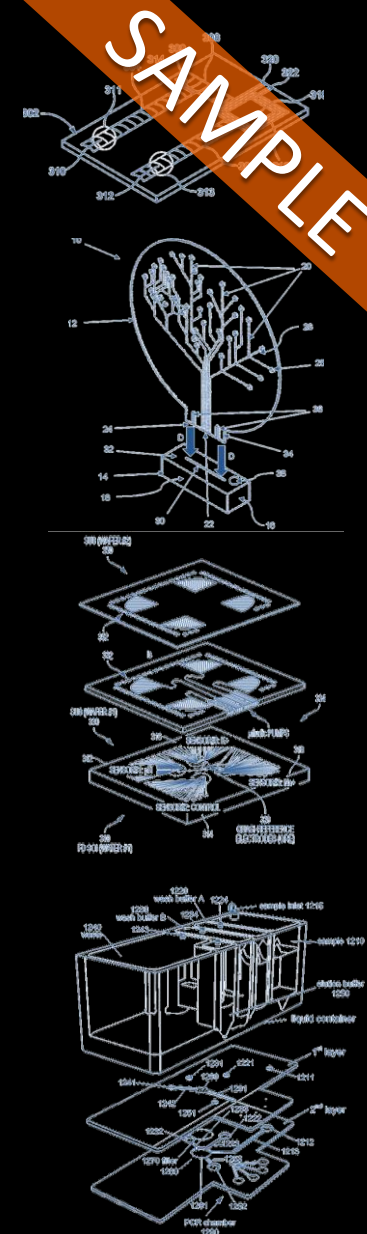
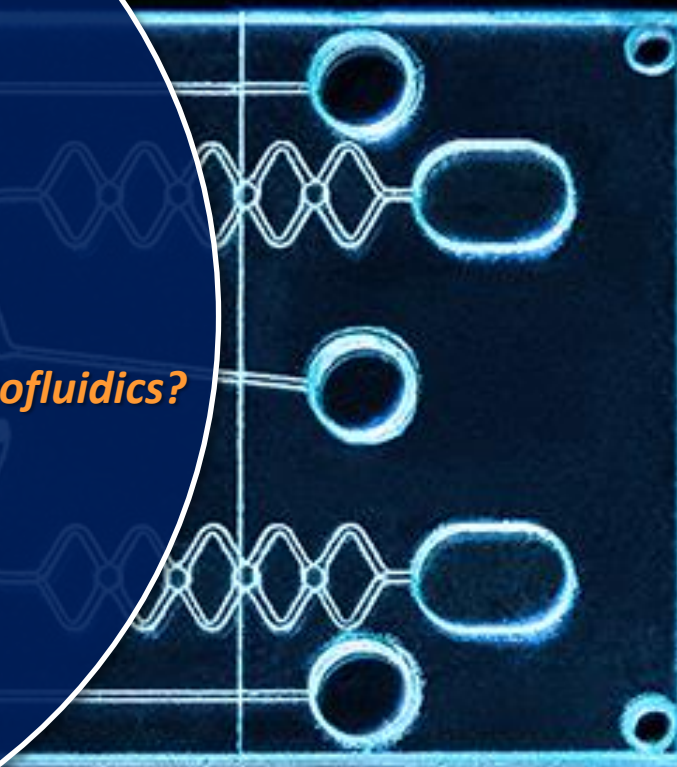


Microfluidics

Startup identification

What are the startups that emerged in Microfluidics?

March 2020



THE AUTHORS

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Specialized in analysis of patents and scientific information, Knowmade provides Technology Intelligence and IP strategy consulting services. The company is supporting R&D organizations, industrial companies and investors in their business development by offering them a deep understanding of the technology trends and their IP environment. Knowmade operates in the following industrial sectors: Microelectronics, Compound Semiconductors, Power Electronics, RF & Microwave Devices, MEMS Sensors & Actuators, LED/OLED, Imaging & Display, Photonics, Battery, Manufacturing & Advanced Packaging, Micro & Nanotechnology, Biotechnology, Cellular & Molecular Biology, Microbiology, Dermatology, Pharmacology, Oncology, Immunology, Medical Devices & Medical Imaging, Agri-Food & Environment. Knowmade performs prior art search, patent landscape analysis, scientific literature analysis, patent valuation and freedom-to-operate analysis. In parallel, the company proposes litigation/licensing support, technology scouting and IP watch service. Knowmade's analysts combine their technical and patent expertise by using powerful analytics tools and proprietary methodologies to deliver relevant patent analyses and scientific reviews.

We Know Technology, We Know Patents

INTRODUCTION

Objectives of the Report

The objective of the report is to provide a list of identified startups working in microfluidics and a description of their patents, their products, and the key people working there.

This report will help you to

- ✓ Identify new business opportunities
- ✓ Identify new competitors
- ✓ Understand key trends, opportunities and perspectives



Why using patents to identify startups ?



Startup identification



Technology assessment



Company's key people

- *Detecting hidden players* – Looking at patent documents makes it possible to identify companies that do not communicate much or even at all. It is a good way to detect companies that could not be found using more conventional methods (e.g. trade fairs, conferences, web searches, etc.).
- *Assessing the technology* – Technology is one of the keys to a startup's success and being able to understand and assess it is highly valuable. The specification of a patent document includes a lot of technical information that can be used to determine the advantages brought by new inventions. The patent claims can also be used to determine the protection the applicant is asking for, and therefore where its interest resides.
- *Identifying the key people* – The success of a startup is strongly linked to the team that composes it. It is therefore important to know the founders and inventors to assess the odds of its success. Patents enable the identification of inventors inside the companies. These inventors are technical experts who have laid the foundation of the technology the startup is developing. Describing the background of key people can help in understanding the startup project, and their history can reveal the extent of the know-how they have accumulated.

SAMPLE

KNOWMADE PRESENTATION 312

STARTUPS ANALYSIS

Sample slides

SAMPLE

For each startup identified, the report provides a complete description of its activity and products/prototypes. Its link to a university, information about funding rounds and government/agency grants or subsidies are also described.

FOR EACH
SELECTED STARTUP

COMPANY DESCRIPTION

Company description

1CellBio (1cell-bio.com) is an American company founded in 2016 by Colin Brenan, PhD. It is a Harvard spin-off company that comprises a dozen employees. The company is dedicated to the development of single-cell RNA sequencing named inDrop™. To develop it the company partnered with Partek Inc. that developed the Partek® Flow® bioinformatics software that is used to analyze the data from inDrop™. President of Partek, Tom Downey, commented on this partnership by saying it was an exciting opportunity "to deliver an affordable and easy-to-use solution for analyzing single cell data, enabling scientists to ask and answer their own research questions without needing to learn and use command line tools".

The first early access version of the platform (inDrop™) was released for research use only (R&D) to validate the inDrop™ system for precision medicine applications. It is used by researchers to study various conditions in patients. The OMI is using a microfluidic device to capture single cells for RNA sequencing.

The CEO of 1CellBio also advertises that researchers can control the droplet size which allows the system to work with various cell types including yeast, pluripotent stem cells, bacteria cells, and large embryos.

In April 2019, 1CellBio announced it has launched a new program that provides custom targeted beads to capture transcripts of a very specific set of user selected genes within single cells. This new program aims at allowing researchers to focus on their genes of interest rather than performing full transcriptome analysis. The potential applications for this new development are the making of custom oncogene panels, the immuno-profiling of antibodies and T-cell receptors, or the detection of mRNA isoforms.

PRODUCT DESCRIPTION

Product description



According to 1CellBio, the inDrop™ system is the only single-cell, high-resolution transcriptomics analysis platform that provides enhanced experimental control, more actionable information and a lower overall cost per result compared to other existing platforms. The company also claims the system allows scientists to conduct more studies looking at more cells to gain more insights.

The platform is aiming at various Cell Biology applications that are useful in Oncology:

- Tumor
- B-cell
- Cell-to
- New a

RNA-seq

According to Colin Brenan (CEO), the current system consists of two instruments and a consumable kit, integrating single-cell capture with cell sorting technology. The firm's method involves using barcoded hydrogel beads with a poly terminus, which allows researchers to perform whole-transcriptome barcoding. The following steps are performed:

1. One instrument accepts the microfluidic chip, barcoded gel beads, cells in suspension, and the lysis buffer with reverse transcriptase.
2. The instrument loads the reagents into a microfluidic device, where the inDrop™ method occurs.
3. The second instrument degrades the barcodes from the gel beads using UV radiation.
4. The cell's RNA transcripts bind to the barcoded DNA primers.
5. Researchers can dissolve the drops, remove the resulting bounded genetic material, and synthesize cDNA sequencing libraries.
6. Researchers then take the resulting sequencing data and run it through a third-party bioinformatics pipeline.

PATENT DESCRIPTION

Patent description (2/2)

Title	Systems and methods for particulate encapsulation in microdroplets
Inventor(s)	SCHIRRI Steven, BERNAN Colin J H, BERNAN Michael, HECHEN Marcel
1 st priority date	2017-10-18
1 st publication date	2019-04-25

Claim 1 (WO2019/076938 A1):

A method of ordering, sorting and/or focusing particles, the method comprising leading the particle through a microfluidic channel comprising a channel height [H] in the range of 1.8 D to 1.2 D, where D is the particle diameter.

Interesting feature:

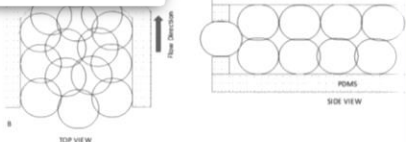
This PCT patent application is not assigned to 1CellBio (PCT patent application (WO2019/086313)). The inventor of 1CellBio's inDrop™ system.

Alleged technical advantage(s):

The claimed invention is according to its co-inventors an improvement of an existing method for co-encapsulating a molecule of interest (e.g. a protein or a nucleic acid) alongside molecules to barcode it (e.g. fluorophore) described by Abate et al. in Lab Chip (2009, 9, 2628-2631).

The inventors claim they have reached their objectives by providing specific dimensions to the microfluidic system: "a microfluidic channel with a height-to-width ratio and the particle diameter-to-channel ratio that results in the close packing of the gel particles in the vertical dimension".

Key figure: Embodiment of the present invention where the channel height is decreased at the exit to form a nozzle equal to the particle diameter but the channel width is larger than the particle diameter with a bevel directing the particles towards the outlet orifice approximately equal to the particle diameter.



KEY PEOPLE & INVENTORS

Key people and inventors (2/4)



Marc W. Kirschner, Co-founder of 1CellBio

Marc Kirschner holds a PhD from the University of California (1971). Dr Kirschner is Professor at Harvard Medical School where he was the founding chair of the Department of Cell Biology.

- Foreign Member of the Royal Society of London (elected in 1999)
- Foreign Member of the Academia Europaea (elected in 1999)
- Member of the National Academy of Sciences
- Member of the American Academy of Arts and Sciences
- Former member of the Advisory Committee to the Director of the National Institutes of Health
- Former President of the American Society for Cell Biology
- E.B. Wilson Medal of the American Society for Cell Biology
- Dr Kirschner's co-authored an inventor on 19 extended patent pathways for cell division and



David A. Weitz, Co-founder of 1CellBio

- Dr Weitz holds multiple prestigious position in Harvard's ecosystem:
- Mallinckrodt Professor of Physics and Applied Physics
- Director of the Materials Research Science and Engineering Center
- Co-Director of the BASF Advanced Research Initiative
- Member of the Kavli Institute for Bionano Science & Technology

Active in the microfluidic ecosystem, Dr Weitz has co-founded multiple startups, including Raindance Technologies, GnuBio, Capsum, HiFiBio, BioMillenia, SpheroBio, NextGen Forensic Sciences, TCRx and Dragon Drop Inn. Dr Weitz' publications:

- Dr Weitz co-authored more than 750 scientific publications. His most recent publications relate to microcapsules, microdroplet behavior.
- He is a very prolific inventor, as he is a named inventor in more than 120 extended patent families. These patents relate to various aspects of microfluidic devices including the production of microspheres, vesicles, droplets and emulsions using microfluidic systems, processes for making microfluidic systems and applications of microfluidic systems to health-oriented applications (e.g. molecular diagnostics, drug encapsulation). Some patents relate to

This report includes a detailed description of all the patents filed by identified startups

This report includes a description of the key people involved in each selected startup.

Sample slides

SAMPLE



ORDER FORM

Microfluidics

Startup identification – March 2020

Ref.:KM20003



SHIP TO

Name (Mr/Ms/Dr/Pr):

Job Title:

Company:

Address:

City:

State:

Postcode/Zip:

Country:

VAT ID Number for EU members:

Tel:

Email:

Date:

PAYMENT METHODS

Check

To pay your invoice using a check, please mail your check to the following address:

KnowMade S.A.R.L.
2405 route des Dolines
06902 Valbonne Sophia Antipolis
FRANCE

Money Transfer

To pay your invoice using a bank money wire transfer please contact your bank to complete this process. Here is the information that you will need to submit the payment:

Payee: KnowMade S.A.R.L.
Bank: Banque Populaire Méditerranée, CAP 3000 Quartier du lac, 06700 St Laurent du Var, France
IBAN: FR76 1460 7003 6360 6214 5695 139
BIC/SWIFT: CCBPFRPPMAR

Paypal

In order to pay your invoice via PAYPAL, you must first register at www.paypal.com. Then you can send money to the KnowMade S.A.R.L. by entering our E-mail address contact@knowmade.fr as the recipient and entering the invoice amount.

RETURN ORDER BY

E-mail: contact@knowmade.fr

Mail: KnowMade S.A.R.L., 2405 route des Dolines, 06902 Valbonne Sophia Antipolis, FRANCE

PRODUCT ORDER

€1,990 – Multi-user license*

For price in dollars, please use the day's exchange rate. For French customer, add 20% for VAT.

All reports are delivered electronically in PDF format at payment reception.

**The report can be shared with the employees of the Company purchasing the report. Subsidiaries and joint-ventures are excluded. Please be aware that the report is watermarked on each page, with the name of the recipient and the organization (the name mentioned on the PO). This watermark also reaffirms that report sharing is not allowed.*

I hereby accept Knowmade's Terms and Conditions of Sale

Signature:

Terms and Conditions of Sales

DEFINITIONS

“Acceptance”: Action by which the Buyer accepts the terms and conditions of sale in their entirety. It is done by signing the purchase order which mentions “I hereby accept Knowmade’s Terms and Conditions of Sale”.

“Buyer”: Any business user (i.e. any person acting in the course of its business activities, for its business needs) entering into the following general conditions to the exclusion of consumers acting in their personal interests.

“Contracting Parties” or “Parties”: The Seller on the one hand and the Buyer on the other hand.

“Intellectual Property Rights” (“IPR”) means any rights held by the Seller in its Products, including any patents, trademarks, registered models, designs, copyrights, inventions, commercial secrets and know-how, technical information, company or trading names and any other intellectual property rights or similar in any part of the world, notwithstanding the fact that they have been registered or not and including any pending registration of one of the above mentioned rights.

“License”: For the reports and databases, 2 different licenses are proposed. The buyer has to choose one license:

1. Single user license: a single individual at the company can use the report.

2. Multi user license: The report can be shared with the employees of the Company purchasing the report. Subsidiaries and joint-ventures are excluded.

“Products”: Reports are established in PowerPoint and delivered on a PDF format and the database may include Excel files.

“Seller”: Based in Sophia Antipolis (France headquarters), Knowmade is a technology intelligence company specialized in the research and analysis of scientific and technical information. We provide patent landscapes and scientific state of the art with high added value to businesses and research laboratories. Our intelligence digests play a key role to define your innovation and development strategy.

1. SCOPE

1.1 The Contracting Parties undertake to observe the following general conditions when agreed by the Buyer and the Seller. ANY ADDITIONAL, DIFFERENT, OR CONFLICTING TERMS AND CONDITIONS IN ANY OTHER DOCUMENTS ISSUED BY THE BUYER AT ANY TIME ARE HEREBY OBJECTED TO BY THE SELLER, SHALL BE WHOLLY INAPPLICABLE TO ANY SALE MADE HEREUNDER AND SHALL NOT BE BINDING IN ANY WAY ON THE SELLER.

1.2 This agreement becomes valid and enforceable between the Contracting Parties after clear and non-equivocal consent by any duly authorized person representing the Buyer. For these purposes, the Buyer accepts these conditions of sales when signing the purchase order which mentions “I hereby accept Knowmade’s Terms and Conditions of Sale”. This results in acceptance by the Buyer.

1.3 Orders are deemed to be accepted only upon written acceptance and confirmation by the Seller, within [7 days] from the date of order, to be sent either by email or to the Buyer’s address. In the absence of any confirmation in writing, orders shall be deemed to have been accepted.

2. MAILING OF THE PRODUCTS

2.1 Products are sent by email to the Buyer:

- within [1] month from the order for Products already released; or

- within a reasonable time for Products ordered prior to their effective release. In this case, the Seller shall use its best endeavours to inform the Buyer of an indicative release date and the evolution of the work in progress.

2.2 Some weeks prior to the release date the Seller can propose a pre-release discount to the Buyer.

The Seller shall by no means be responsible for any delay in respect of article 2.2 above, and including in cases where a new event or access to new contradictory information would require for the analyst extra time to compute or compare the data in order to enable the Seller to deliver a high quality Products.

2.3 The mailing of the Product will occur only upon payment by the Buyer, in accordance with the conditions contained in article 3.

2.4 The mailing is operated through electronic means either by email via the sales department. If the Product’s electronic delivery format is defective, the Seller undertakes to replace it at no charge to the Buyer provided that it is informed of the defective formatting within 90 days from the date of the original download or receipt of the Product.

2.5 The person receiving the Products on behalf of the Buyer shall immediately verify the quality of the Products and their conformity to the order. Any claim for apparent defects or for non-conformity shall be

sent in writing to the Seller within 8 days of receipt of the Products. For this purpose, the Buyer agrees to produce sufficient evidence of such defects.

2.6 No return of Products shall be accepted without prior information to the Seller, even in case of delayed delivery. Any Product returned to the Seller without providing prior information to the Seller as required under article 2.5 shall remain at the Buyer’s risk.

3. PRICE, INVOICING AND PAYMENT

3.1 Prices are given in the orders corresponding to each Product sold on a unit basis or corresponding to annual subscriptions. They are expressed to be inclusive of all taxes. The prices may be reevaluated from time to time. The effective price is deemed to be the one applicable at the time of the order.

3.2 Payments due by the Buyer shall be sent by cheque payable to Knowmade, PayPal or by electronic transfer to the following account:

Banque Populaire Méditerranée, CAP 3000 Quartier du lac, 06700 St Laurent du Var, France

BIC or SWIFT code: CCBPFRPPMAR

IBAN: : FR76 1460 7003 6360 6214 5695 139

To ensure the payments, the Seller reserves the right to request down payments from the Buyer. In this case, the need of down payments will be mentioned on the order.

3.3 Payment is due by the Buyer to the Seller within 30 days from invoice date, except in the case of a particular written agreement. If the Buyer fails to pay within this time and fails to contact the Seller, the latter shall be entitled to invoice interest in arrears based on the annual rate Refi of the «BCE» + 7 points, in accordance with article L. 441-6 of the French Commercial Code. Our publications (report, database, tool...) are delivered only after reception of the payment.

3.4 In the event of termination of the contract, or of misconduct, during the contract, the Seller will have the right to invoice at the stage in progress, and to take legal action for damages.

4. LIABILITIES

4.1 The Buyer or any other individual or legal person acting on its behalf, being a business user buying the Products for its business activities, shall be solely responsible for choosing the Products and for the use and interpretations he makes of the documents it purchases, of the results he obtains, and of the advice and acts it deduces thereof.

4.2 The Seller shall only be liable for (i) direct and (ii) foreseeable pecuniary loss, caused by the Products or arising from a material breach of this agreement

4.3 In no event shall the Seller be liable for:

a) damages of any kind, including without limitation, incidental or consequential damages (including, but not limited to, damages for loss of profits, business interruption and loss of programs or information) arising out of the use of or inability to use the Seller’s website or the Products, or any information provided on the website, or in the Products;

b) any claim attributable to errors, omissions or other inaccuracies in the Product or interpretations thereof.

4.4 All the information contained in the Products has been obtained from sources believed to be reliable. The Seller does not warrant the accuracy, completeness adequacy or reliability of such information, which cannot be guaranteed to be free from errors.

4.5 All the Products that the Seller sells may, upon prior notice to the Buyer from time to time be modified by or substituted with similar Products meeting the needs of the Buyer. This modification shall not lead to the liability of the Seller, provided that the Seller ensures the substituted Product is similar to the Product initially ordered.

4.6 In the case where, after inspection, it is acknowledged that the Products contain defects, the Seller undertakes to replace the defective products as far as the supplies allow and without indemnities or compensation of any kind for labor costs, delays, loss caused or any other reason. The replacement is guaranteed for a maximum of two months starting from the delivery date. Any replacement is excluded for any event as set out in article 5 below.

4.7 The deadlines that the Seller is asked to state for the mailing of the Products are given for information only and are not guaranteed. If such deadlines are not met, it shall not lead to any damages or cancellation of the orders, except for non-acceptable delays exceeding [4] months from the stated deadline, without information from the Seller. In such case only, the Buyer shall be entitled to ask for a reimbursement of its first down payment to the exclusion of any further damages.

4.8 The Seller does not make any warranties, express or implied, including, without limitation, those of

saleability and fitness for a particular purpose, with respect to the Products. Although the Seller shall take reasonable steps to screen Products for infection of viruses, worms, Trojan horses or other codes containing contaminating or destructive properties before making the Products available, the Seller cannot guarantee that any Product will be free from infection.

5. FORCE MAJEURE

The Seller shall not be liable for any delay in performance directly or indirectly caused by or resulting from acts of nature, fire, flood, accident, riot, war, government intervention, embargoes, strikes, labor difficulties, equipment failure, late deliveries by suppliers or other difficulties which are beyond the control, and not the fault of the Seller.

6. PROTECTION OF THE SELLER’S intellectual property

6.1 All intellectual property rights attached to the Products are and remain the property of the Seller and are protected under French and international copyright law and conventions.

6.2 The Buyer agreed not to disclose, copy, reproduce, redistribute, resell or publish the Product, or any part of it to any other party other than employees of its company. The Buyer shall have the right to use the Products solely for its own internal information purposes. In particular, the Buyer shall therefore not use the Product for purposes such as:

- Information storage and retrieval systems;

- Recordings and re-transmittals over any network (including any local area network);

- use in any timesharing, service bureau, bulletin board or similar arrangement or public display;

- Posting any Product to any other online service (including bulletin boards or the Internet);

- Licensing, leasing, selling, offering for sale or assigning the Product.

6.3 The Buyer shall be solely responsible towards the Seller of all infringements of this obligation, whether this infringement comes from its employees or any person to whom the Buyer has sent the Products and shall personally take care of any related proceedings, and the Buyer shall bear related financial consequences in their entirety.

6.4 The Buyer shall define within its company point of contact for the needs of the contract. This person will be the recipient of each new report in PDF format. This person shall also be responsible for respect of the copyrights and will guaranty that the Products are not disseminated out of the company.

7. TERMINATION

7.1 If the Buyer cancels the order in whole or in part or postpones the date of mailing, the Buyer shall indemnify the Seller for the entire costs that have been incurred as at the date of notification by the Buyer of such delay or cancellation. This may also apply for any other direct or indirect consequential loss that may be borne by the Seller, following this decision.

7.2 In the event of breach by one Party under these conditions or the order, the non-breaching Party may send a notification to the other by recorded delivery letter upon which, after a period of thirty (30) days without solving the problem, the non-breaching Party shall be entitled to terminate all the pending orders, without being liable for any compensation.

8. MISCELLANEOUS

All the provisions of these Terms and Conditions are for the benefit of the Seller itself, but also for its licensors, employees and agents. Each of them is entitled to assert and enforce those provisions against the Buyer.

Any notices under these Terms and Conditions shall be given in writing. They shall be effective upon receipt by the other Party.

The Seller may, from time to time, update these Terms and Conditions and the Buyer, is deemed to have accepted the latest version of these terms and conditions, provided they have been communicated to him in due time.

9. GOVERNING LAW AND JURISDICTION

9.1 Any dispute arising out or linked to these Terms and Conditions or to any contract (orders) entered into in application of these Terms and Conditions shall be settled by the French Commercial Courts of Grasse, which shall have exclusive jurisdiction upon such issues.

9.2 French law shall govern the relation between the Buyer and the Seller, in accordance with these Terms and Conditions.



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