i>	<i>May 5, 2014</i>
<i>Adaptimmune and GlaxoSmithKline enter into collaboration to develop and commercialize cell-based therapies</i>	<i>June 2, 2014</i>
<i>Cellectis and Pfizer enter into cancer immunotherapy collaboration</i>	<i>June 18, 2014</i>
<i>bluebird bio acquires gene-editing company Prgenen</i>	<i>June 30, 2014</i>
<i>Oxford BioMedica announces new process development and manufacturing collaboration with Novartis</i>	<i>October 10, 2014</i>

Examples of Major Regulatory Milestones

<i>Celladon receives Breakthrough Therapy designation for MYDICAR</i>	<i>April 10, 2014</i>
<i>Novartis/UPenn CAR-T 19 program receives FDA Fast Track Designation</i>	<i>July 7, 2014</i>
<i>Humacyte receives FDA Fast Track designation for HumaGraft</i>	<i>July 23, 2014</i>
<i>First patient receives iPSC derived RPE cells to treat AMD in Japan</i>	<i>September 12, 2014</i>
<i>Mesoblast announces plan to launch first cell therapy product in Japan to treat GvHD</i>	<i>October 1, 2014</i>
<i>Juno Therapeutics receives Breakthrough Therapy designation for JCAR015</i>	<i>November 24, 2014</i>
<i>Japan PMD Act implements rules for expedited approval of regenerative medicine/cell therapy products</i>	<i>November 25, 2014</i>

Examples of Major Data and Technology Events

<i>Kite Pharma announces positive results from Phase I ALL trial – 70% response</i>	<i>October 13, 2014</i>
<i>NeoStem announces initial positive data from Phase II PreSERVE AMI patients</i>	<i>November 17, 2014</i>
<i>bluebird releases early Beta thalassemia data</i>	<i>December 8, 2014</i>
<i>Juno announces positive Phase 1 data — 89% complete remission for ALL patients</i>	<i>December 8, 2014</i>
<i>Genome editing technologies including ZFN, CRISPR/Cas9, TALEN attract significant investor interest</i>	
<i>Multiple companies announce advanced gene therapy and genome editing programs for Hemophilia A&B</i>	



\$6.3 Billion
Total Amount
Raised in 2014

*\$3.0 Billion raised in 2013
YoY growth of 112%*



\$3.0 Billion
Gene & Gene-
Modified Cell Therapy

*\$491 Million raised in 2013
YoY growth of 510%*



\$687 Million
Tissue Engineering

*\$708 Million raised in 2013
YoY growth of -3%*

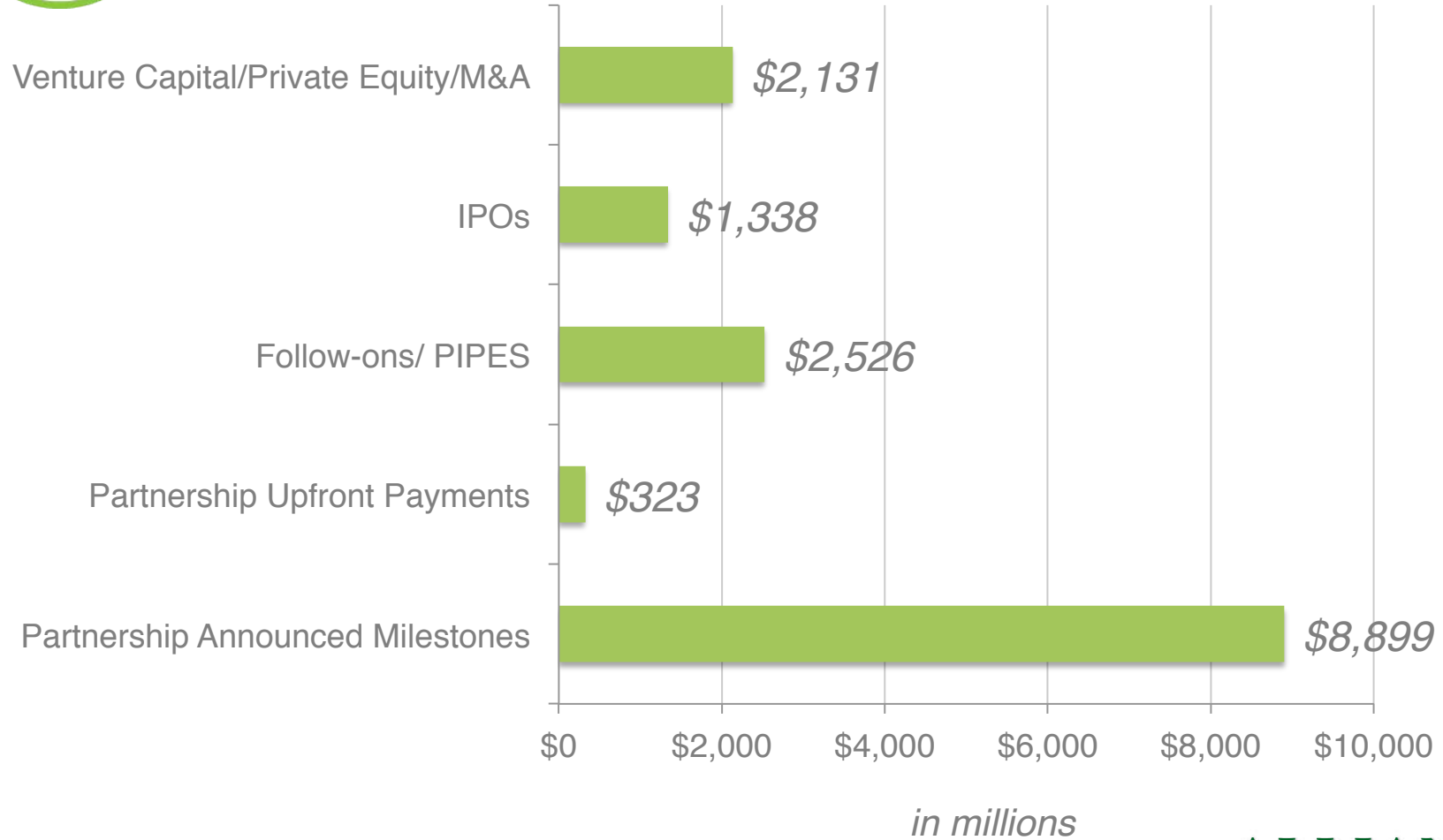


\$2.6 Billion
Cell Therapy

*\$2.0 Billion raised in 2013
YoY growth of 30%*

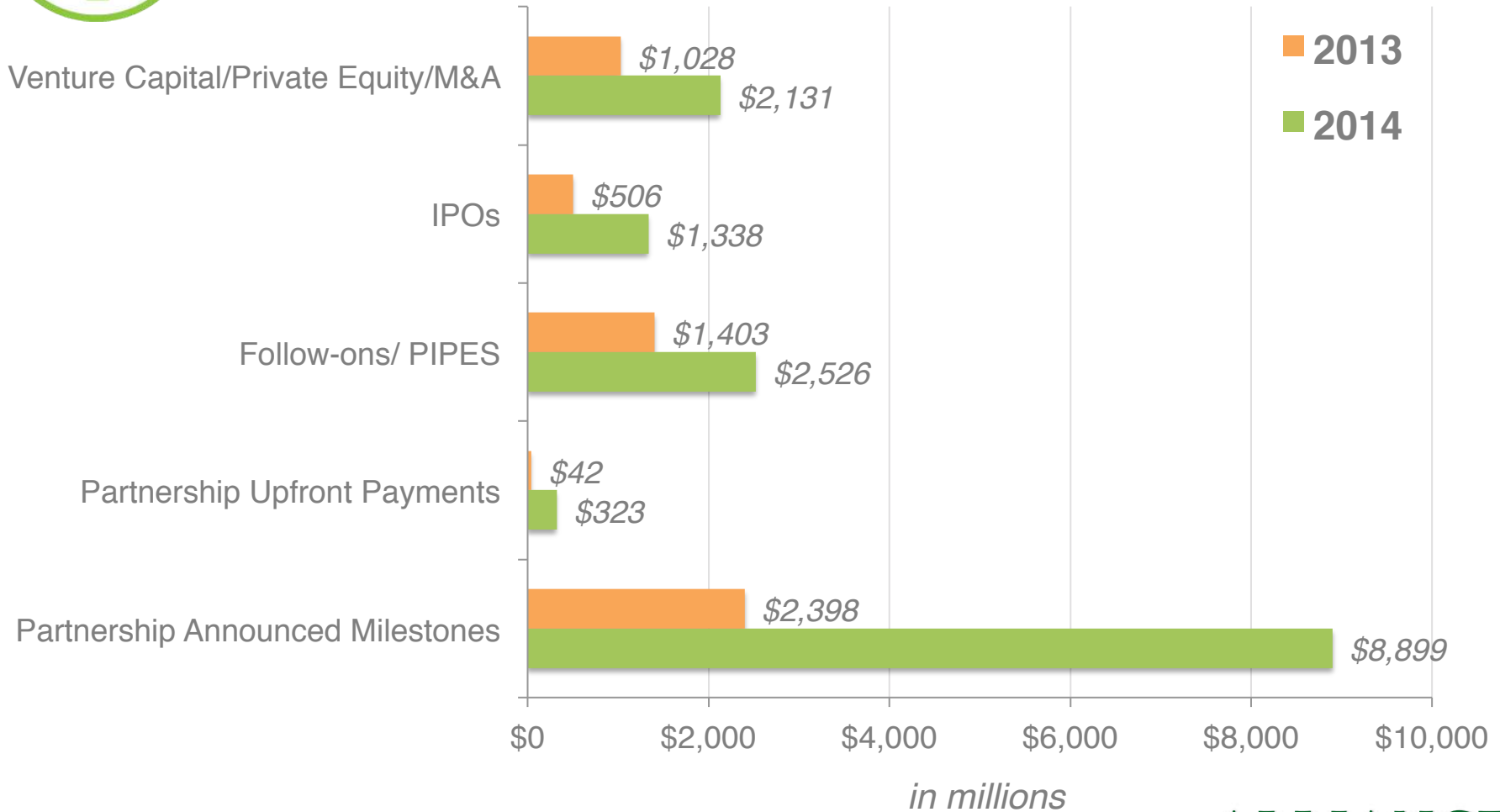


2014 Total Financings



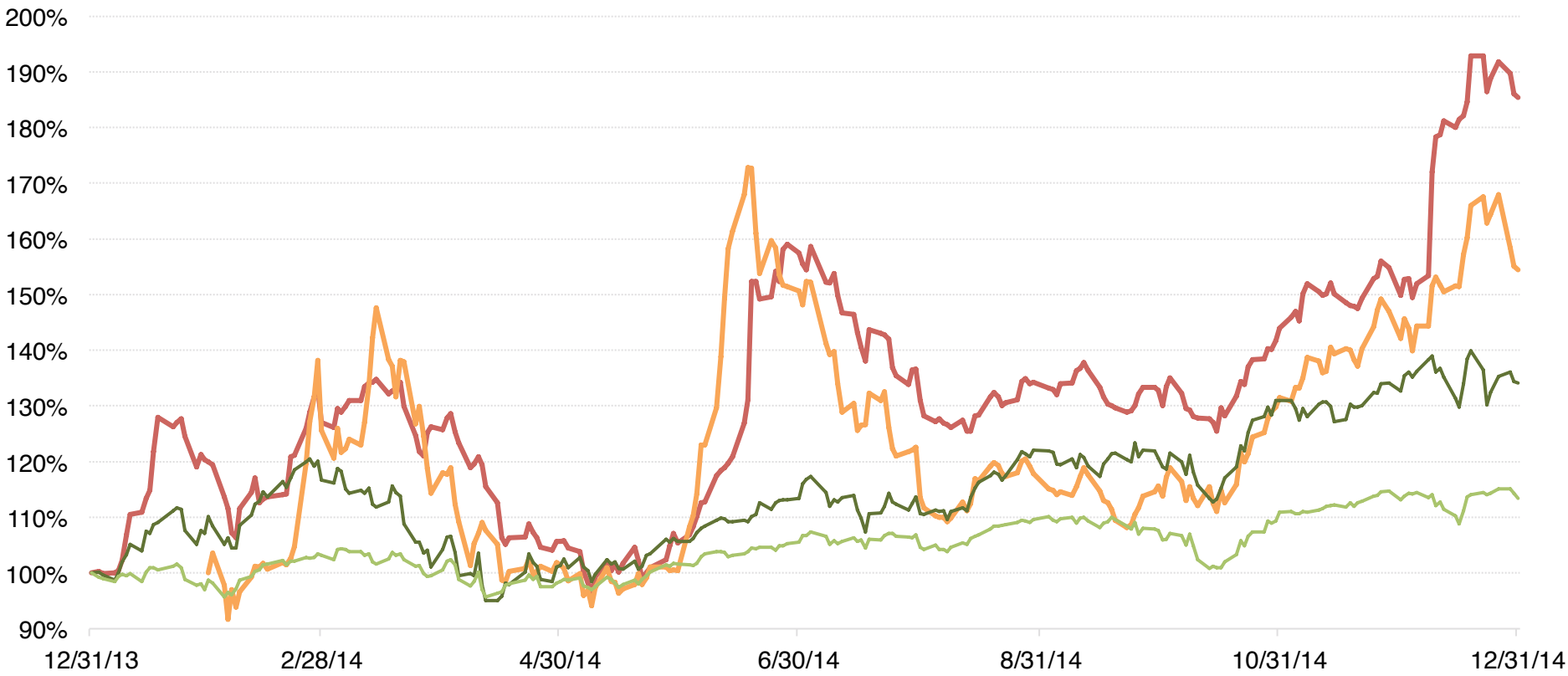


2013 / 2014 Total Financings





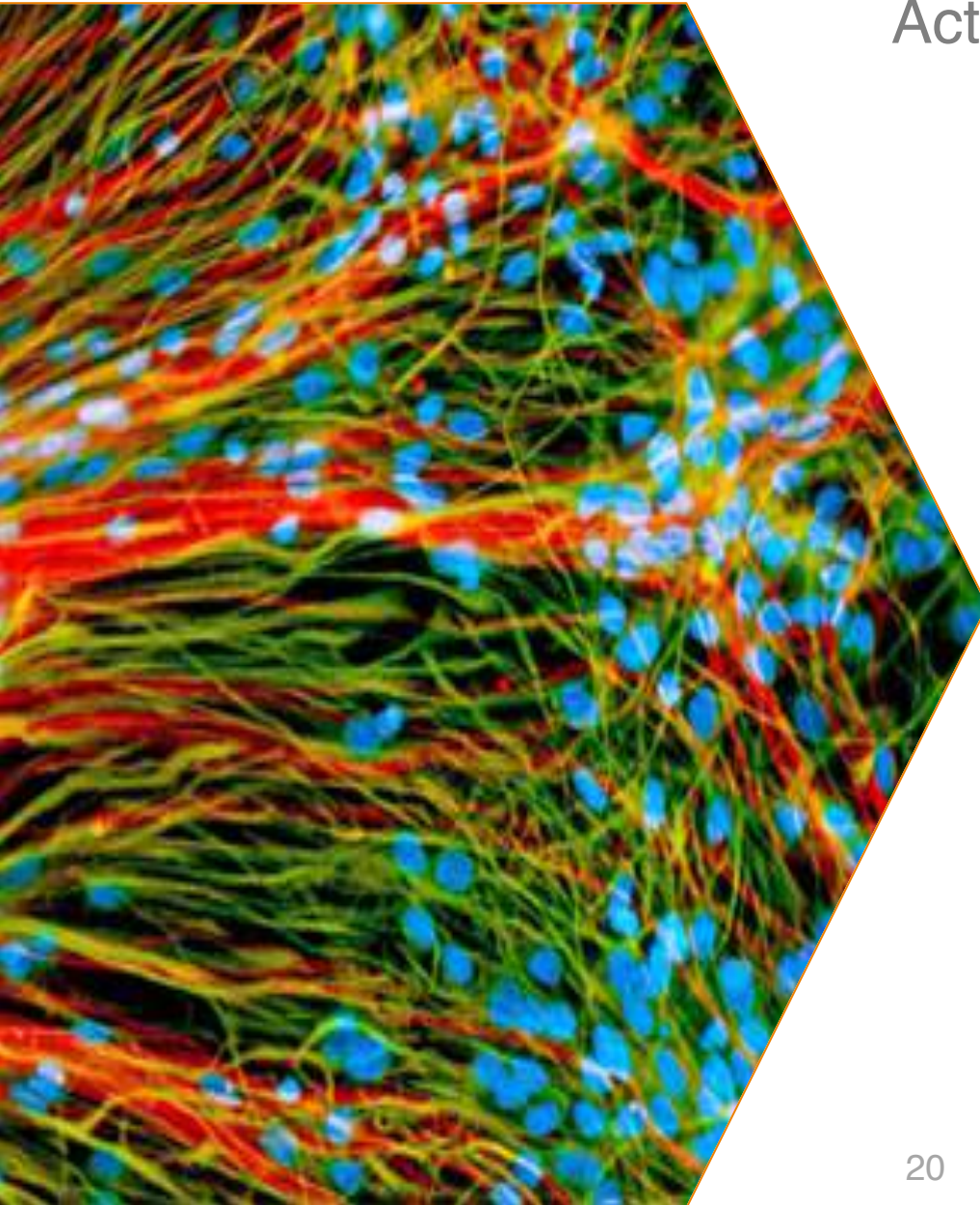
Advanced Therapies Public Company Performance



Gene Therapy Average RM/AT IPO Average Nasdaq Biotech Index % Nasdaq Index %

IPOs & Follow-Ons: 2014

Total Amount Raised	Follow-On Financing	Company	Stock Listing Date	Performance after-market / IPO pricing
\$443.5 Million Total	\$116.2M IPO / \$102.0M and \$225.3M Follow-on	bluebird bio	6/19/2013, 7/31/2014 12/15/2014	259.7% / 439.5%
\$184.0 Million IPO		Intrexon	8/8/2013	30.5% / 72.1%
\$363.0 Million Total	\$146.6M IPO / \$216.4M Follow-on	Kite Pharma	6/20/2014, 12/10/2014	126.6% / 239.2%
\$304.8 Million IPO		Juno Therapeutics	12/19/2014	33.9% / 117.6%
\$160.6 Million IPO		Bellicum Pharmaceuticals	12/18/2014	-6.2% / 21.3%
\$109.1 Million IPO		Avalanche Biotechnologies	7/31/2014	116.0% / 217.6%
\$102.4 Million Total	\$62.1M IPO / \$40.3M Follow-on	Vital Therapies	4/17/2014, 10/31/2014	103.5% / 107.8%
\$ 94.3 Million Total	\$50.6M IPO / \$43.7M Follow-on	Celladon Corporation	1/30/2014, 8/18/2014	97.3% / 144.1%
\$ 92.0 Million Total	\$57.5M IPO / \$34.5M Follow-on	Applied Genetic Technologies Corp	3/27/2014, 7/30/2014	64.9% / 75.2%
\$ 91.8 Million IPO		uniQure BV	2/5/2014	-12.9% / -12.9%
\$ 65.0 Million IPO		Histogenics	12/3/2014	-3.1% / 0.0%
\$ 62.3 Million IPO		Horizon Discovery	3/27/2014	-1.2% / N/A (GBX pricing)
\$ 60.0 Million IPO		Immune Design Corp	7/24/2014	153.3% / 156.5%
\$ 53.5 Million IPO		MacroCure	7/31/2014	-18.9% / -27.0%
\$ 45.0 Million IPO		Argos Therapeutics	2/7/2014	12.4% / 25.0%
\$ 41.4 Million IPO		Xenon Pharmaceuticals	11/5/2014	97.1% / 119.4%
\$ 22.5 Million IPO		TxCell SA	4/14/2014	2.2% / N/A (Euro pricing)
\$ 7.6 Million IPO		Orthocell Pty Ltd	8/12/2014	7.7% / N/A (AUD pricing)



Active interest in the sector:

- Abbvie
- Amgen
- Astellas
- AstraZeneca
- Baxter Int'l
- Biogen Idec
- BioMarin
- Celgene
- GlaxoSmithKline
- Johnson & Johnson
- Novartis
- Pfizer
- Regeneron
- Sanofi
- Shire Plc

Major Corporate Partnerships: 2014

Recipient Company	Corporate / Partner Company	Upfront Payment	Anticipated Deal Value	Date
<i>Collectis SA</i>	<i>Total 2014 Partnerships Pfizer Inc Les Laboratoires Servier</i>	<i>\$80 Million \$10 Million</i>	<i>\$3.705 Billion \$2.855 Billion \$850 Million</i>	<i>6/18/2014 2/17/2014</i>
<i>Chatham Therapeutics</i>	<i>Baxter International Inc.</i>	<i>\$70 Million</i>	<i>\$1.4 Billion</i>	<i>4/2/2014</i>
<i>Avalanche Biotechnologies</i>	<i>Regeneron Pharmaceuticals</i>	<i>\$2 Million</i>	<i>\$653 Million</i>	<i>5/5/2014</i>
<i>Adaptimmune</i>	<i>GlaxoSmithKline PLC</i>	<i>None</i>	<i>\$350+ Million</i>	<i>6/2/2014</i>
<i>Immunocore Limited</i>	<i>Total 2014 Partnerships MedImmune / AstraZeneca Eli Lilly and Company</i>	<i>\$20 Million \$10 Million</i>	<i>\$345 Million \$320 Million \$25 Million</i>	<i>1/8/2014 7/16/2014</i>
<i>Capricor Therapeutics Inc</i>	<i>Janssen Biotech Inc</i>	<i>\$12.5 Million</i>	<i>\$337.5 Million</i>	<i>1/6/2014</i>
<i>Sangamo BioSciences Inc</i>	<i>Biogen Idec</i>	<i>\$20 Million</i>	<i>\$320 Million</i>	<i>1/9/2014</i>
<i>Shire PLC</i>	<i>Organogenesis Inc</i>	<i>None</i>	<i>\$300 Million</i>	<i>1/17/2014</i>
<i>Transposagen Biopharma</i>	<i>Janssen Biotech Inc</i>	<i>Undisclosed</i>	<i>\$292 Million</i>	<i>11/24/2014</i>
<i>Spark Therapeutics</i>	<i>Pfizer</i>	<i>\$20 Million</i>	<i>\$280 Million</i>	<i>12/8/2014</i>
<i>Dimension Therapeutics</i>	<i>Bayer Healthcare</i>	<i>\$20 Million</i>	<i>\$252 Million</i>	<i>6/23/2014</i>
<i>Altor BioScience Corp</i>	<i>Shenzhen Beike Biotechnology</i>	<i>\$9 Million</i>	<i>\$209 Million</i>	<i>9/10/2014</i>
<i>SanBio Co Ltd</i>	<i>Dainippon Sumitomo Pharma</i>	<i>\$6 Million</i>	<i>\$205 Million</i>	<i>9/26/2014</i>
<i>Immune Design Corp</i>	<i>Sanofi</i>	<i>Undisclosed</i>	<i>\$168 Million</i>	<i>8/7/2014</i>
<i>Pregenen</i>	<i>bluebird bio</i>	<i>\$16 Million</i>	<i>\$156 Million</i>	<i>6/30/2014</i>
<i>TxCell SA</i>	<i>Ferring International Center SA</i>	<i>\$1.4 Million</i>	<i>\$105.7 Million</i>	<i>3/14/2014</i>

Examples of Anticipated Major Clinical Data Events: 2015



Company	Indication	Clinical Stage	Expected Reporting Date
Athersys	Stroke	Phase II	Q1 2015
StemCells, Inc.	Spinal cord injury	Phase I/II	Q2 2015
Celladon	Systolic Heart Failure – MYDICAR	Phase IIb	April 2015
AGTC	AAT deficiency	Phase IIb	Mid 2015
Avalanche Biotech	AVA-101 – AAV-based treatment for wet AMD	Phase IIa	Mid 2015
UniQure	Hemophilia B	Phase I/II	Mid 2015
Sangamo	HIV/AIDS	Phase II	2H 2015
Spark	RPE65 Mediated IRDs	Phase III	2H 2015
StemCells, Inc.	Dry age-related macular degeneration	Phase I/II	Q3 2015
TiGenix	Complex perianal fistula	Phase III	Q3 2015
ReNeuron	Stroke	Phase II	Q4 2015

Examples of Anticipated Major Clinical Data Events: 2015



Company	Indication	Clinical Stage	Expected Reporting Date
<i>bluebird</i>	<i>Severe sickle cell</i>	<i>Phase I/II</i>	<i>2015</i>
<i>bluebird</i>	<i>Beta Thalassemia Major</i>	<i>Phase I/II</i>	<i>2015</i>
<i>Cardio3</i>	<i>CHART-1 – Congestive Heart Failure</i>	<i>European Phase III</i>	<i>2015</i>
<i>Mesoblast/Teva</i>	<i>Congestive heart failure</i>	<i>Complete enrolment for the first interim analysis of the Phase III study</i>	<i>2015</i>
<i>Mesoblast</i>	<i>Chronic low back pain</i>	<i>24-month data from Phase II</i>	<i>2015</i>
<i>Mesoblast</i>	<i>Diabetic nephropathy</i>	<i>Topline data Phase II</i>	<i>2015</i>
<i>Mesoblast</i>	<i>Rheumatoid arthritis</i>	<i>Topline data Phase II</i>	<i>2015</i>
<i>NeoStem</i>	<i>Acute Myocardial Infarction</i>	<i>Phase III</i>	<i>2015</i>
<i>Kite Pharma</i>	<i>Aggressive NHL</i>	<i>Phase I/II</i>	<i>2016</i>
<i>TXCell</i>	<i>Crohn's</i>	<i>Phase II</i>	<i>Q4 2016</i>
<i>Histogenics</i>	<i>Knee cartilage damage</i>	<i>Phase III</i>	<i>Early 2017</i>



Pricing and Patient Access



The Washington Post

A new lawsuit claims \$84,000 is way too much for this lifesaving drug



FiercePharma

NEWS TOPICS ANALYSIS FEATUR

Topics: Regulatory | Sales and Marketing

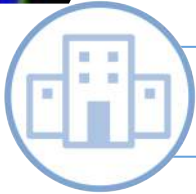
Activists pounce on \$1,000-a-day price for Gilead's hep C wonder drug, Sovaldi



Pricing and Patient Access



Communications



Access to Capital



Regulatory and Advocacy

About the Alliance for Regenerative Medicine

ARM's is an influential global advocate for the regenerative medicine and advanced therapies field and its development of revolutionary treatments and cures.

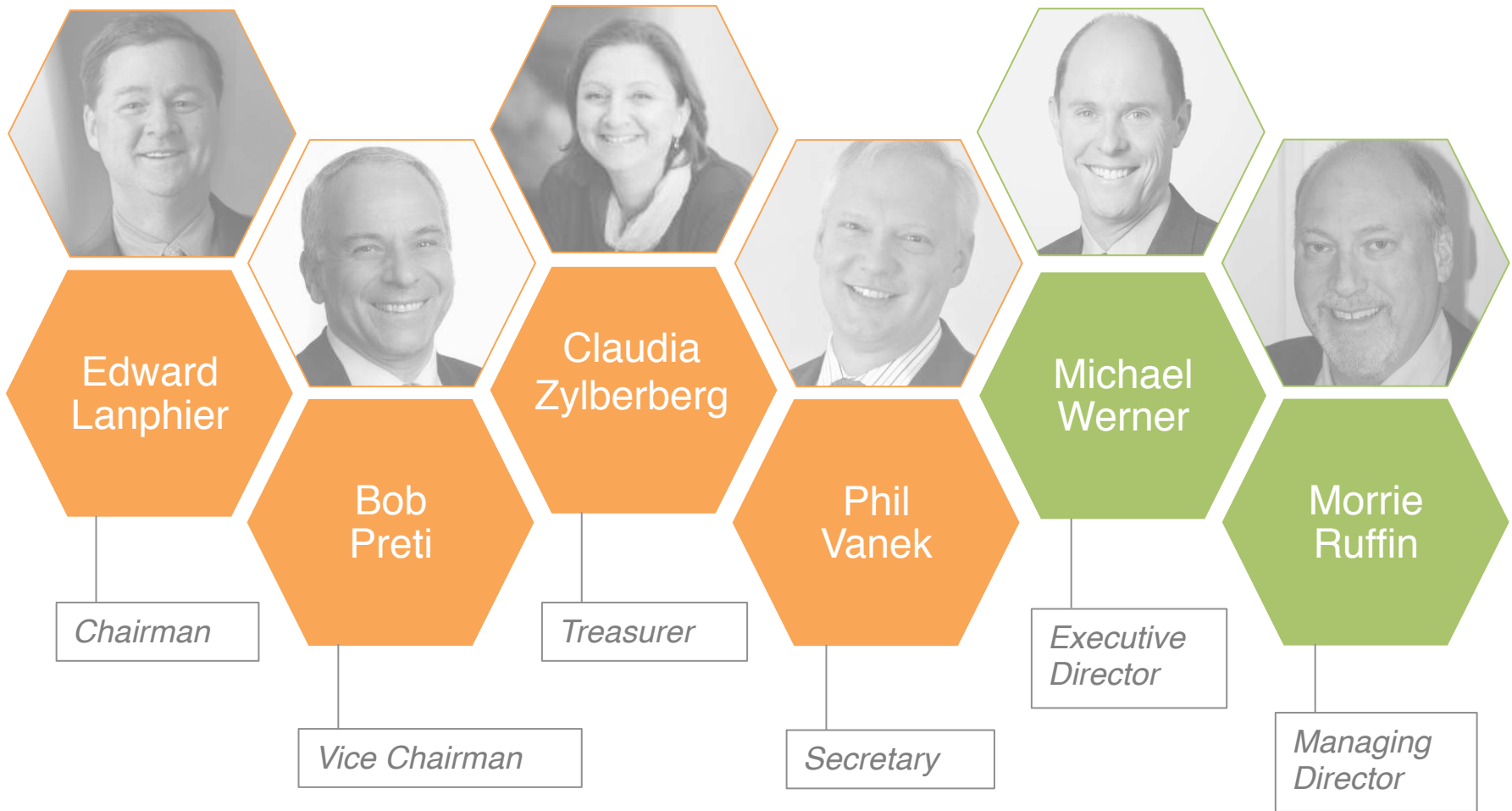
ARM works with multiple stakeholder groups to enable legislative, regulatory and public understanding of this evolving industry with the potential to transform patient care.

ARM's 2015 advocacy aims:

- *Enactment of Regenerative Medicine Promotion Act and 21st Century Cures*
- *Facilitate expedited approval for RM products and promote a clear, predictable regulatory pathway*
- *Create reimbursement models and policies to support RM*
- *Establish U.S. Center for Standards of Regenerative Medicines*
- *Ensure easier, more transparent access to federal agency data*
- *Support coordinated federal policymaking*



ARM Leadership and Governance





ALLIANCE for
Regenerative Medicine

*Special
thanks to our
data partner:*

informa