SIVORO MICROFLUIDICS

Living channels. Programmable flow.

A self-assembling microfluidic platform built from engineered *Neurospora crassa*, with septal pore valves addressed by light instead of pneumatics. No cleanroom in the critical path.



SEED ROUND	TIMING	PRE-MONEY
$1.5M	Q1 2027	$6M

US provisional application 64/087,071 · filed June 10, 2026 · New York, New York

THE PROBLEM

Microfluidics is stuck in the cleanroom

01 **2–4 weeks per chip, $5k–20k per mask**

PDMS fabrication requires a cleanroom. Each design change means a new photomask — slow iteration, high cost, high barrier to entry.

02 **Passive channels — no programmability**

Active valves require complex external pneumatic systems. No built-in actuation, and no design reusability across projects.

03 **Single-use waste — clogging kills the chip**

Channel fouling is terminal. Each clog means discarding the device and restarting fabrication from scratch.

MARKET OPPORTUNITY

$25B

Microfluidics market by 2028 — growth limited by fabrication bottlenecks and passive chip designs.

Internal estimate; see market sizing note on the roadmap slide.

THE CORE BOTTLENECK

Every experiment starts with a cleanroom. Biology moved on — microfluidics hasn't.

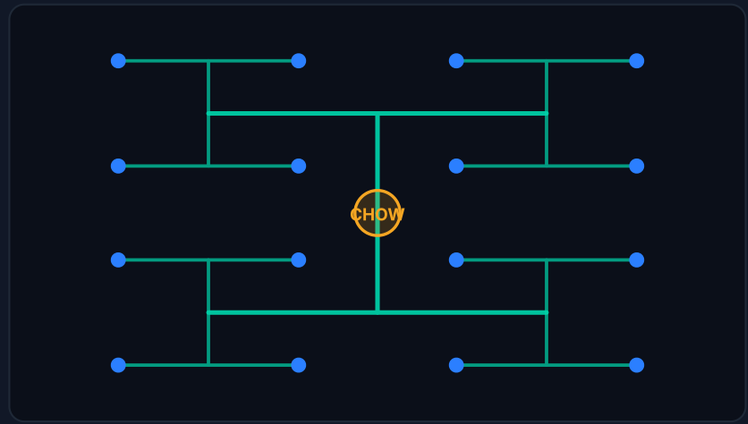
THE SOLUTION

One fungus. One week. Zero cleanroom.

FEATURE	SIVORO LIVING CHIP	CONVENTIONAL PDMS
Fabrication	**Organism grows the channels**	Photolithography (cleanroom)
Valves	**Light-addressed, 450 nm, intrinsic**	Pneumatic, external control lines
Valve density	**Set by projection optics**	Set by control-line routing
Iteration	**Days (transform strain)**	Weeks (redesign mask)
Channel recovery	**Hyphal turnover (target behavior)**	Terminal (chip disposal)

Valve density and channel recovery are design targets of the architecture, not yet measured in a device.

H-TREE SCAFFOLD



10×10 mm · 4 levels · 16 reagent ports + central chow reservoir. Channel width 13–20 µm, set against measured *N. crassa* hyphal geometry rather than adapted from PDMS conventions.

Equal path length from every port to the centre gives simultaneous, pressure-balanced delivery.

TECHNOLOGY

Five patent families, three technical layers

LAYER 1 — CHASSIS

Metabolically Orthogonal *M. crassa*

Engineered to run on xylose while uptake of reagent sugars and metabolites is substantially reduced. Six-gene knockout selected *in silico* from 10,440 pairwise combinations across a 145-gene pool.

Partial by design.

~87% of reagent uptake blocked, xylose growth sustained at ~18–19% of wild-type rate. The tradeoff is a design constraint, not a defect.

COMPOSITION OF MATTER

SCREENING METHOD

LAYER 2 — VALVE

Optogenetic Septal Pore Valve

Hyphae are partitioned by septa, each perforated by a central pore roughly 150 nm across. The organism has already fabricated a dense valve array — it is simply not addressable.

CompA_v3 (LOV2-Jα-HEX1) plus a SPA1-ePDZ anchor make it addressable at 450 nm. Removing light reverses it.

The open question.

Per-domain confidence is high (pLDDT 91 / 88). Interface confidence is not: lit-state multimer prediction returned an inconclusive ipTM of 0.18.

OPTOGENETIC CONSTRUCT

FLOW CONTROL METHOD

LAYER 3 — SCAFFOLD

H-Tree Scaffold & Integration

Parametric design (10×10 mm, 16 ports, 4 levels). Compatible with standard SU-8/PDMS or direct printing.

Channel dimensions engineered for 2–8 hyphae (13–20 µm width, 15 µm depth), set against measured hyphal geometry rather than adapted from PDMS conventions.

A fabrication-ready DXF exists for the current geometry.

FUNGAL-SPECIFIC GEOMETRY

CO-CULTURE METHODS

MECHANISM

How the valve works

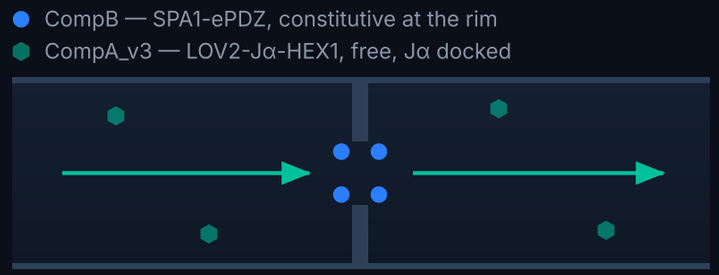
1 · THE ARRAY ALREADY EXISTS



Hyphae are partitioned by septa. Each carries a central pore ~150 nm across, natively gated by Woronin bodies built from the self-assembling protein HEX1.

A dense valve array — just not addressable.

2 · DARK — ANCHOR SET, PORE OPEN



With Jα docked against LOV2 the binding motif is hidden. The plug protein stays cytoplasmic and material moves freely between compartments.

No light means no plug — fail-safe open.

3 · 450 nm — RECRUITED, OCCLUDED



Light undocks Jα and exposes the motif. The anchor captures it, and HEX1 oligomerizes at the anchored site into a plug that occludes the pore.

Thermal reversion reopens it with no input.

This shows the intended mechanism, not a measured result. Stage 1 is established *N. crassa* biology. Stages 2 and 3 are the behavior our constructs are designed to produce — whether they do is precisely what Gate 1 and Gate 2 determine.

INTELLECTUAL PROPERTY

Five patent families — provisional filed

#	FAMILY	COVERAGE	STRENGTH
01	Metabolically orthogonal chassis	Specific genotype + six-gene knockout screening method	HIGH
02	Optogenetic septal pore valve	LOV2-Jα-HEX1 + SPA1-ePDZ constructs & method of flow control	HIGH
03	Living microfluidic device	Chip + organism + scaffold as an integrated system	HIGH
04	H-tree scaffold, fungal dimensions	Fungal-specific channel geometry (13–20 µm) novel over PDMS art	MED
05	Six-gene chassis (Δcre-1 + Δwc-1)	Requirement for 450 nm optogenetic activation in an orthogonal host	HIGH

STATUS

US provisional 64/087,071

Filed June 10, 2026. Michael McKenna is sole applicant; the application is owned outright with no institutional encumbrance.

FREEDOM TO OPERATE

iLID system (Strickland 2012) — FTO check pending; design-around identified (alternative PDZ pairs).

HEX1 / SPA1 biology — natural *N. crassa* genes, no IP restrictions.

H-tree scaffold — public domain; the fungal-specific dimensions are the novel contribution.

NEXT STEP

Non-provisional conversion with a commissioned FTO search, plus a PCT option.

PRODUCT ROADMAP

From academic kits to platform licensing

SEQUENCING	PRODUCT	DESCRIPTION	TARGET MARKET	PRICE POINT
FIRST POST-VALIDATION	Sivoro Start	Strain + scaffold kit · academic labs · drug screening, toxicology	University research labs	$2,500 / kit
FOLLOWS START	Sivoro Organ	Organ-on-chip integration · liver, gut, blood-brain barrier models	Pharma R&D	$50k–150k platform
FOLLOWS ORGAN	Sivoro License	IP licensing + custom strains to PDMS chip manufacturers	Microfluidics OEMs	5–10% royalty
LONG-TERM	Sivoro Dx	Research-use-only assay formats. Clinical pathways are a long-term possibility and not a current program.	Research use only	Per-assay pricing

TAM EXPANSION

$500M

Academic microfluidics

$2B

Organ-on-chip by 2030

$5B+

PDMS replacement licensing

Market sizing note. These are internal estimates. Segment sizing is derived from published market reports and our own assumptions about addressable share; treat them as directional rather than researched figures.

COMPETITIVE LANDSCAPE

The only living, self-assembling microfluidic platform

COMPETITOR	TECHNOLOGY	SIVORO ADVANTAGE
Emulate, Inc.	Organ-on-chip (PDMS + mechanical stretch)	No living channels, no optogenetics; instruments $200k+
CN Bio Innovations	Organ-on-chip (PDMS)	Lower cost, faster design iteration
Micronit	Glass/PDMS fabrication services	Sivoro requires no cleanroom
Academic PDMS labs	Custom fabrication, service model	A standard product, not a custom service
Fluidigm / Standard BioTools	Integrated fluidic circuits	Price point 10× higher; no biological actuation



The lower-right quadrant — simple fabrication with active biological control — is unoccupied.

BUSINESS MODEL

Three revenue streams, expanding margin over time

STREAM 1

Academic Kits

70%

First post-validation stream

Sivoro Start kit: strain, scaffold and protocols. Recurring revenue from media replacements and strain upgrades.

$2,500 starter · **$500** reagent kit (20 assays)

STREAM 2

Pharma Platforms

60%

Follows the kit

Sivoro Organ platform with organ-chip integration. Custom strain engineering plus service contracts.

$50k–150k platform · **$10k–30k** annual service

STREAM 3

IP Licensing

90%

Follows the platform

License strain and valve IP to PDMS manufacturers. Pure IP — the lowest cost to deliver.

Non-exclusive 5–7% royalty · **Exclusive** 10–12% + upfront

ILLUSTRATIVE REVENUE MIX, THIRD YEAR OF SALES



Modeled gross margins, pre-validation. No product has yet been built or sold.

DEVELOPMENT STATUS

Computational phases complete. Two experimental gates next.

Metabolic modeling, the knockout screen, valve design and scaffold design are done. Two biophysical measurements now determine whether the valve works.

> Chassis construction follows those results rather than preceding them.

Why this ordering. Strain engineering is the expensive step. There is no reason to spend it before the valve protein is known to behave. Both gates run on standard instrumentation at an established core facility, and each has a construct-level fix already designed if it fails.

No month numbers are given: a gated plan should not promise dates it cannot control.

VALIDATION SEQUENCE

✓ **Metabolic modeling, KO screen, valve design, scaffold design**
Complete — all computational

G1 **SEC-MALS on CompA_v3**
`Mw ≥ 1000 kDa, Mw/Mn < 1.5 (R_h ≥ 28 nm)`

G2 **BLI/SPR — Jα motif to ePDZ anchor**
`K_d ≤ 1 μM lit, ≥10× dark/lit contrast`

CONTINGENT ON BOTH GATES

Six-gene chassis construction
`PCR-verified knockouts`

Valve function in hypha (microscopy)
`Reversible reduction in cross-septal transport at 450 nm`

Prototype chip colonization
`Fluorescent flow through network`

First academic beta site
`LOI from 3 labs`

TRACTION TO DATE

Computational validation complete

10,440
Knockout pairs screened *in silico* from a 145-gene pool

16
Strains clearing the chip-integration threshold

2
Constructs designed, codon-optimized, modeled

7,600+
Lines of modeling and analysis code

WHAT THE STRUCTURE PREDICTION DOES AND DOES NOT SAY

Per-domain confidence is high — **pLDDT 91** for LOV2, **88** for HEX1. That says each domain is likely to fold correctly. It does not address whether the two components bind each other.

Our construct presents the binding motif through an internal linker rather than at a free C-terminus, and multimer prediction of the lit-state complex returned an inconclusive **ipTM of 0.18**. That is the open question, and it is what Gate 2 measures.

CROSS-SPECIES REPLICATION

The orthogonality strategy was re-run *in silico* on *Aspergillus nidulans* (iMA871, 871 genes, ~170M years of divergence). An orthologous double knockout reaches COS 0.508 / RBS 0.958 — stronger reagent blocking than the *N. crassa* equivalent.

A computational replication in a second species, not wet-lab validation.

TEAM

Founder, contractors, and the hires that come with funding

FOUNDER

Michael McKenna

Computational biology · Metabolic modeling · Microfluidics

Complete computational pipeline — 7,600+ lines of modeling code, genome-scale metabolic modeling (iJDZ836), ColabFold structural modeling.

Screened 10,440 knockout combinations using a custom Composite Orthogonality Score; designed and structurally modeled two optogenetic constructs.

US provisional application 64/087,071 filed June 10, 2026 — five claim families, sole applicant, no institutional encumbrance.

HOW THE BENCH WORKS

Sivoro does not operate a laboratory and does not intend to before validation. Gene synthesis and cloning are contracted commercially; protein expression, SEC-MALS and BLI run at university core facilities on a fee-for-service basis, all in the United States. Sivoro retains all IP.

CONTRACT & CONSULTING ROLES

Fungal Geneticist — Contractor

N. crassa transformation for chassis construction, engaged after the gates clear. Work performed at a contracted facility.

Protein Biochemist — Consultant, engaged at Gate 1

Executes SEC-MALS and BLI/SPR validation. *E. coli* / *Pichia* expression and purification.

Microfluidics Engineer — First full-time hire, post-validation

Owns chip fabrication — SU-8, PDMS, organ-chip integration.

ACADEMIC MENTORS

Dr. Timothy James (Mycology, University of Michigan) has advised the founder academically on *Neurospora* biology. Dr. James holds no position, equity, or commercial relationship with Sivoro Microfluidics.

USE OF FUNDS

$1.5M seed — 18 months to a functional prototype

CATEGORY	AMOUNT	DESCRIPTION
Contracted lab & core facilities	$400k	Core-facility access, SEC-MALS and BLI service contracts, consumables
Strain construction	$300k	Contracted gene synthesis, cloning, strain engineering · 18 months
Founder salary + ops	$250k	18 months runway
Protein validation	$200k	*E. coli* / *Pichia* expression, purification, BLI/SPR
Chip prototyping	$150k	SU-8 masters, PDMS, photomasks, microscope time
IP legal	$100k	Non-provisional conversion + FTO · US + PCT option
Contingency (15%)	$100k	Unforeseen costs
Total	**$1,500k**	

Sivoro runs no lab of its own, so the largest line is contracted work at core facilities rather than capital equipment.

ALLOCATION



NEXT ROUND

Series A · $5M · Q4 2027

Scale production · hire sales · enter pharma pilots

THE ASK

$1.5M

Seed round · Q1 2027

Pre-money valuation	**$6M**
Post-money valuation	**$7.5M**
Runway	**18 months**
Goal	**Functional prototype**
Next round	**Series A · Q4 2027**

> We would rather tell you what we do not yet know than describe what we have modeled as though it were measured.

KEY RISKS & MITIGATIONS

HEX1 may not oligomerize in the fusion construct

Mitigation: linker-length and fusion-terminus series, evaluated by the same assay. HEX1 oligomerization is well-characterized in the native protein; the open question is whether the fusion preserves it.

The internal Jα presentation may not support ePDZ binding

Mitigation: motif-presentation series and an alternative sterically caged binding module. This is the highest-risk element of the program and our structure prediction is inconclusive (ipTM 0.18).

Δwc-1 and Δcre-1 may affect growth rate or morphology

Mitigation: morphological characterization precedes chip loading. Contingency: alternative promoters or partial truncations that preserve optogenetic response without a growth penalty.

The model likely underestimates transporter redundancy

Mitigation: measured orthogonality may fall below prediction. Chassis work is sequenced after valve validation and does not gate it.

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New York, New York · US provisional 64/087,071, filed June 10, 2026