Perspectives from an Investor in Start-Up Life Science Industrials that Provide Fundamental Technologies and Services to Biopharma

Gustavo Mahler, PhD

3 June 2020

Start-ups in Life Science Industrials category

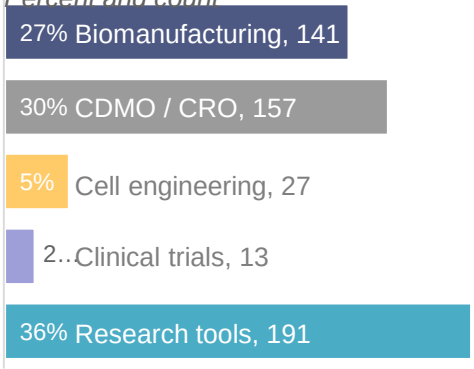
- Start-ups in Life Science industrials (LSI) develop critical technologies, tools and services for biopharma and R&D
- These companies are the drivers of innovation in the space by developing tools and services that increase yields, productivity and reduce costs of discovery, development and manufacturing of biotherapeutics
- LSI start-ups can be further categorized across these application areas
  - Biomanufacturing
  - CDMO/CRO services
  - Cell engineering
  - Clinical Trial applications
  - Research tools
  - Software/AI applications
- Products, consumables and services in this field may be applied to existing biologics, vaccines, biosimilars and/or novel therapeutics including cell and gene therapies

Large market: 500+ early and late stage LSI start-ups

- 529 LSI start-ups raised $5 billion in last 5 years
  - Over $2.5 billion deployed in last financing rounds alone
- Using median ownership assumptions, this values the sector at $13.1 billion

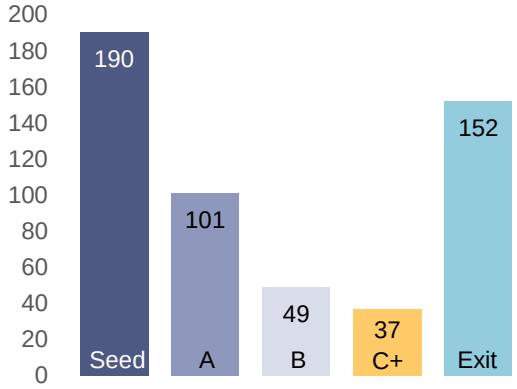
LSI start-up by application areas

Percent and count



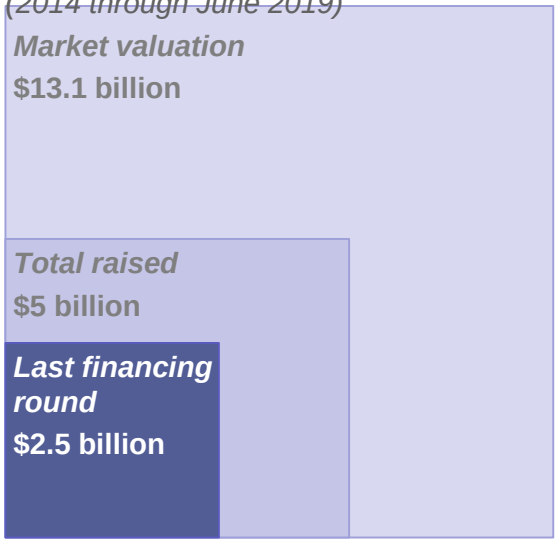
LSI start-up by funding round

Count



LSI start-up funding and market valuation

(2014 through June 2019)



Source: Crunchbase, Pitchbook, Dynamk analysis

DYNAMK CAPITAL

Key acquirers support $86 billion + in LSI M&A activity

- From 2015 to 2020, 36 key acquirers led 138 M&A deals valued at over $86 billion on $3.2 billion in invested capital
  - Acquirers are highly active with 259 M&A deals valued at $133 billion on $5.8 billion in invested capital
  - Transaction count steady between 20-33 deals annually
- Major players drive majority of acquisition value
  - 10 deals over $1 billion represent $73 billion of M&A activity

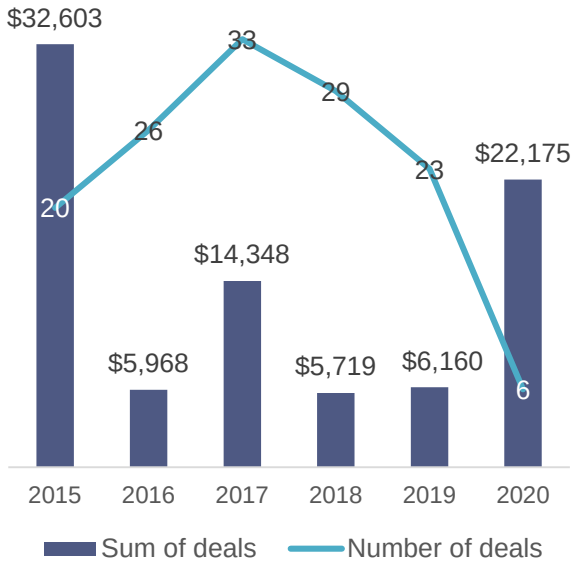
Most active acquirers

(2015 through March 2020)

By deal count	Bruker 13	Thermo Scientific 12	Agilent 11	Charles River 10	Sartorius 9
By deal amount	Danaher $38 Bn	Millipore Sigma $17.3 Bn	Thermo Scientific $12.6 Bn	Lonza Pharma & Biotech $5.6 Bn	Charles River $2.8 Bn

M&A activity in $ millions

(2015 through March 2020)

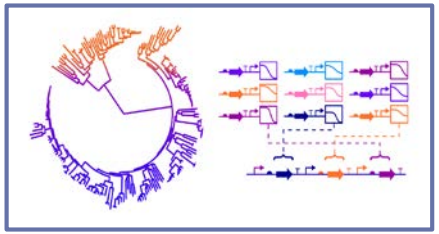


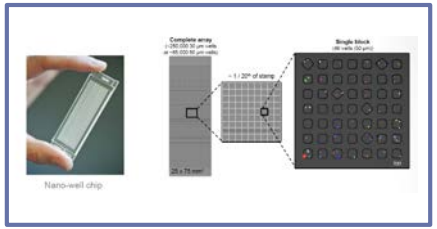
Source: Crunchbase, Pitchbook, Dynamk analysis

DYNAMK CAPITAL

Cell Line Development

- Start-ups innovating in the cell line development field are focused mainly in:
  - Alternative high yield systems (yeast and fungal based)
  - Synthetic biology systems: alternate, highly optimized expression systems working based on permutations of existing genetic elements, both natural occurring as well as synthetic
  - High throughput selection of high producing cells, including single cell selection and testing systems
- As alternative, several start-ups are working on cell-free systems. A cell-free substrate generated based on specific proprietary strains enable high volume, fast protein manufacturing on demand.





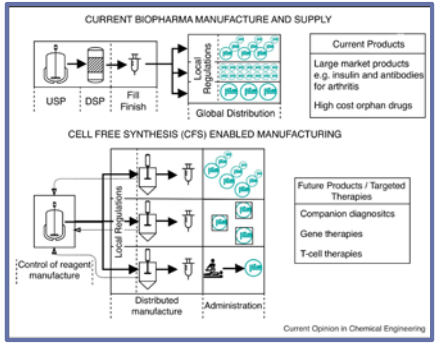


Image Source: Asimov, OneCyte, Sutro

DYNAMK CAPITAL

Cell Culture and Fermentation

As significant innovation has already emerged from wide use of single use bioreactors, this area is seeing some refinement through new technologies:

- High concentration inoculum storage for quick cell culture start
- Inoculum process intensification to increase facility utilization
- Process intensification using retention devices in multiple configurations
- Microbioreactors using microfluidics with highly controlled environments

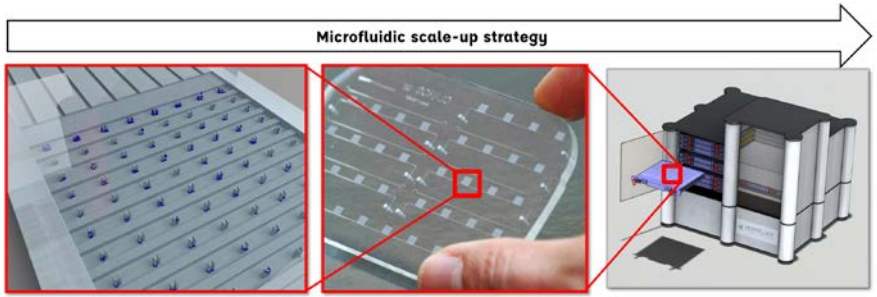


Image Source: MicrofluidX

DYNAMK CAPITAL

Harvesting and Purification

Downstream processing is currently one of the areas with major challenges due to the increase in titers in upstream processing:

- Alternate cell separation methods based on physical principles (flotation, sonic waves, flocculation)
- Continuous chromatography, including multicolumn chromatography
- Membrane based chromatography, including Protein A capabilities
- Single use concentration equipment

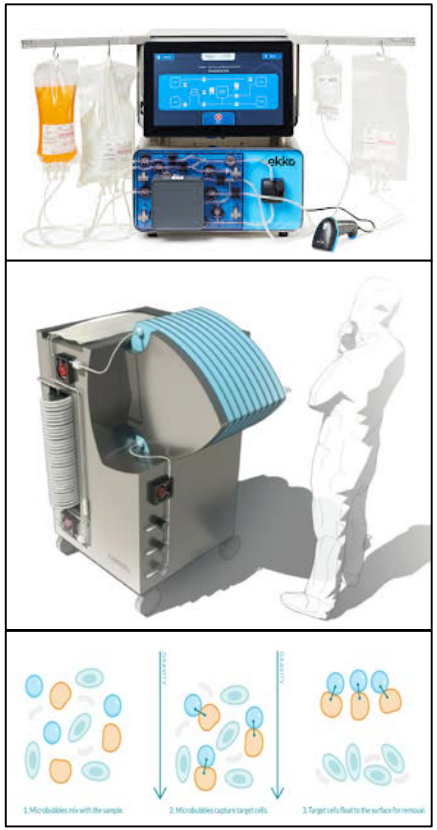
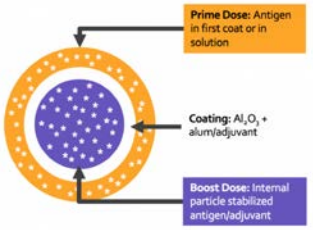


Image Source: MilliporeSigma/FloDesign Sonics Inc., Chreto, Akadeum Life Sciences

Formulation, Fill and Finish and Storage



Alternate formulation and API fill/storage methodologies are being developed to achieve high concentrations, temperature stability and better protect API after formulation:

- Thermostable formulations for therapeutics and vaccines, including “boost” formulations
- High protein concentration formulations
- Closed systems for API fill, freeze, storage and transportation
- Small batch fill finish with high automation

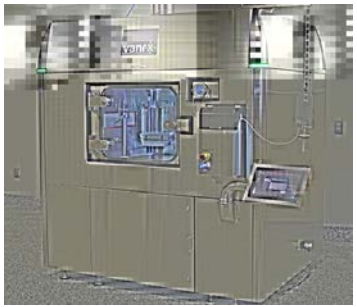


Image Source: Vitivax, Single Use Support and VANRX

DYNAMK CAPITAL

Analytics and In-Process Control

Multiple options for in-process control technologies and high-throughput analytical technologies are being developed:

- In line metabolite cell culture monitoring using new principles (AA, NMR, enzymatic amperometry methods)
- Offline metabolite analysis using AA and NIR
- Fast separation to replace HPLC and UPLC methods
- Cell based *in vivo* analysis using microfluidic devices

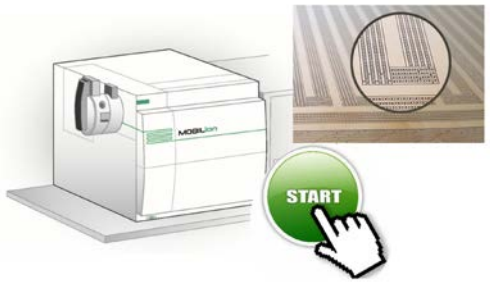


Image Source: 908 devices, Biotome , Irubis and MOBILion

DYNAMK CAPITAL

Software and AI

New Software applications are being developed to better design and control processes:

- Entire process modeling and optimization using AI, including applications for process characterization and validation
- Machine learning as a tool to optimize processes
- Process optimization based on metabolic cell modeling

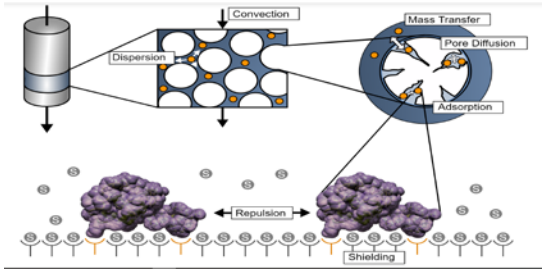


Image Source: Ypso Facto, GoSilico, Elemental Machines

In Summary

- Innovative Start-up companies are bringing new, challenging technologies to the market in all aspects of biotherapeutic manufacturing
- Funding partners that understand the market dynamics and how to position and commercialize new products are key to accelerate innovation in bioprocessing
- As technologies are adopted and become mainstream, companies are acquired by larger players, consolidating the market and becoming reliable suppliers of new inventions
- Cycles for these products require several years, and will probably be adopted first in biotherapeutics in clinical development

Thank you.

For more information please visit us at www.dynamk.vc

Presented by:
Gustavo Mahler, Ph.D.
Managing Director
gmahler@dynamk.vc

DYNAMK CAPITAL