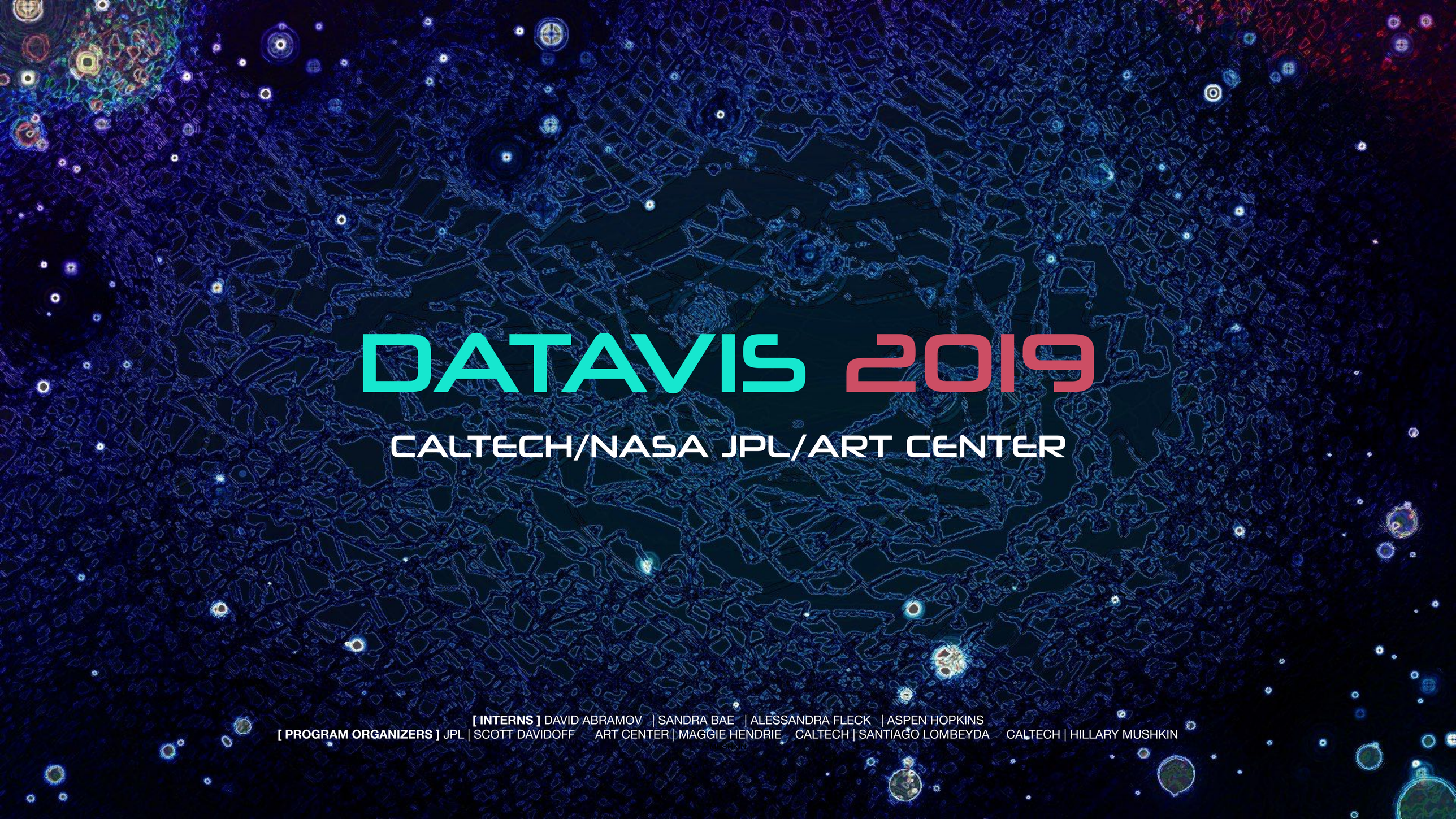
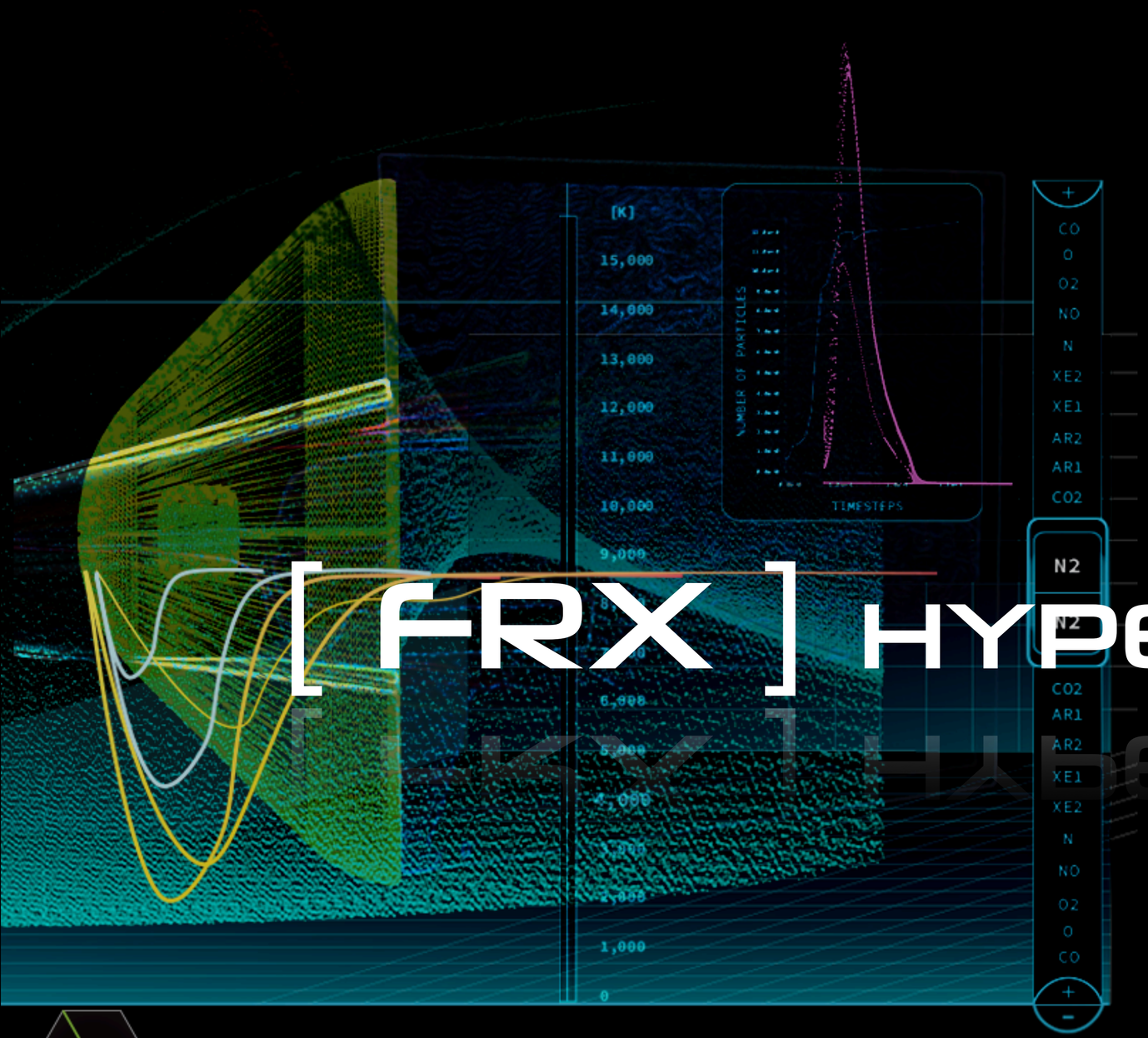
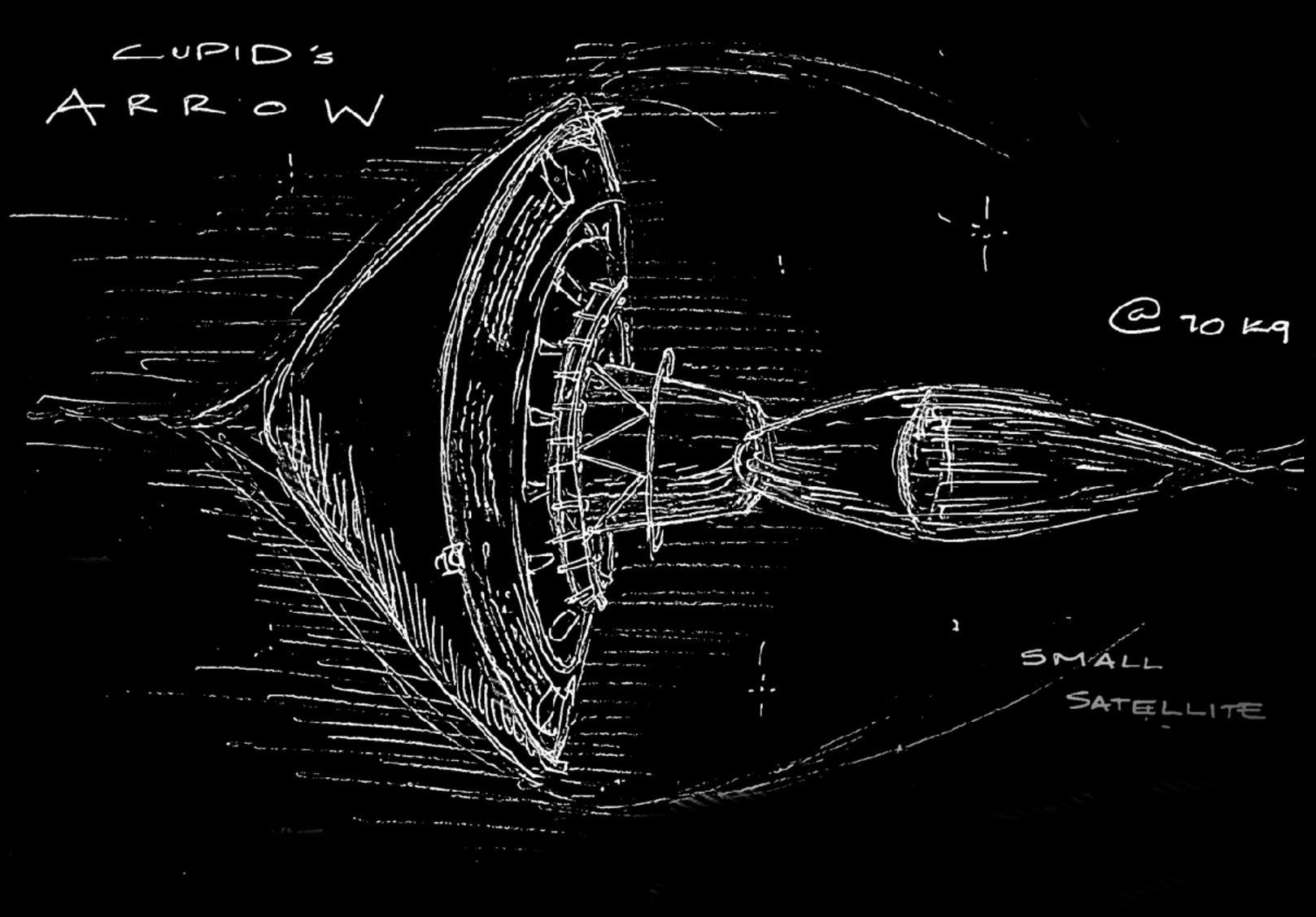


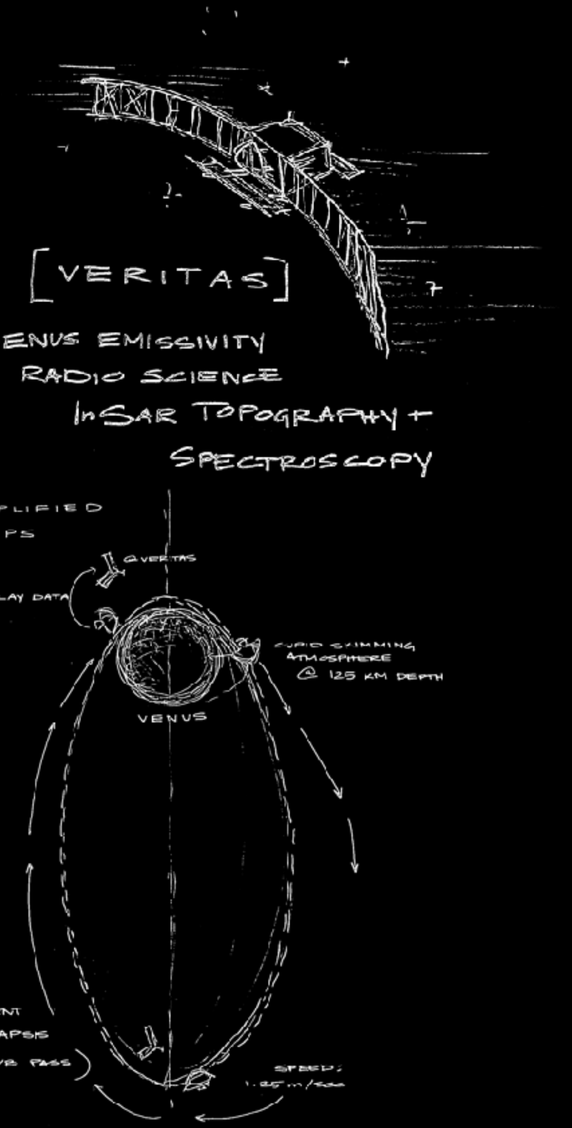
[INTERNS] DAVID ABRAMOV | SANDRA BAE | ALESSANDRA FLECK | ASPEN HOPKINS
[PROGRAM ORGANIZERS] JPL | SCOTT DAVIDOFF ART CENTER | MAGGIE HENDRIE CALTECH | SANTIAGO LOMBEYDA CALTECH | HILLARY MUSHKIN



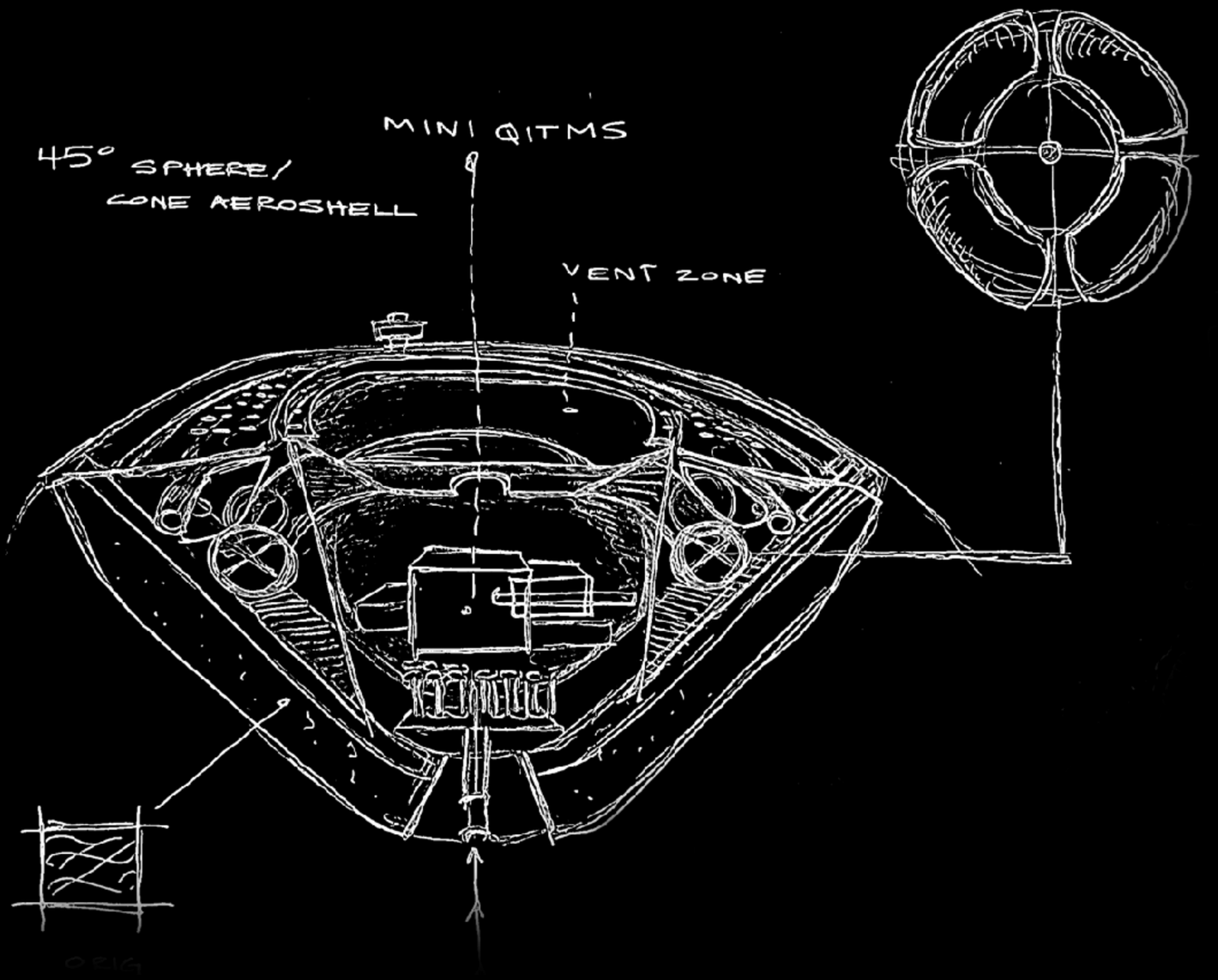
[FRX] HYPERVELOCITY

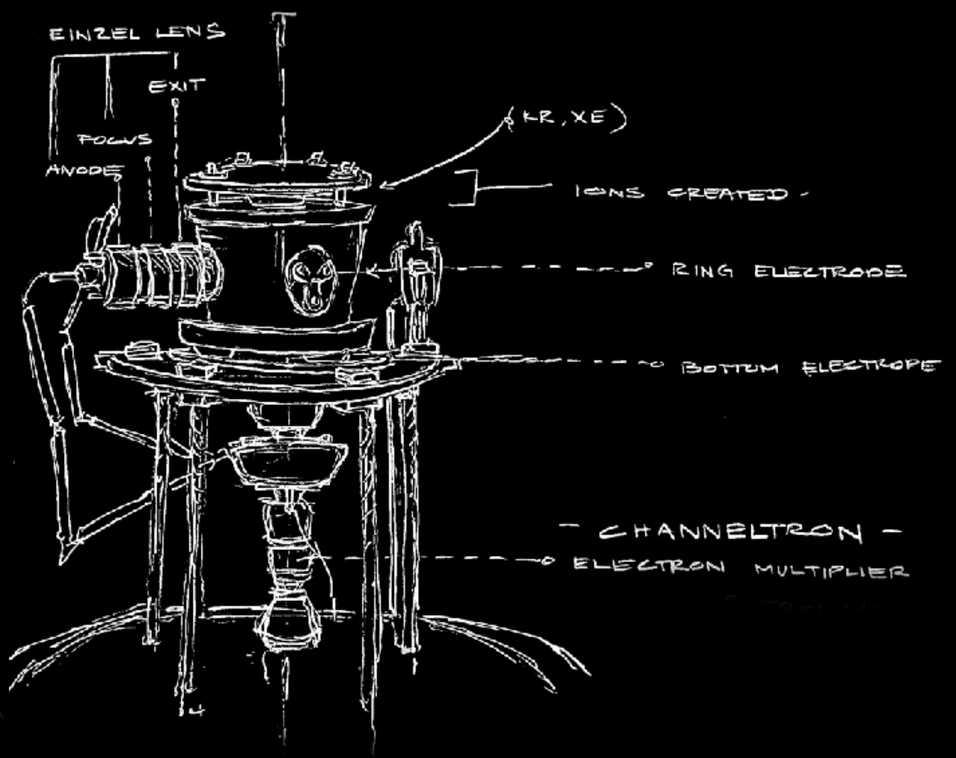
HYP

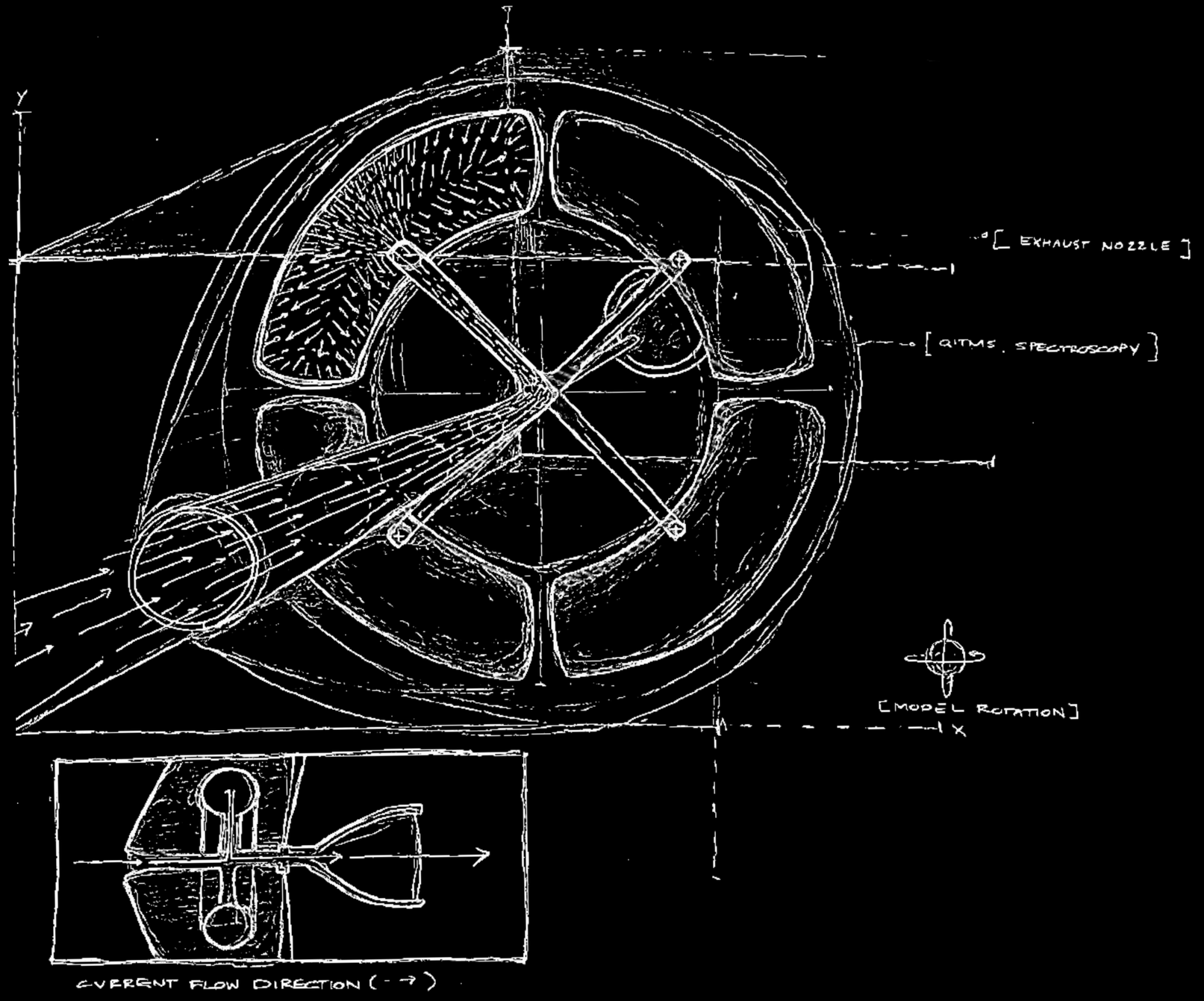

CUPID's
ARROW
@ 70 kg
SMALL
SATELLITE


[VERITAS]
VENUS EMISSIVITY
RADIO SCIENCE
InSAR TOPOGRAPHY +
SPECTROSCOPY
SIMPLIFIED
CONOPS
VERITAS
RELAY DATA
VENUS
@ 125 KM DEPTH
DEPLOYMENT
@ APOAPSIS

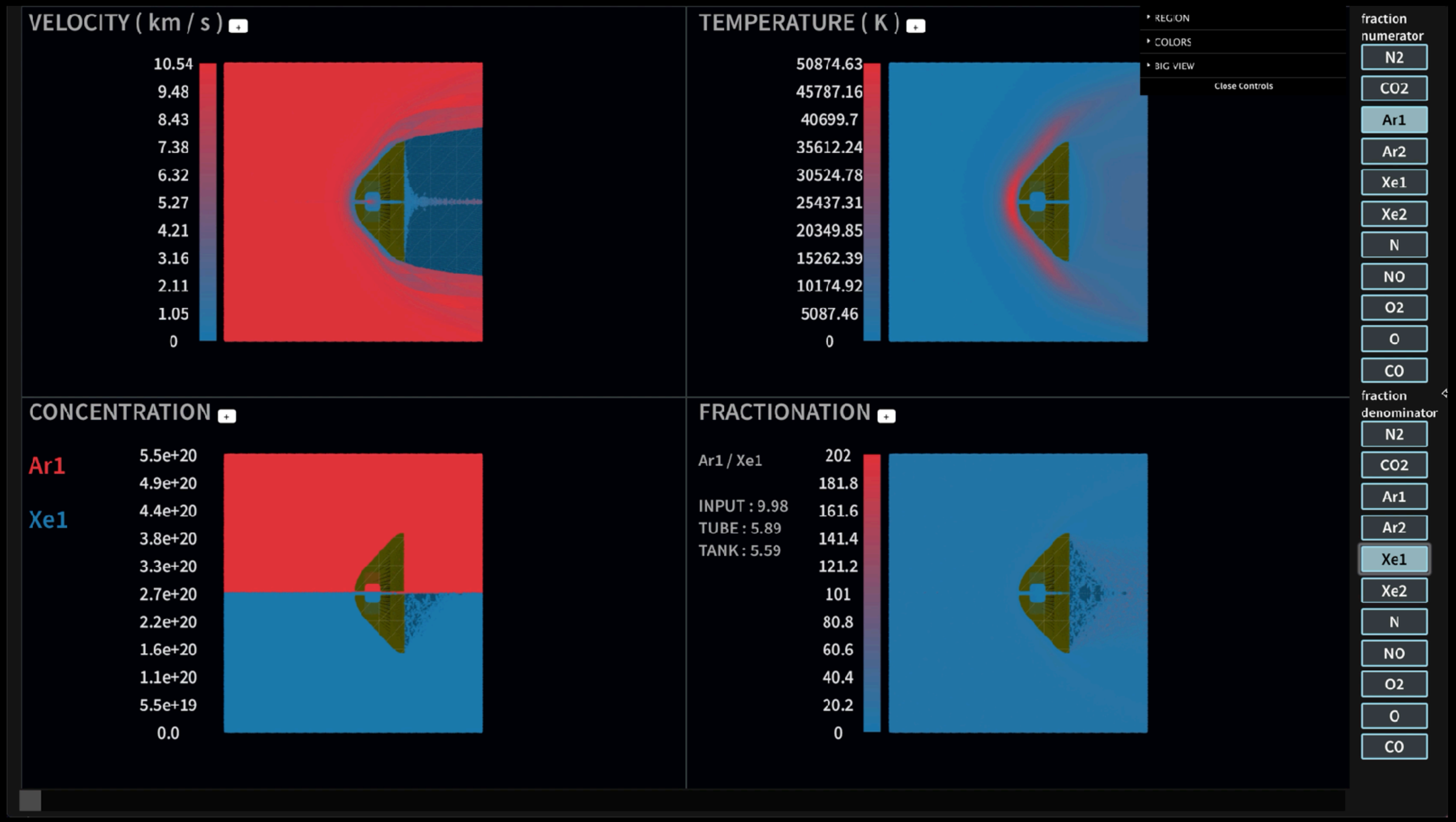
HYP


MINI QITMS
45° SPHERE/
CONE AEROSHELL
VENT ZONE

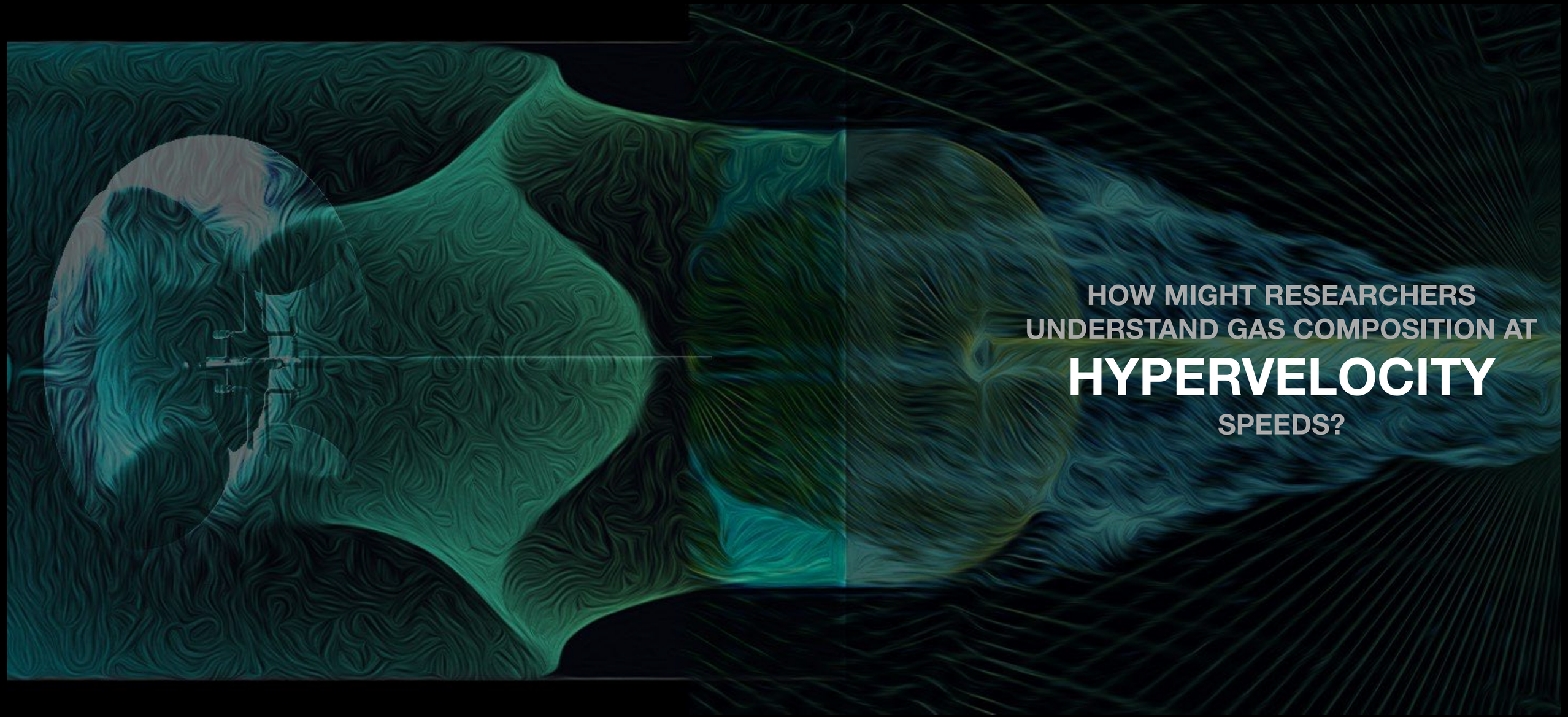

EINZEL LENS
EXIT
FOCUS
ANODE
(AR, XE)
IONS CREATED
RING ELECTRODE
BOTTOM ELECTRODE
CHANNELTRON
ELECTRON MULTIPLIER


Y
[EXHAUST NOZZLE]
[QITMS . SPECTROSCOPY]
[MODEL ROTATION]
X
CURRENT FLOW DIRECTION (→)

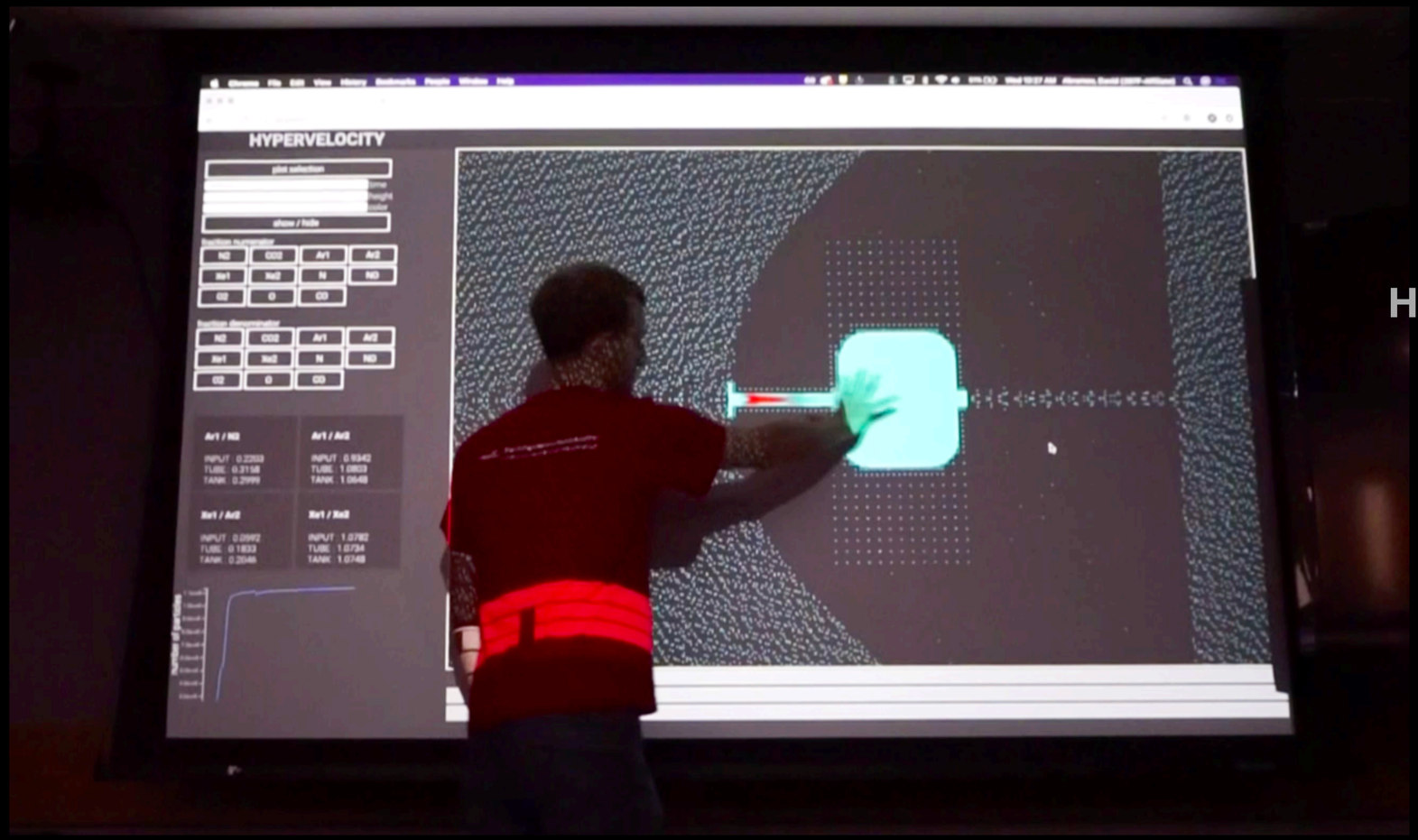
HYP


VELOCITY (km / s)
10.54
9.48
8.43
7.38
6.32
5.27
4.21
3.16
2.11
1.05
0
TEMPERATURE (K)
50874.63
45787.16
40699.7
35612.24
30524.78
25437.31
20349.85
15262.39
10174.92
5087.46
0
REGION
COLORS
BIG VIEW
Close Controls
fraction numerator
N2
CO2
Ar1
Ar2
Xe1
Xe2
N
NO
O2
O
CO
CONCENTRATION
Ar1
Xe1
5.5e+20
4.9e+20
4.4e+20
3.8e+20
3.3e+20
2.7e+20
2.2e+20
1.6e+20
1.1e+20
5.5e+19
0.0
FRACTIONATION
Ar1 / Xe1
INPUT : 9.98
TUBE : 5.89
TANK : 5.59
202
181.8
161.6
141.4
121.2
101
80.8
60.6
40.4
20.2
0
fraction denominator
N2
CO2
Ar1
Ar2
Xe1
Xe2
N
NO
O2
O
CO

HYP


HOW MIGHT RESEARCHERS
UNDERSTAND GAS COMPOSITION AT
HYPERVELOCITY
SPEEDS?

HYP

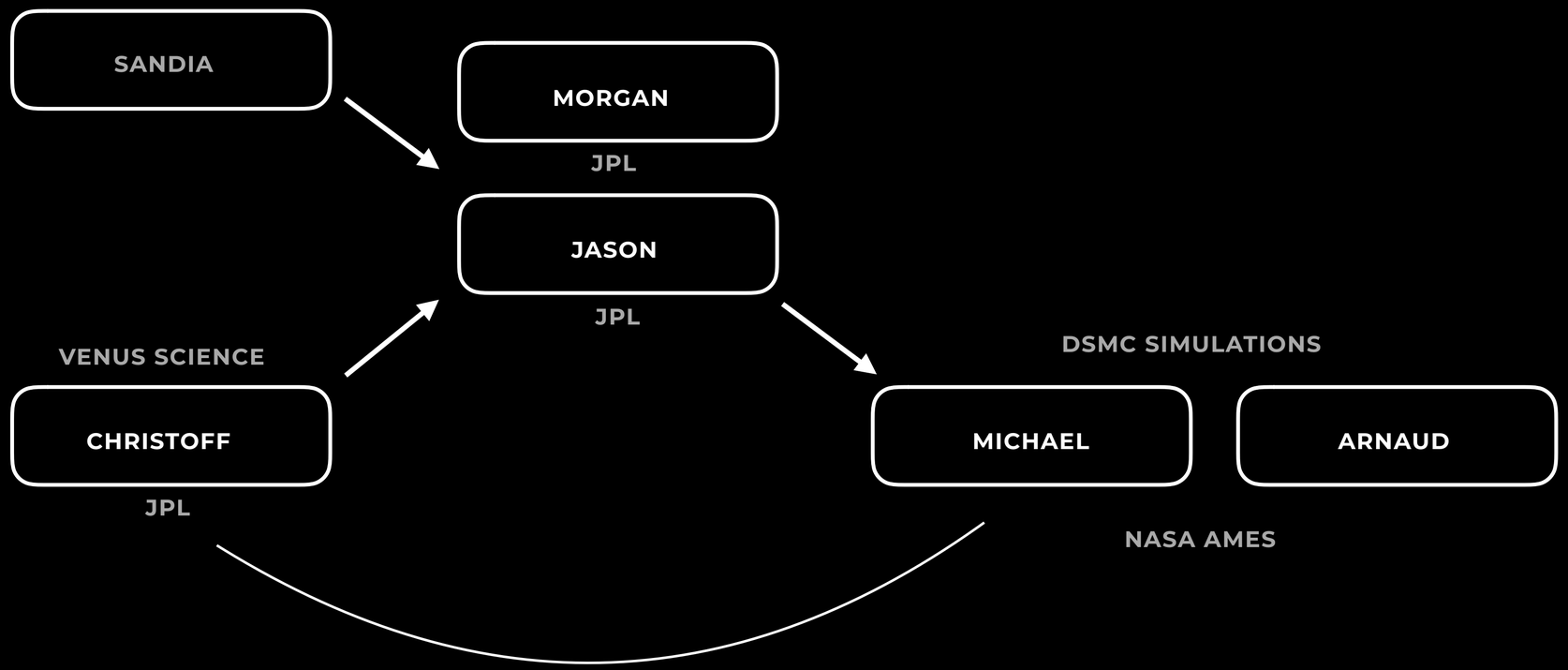


HOW MIGHT RESEARCHERS IMPROVE CURRENT INTERFACE USAGE TO BETTER EXPLORE THE NATURE OF

FRACTIONATION?

HYP

USER STRUCTURE



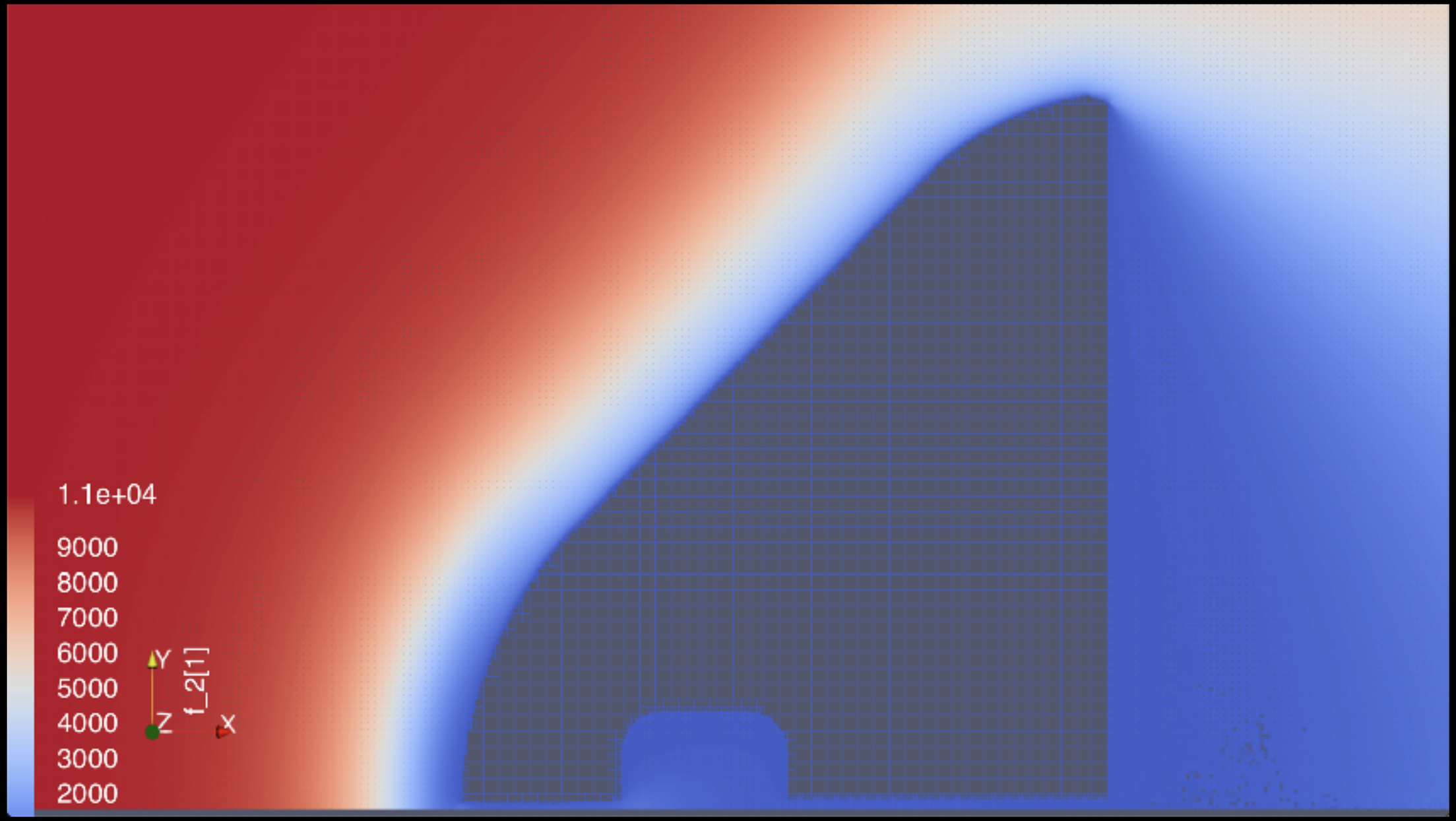
HYP

INTERFACE PROBLEM

REPRESENTING AND VISUALIZING AN ACCURATE READING OF ATMOSPHERIC GAS SAMPLING AT HYPERVELOCITY SPEED

THE NEED FOR AN INTERFACE THAT CAN PROVIDE A SPATIAL REPRESENTATION OF GAS FLOW THROUGH THE SPACECRAFT INTO THE TANKS

HYP



HYP

OUR PROPOSED SOLUTION

FRX

TECHNICAL OVERVIEW

BUILT IN HTML / CSS / JAVASCRIPT

RELIES ON D3.js (DATA MANAGEMENT AND MANIPULATION)

THREE.js FOR RENDERING THE 3D VISUALIZATION

TWEEN.js FOR SMOOTHING THE CAMERA MOVEMENTS

ACCOMPLISHMENTS

COMPRESSING A APPROX 5.5 GB SIMULATION DOWN TO 170 MB (LOSSY)

VISUALIZE 1/2 MILLION DATA POINTS SIMULTANEOUSLY ACROSS FOUR LINKED VIEWS IN REAL TIME

INTERACTIVELY PAN, FILTER AND ZOOM IN A HYBRID 2D/3D ENVIRONMENT

EXPLORE HIGH DIMENSIONAL SIMULATION DATA SPATIALLY AND TEMPORALLY

HYP