

# UK & Japanese Biomedical Engineering Collaborations

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# Japan Land of Innovative Engineering

Yamaha's Motorcycling Robot

Toshiba Developing Vegetable Factories

Maglev Train to travel at 500 km/hr

Aerial Burton 3D Projection into air



# Japan Vision for Healthcare 2035

A healthcare system built for the next 20 years and designed for all lifestyles and people:



- Quantity to Quality
- Inputs to Value
- Government Regulation to Autonomy
- Cure to Care
- Fragmentation to Integration




# Optical Instrumentation

|   |  |   |        |
|---|--|---|--------|
|  |  |  |        |
| Established   | 1917   | Established   | 1992   |
| Size  | Multinational  | Size  | Medium |
| Sector  | Manufacturer of optical instruments  | Medtech   |        |
| Collaboration   | Purchase   |   |        |
| Year of acquisition   | 2015   |   |        |
| Reason  | <ul style="list-style-type: none"><li>• Sales of digital cameras declining</li><li>• Access to Retinal imaging &amp; ultra wide field technology</li><li>• Ageing populations, increase in diabetes, developing age-related macular degeneration</li></ul> |   |        |



# Microscopy Innovation

|   |   |   |         |
|---|---|---|---------|
|  |   |  |         |
| Established   | 1917  | Established   | 1828-29 |
| Size  | Multinational   | Size  |         |
| Sector  | Manufacturer of optical instruments   | Nikon Imaging Centre at KCL   |         |
| Collaboration   | Investment  |   |         |
| Year of acquisition   | 2012  |   |         |
| Reason  | <ul style="list-style-type: none"><li>• Promote innovation in biological fields with microscopy &amp; imaging equipment.</li><li>• Training to the KC &amp; London research community</li><li>• Develop new imaging techniques with researchers</li></ul> |   |         |




# Stem Cell Manufacturing (Swiss)

|   |  |   |               |
|---|--|---|---------------|
|  |  | <b>Lonza</b>                                    |               |
| Established   | 1917   | Established                                     | 1897          |
| Size  | Multinational  | Size  | Multinational |
| Sector  | Manufacturer of optical instruments  | Biopharma & Speciality Ingredients Manufacturer |               |
| Collaboration   | Collaboration – Swiss/Japanese- Nikon CeLL innovation Co., Ltd.  |   |               |
| Year of collaboration   | 2015   |   |               |
| Reason  | <ul style="list-style-type: none"><li>• Nikon &amp; Lonza (Swiss) launch regenerative medicine manufacturing plant.</li><li>• Nikon will acquire the know-how to manufacture cells, including somatic stem cells, and will accelerate its effort to realize future practical applications of iPSCs in the field of regenerative medicine.</li><li>• Nikon Instrument Business Unit, ‘BioStation CT’ manufacturers cell culture observation system for live cells including iPSCs</li></ul> |   |               |

# Analytical Instrumentation


|  |  |   |               |
|--|--|---|---------------|
|  <b>SHIMADZU</b><br>Excellence in Science |  |  <b>KRATOS</b><br>ANALYTICAL<br>A SHIMADZU GROUP COMPANY |               |
| Established  | 1875   | Established   | 1962          |
| Size   | Multinational  | Size  | Multinational |
| Sector   | Manufacturer of analytical instrumentation   | Manufacturer of analytical instrumenation   |               |
| Collaboration  | Acquisition  |   |               |
| Year of collaboration  | 1989   |   |               |
| Reason   | <ul style="list-style-type: none"><li>• Kratos Analytical Ltd, Manchester wholly owned subsidiary of Shimadzu Corporation</li><li>• Manufacturer of X-ray Photoelectron Spectroscopy &amp; mass spectrometry instrumentation</li><li>• Analysis of biomolecules, in-vitro-diagnostics, material surfaces</li><li>• The UK Centre of Excellence Evaluation Laboratory</li></ul> |   |               |

# Biosensors



|   |  |  |      |
|---|--|--|------|
| <div> <i>Japan Radio Co., Ltd.</i></div> |  | <div></div> |      |
| Established   | 1915   | Established  | 2009 |
| Size  | Multinational  | Size   | SME  |
| Sector  | Electronics & Wireless Comms   | Bio-sensor   |      |
| Collaboration   | Joint venture ( JRC & Orla Protein)  |  |      |
| Year of collaboration   | 2009   |  |      |
| Reason  | <div><ul style="list-style-type: none"><li>Japan Radio &amp; OJ-Bio joint development of multichannel SAW Biosensor</li><li>Orla Protein technology to create protein biomarkers &amp; Japan Radio's semiconductor expertise to create POC Biosensors</li></ul></div> <div></div> |  |      |




# Diagnostic Instrumentation

|  |   |  |      |
|--|---|--|------|
| <b>TOSHIBA</b><br>Leading Innovation >>> |   | OptiGene  |      |
| Established                              | 1875  | Established  | 2008 |
| Size                                     | Multinational   | Size   | SME  |
| Sector                                   | Medical Instrumentation   | Instrumentation  |      |
| Collaboration                            | OEM Agreement   |  |      |
| Year of collaboration                    | 2015  |  |      |
| Reason                                   | <ul style="list-style-type: none"><li>Request from Republic of Guinea to Japanese government for emergency assistance in response to the Ebola Virus Disease. Reagent kit designed by Nagasaki University &amp; Toshiba for use with Optigene’s gene fluorescent detector.</li><li>Agreement allows own branded marketing of the Detector in Japan and other markets.</li></ul> |  |      |


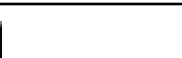



# Biomaterial Implants

|   |  |   |      |
|---|--|---|------|
|  |  |  |      |
| Established   | 1921   | Established   | 1982 |
| Size  | Multinational  | Size  | SME  |
| Sector  | Medical Devices  |   |      |
| Collaboration   | Acquisition  |   |      |
| Year of collaboration   | 2002   |   |      |
| Reason  | <ul style="list-style-type: none"><li>• Vascutek set up based on research between a textile company, Coats Paton, Strathclyde University and Glasgow Royal Infirmary.</li><li>• Acquisition to enter into the vascular prostheses business.</li><li>• Portfolio includes AAA stent graft and range of sealed woven and knitted polyester grafts for peripheral, abdominal and cardiothoracic surgery and ePTFE grafts.</li></ul> |   |      |



# Stem Cell Technology Centre

|  |  |             |      |
|--|--|-------------|------|
|  東京エレクトロン |  |             |      |
| Established  | 1963   | Established | 2014 |
| Size   | Multinational  | Size        | SME  |
| Sector   | Semiconductor Production Equipment   |             |      |
| Collaboration  | Direct Investment  |             |      |
| Year of collaboration  | 2002   |             |      |
| Reason   | <ul style="list-style-type: none"><li>• The goal to partner with academia and industry to develop standardised Smart Cell Processing Technologies for cell culture and inspection through open innovation.</li><li>• ‘Smart Cell Processing Technologies’ will comprise of hardware solutions for culture and inspection of cells and software algorithms and characterization methods.</li><li>• TEL has experience in automation and quality management frameworks in the semiconductor industry</li></ul> |             |      |

# Biopharmaceutical Manufacturing

|  |  |   |               |
|--|--|---|---------------|
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| Established  | 1934   | Established   | -             |
| Size   | Multinational  | Size  | Multinational |
| Sector   | Photographic Film Maker  |   |               |
| Collaboration  | Acquisition  |   |               |
| Year of collaboration  | 2011   |   |               |
| Reason   | <ul style="list-style-type: none"><li>Acquisition for contract manufacturing and development services for the biopharmaceutical industry, Diosynth RTP, LLC and MSD Biologics (UK) Limited</li></ul> |   |               |

# Biopharmaceutical

|   |   |   |      |
|---|---|---|------|
|  |   |  |      |
| Established   | 1990  | Established   | 2007 |
| Size  | SME   | Size  | SME  |
| Sector  | Pharmaceutical  | Pharmaceutical  |      |
| Collaboration   | Acquisition   |   |      |
| Year of collaboration   | 2015  |   |      |
| Reason  | <ul style="list-style-type: none"><li>• Access to clinical, preclinical pipeline and collaborative partnerships</li></ul> |   |      |

# Final Thoughts

- Japanese companies enter collaborations for the same reasons as other companies wanting to internationalise
- Japanese companies enter deals at all stages of a potential partners development: SME, Early Stage, New Venture