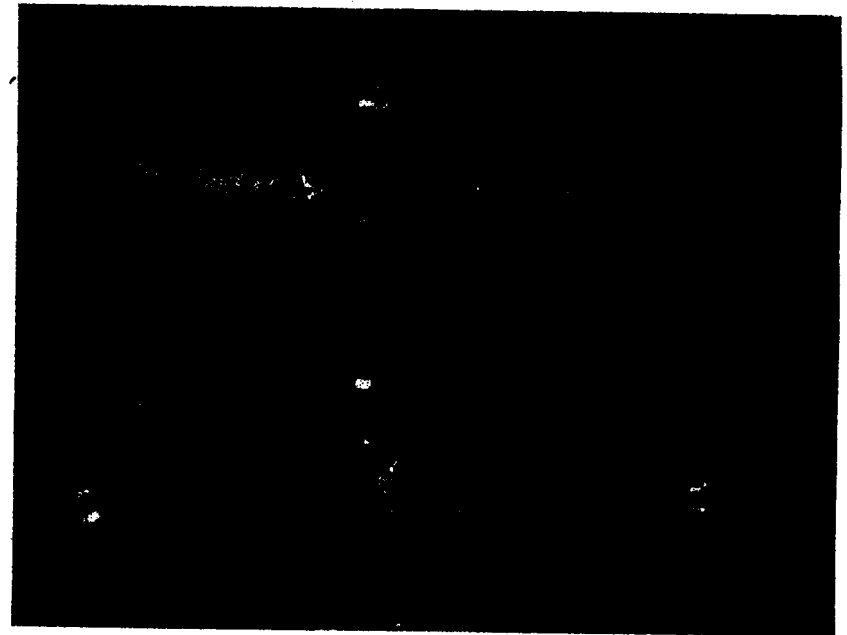


Measurements of Liquid Metal MHD flows

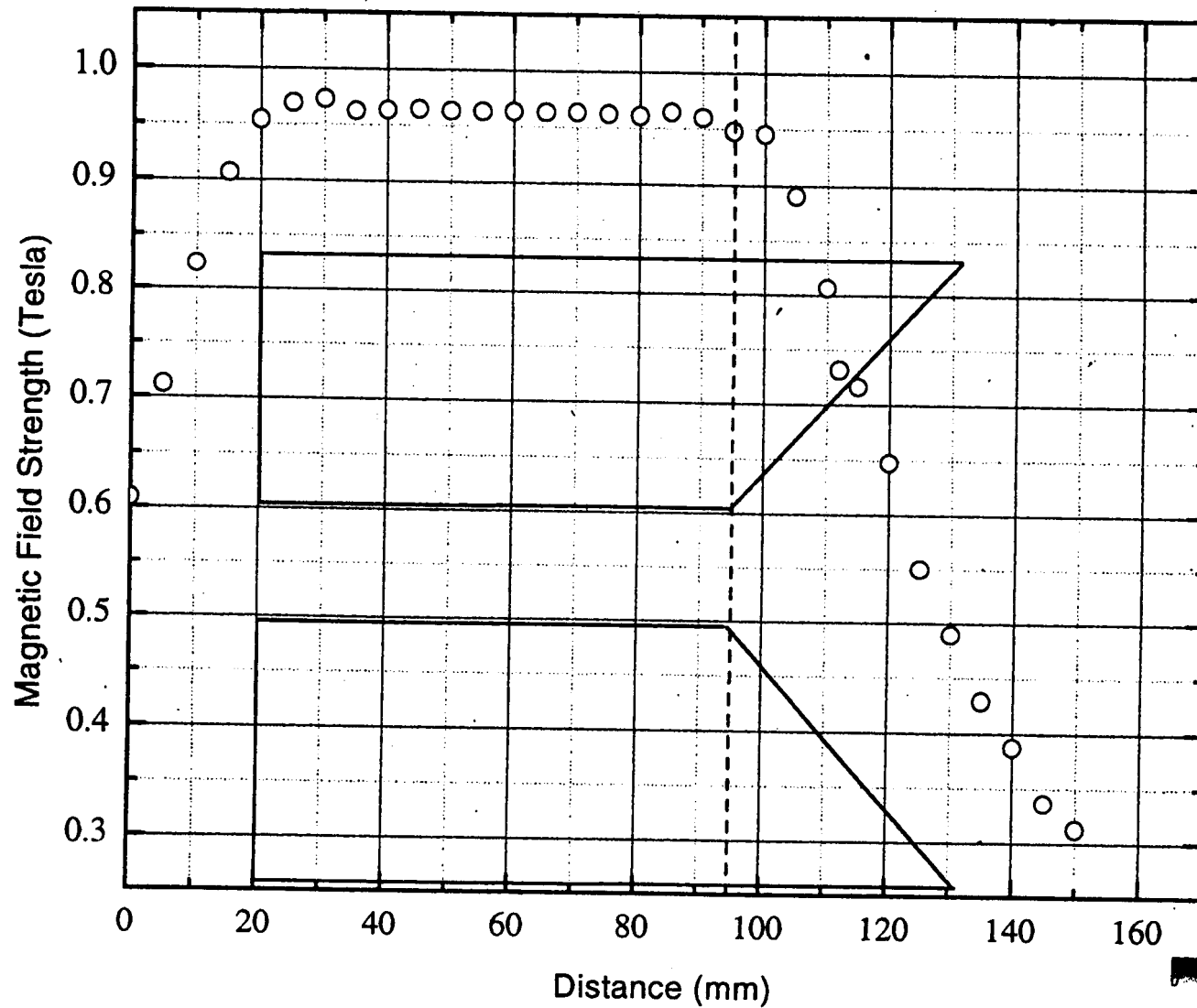
David N. Ruzic

*Department of Nuclear,
Plasma, and Radiological
Engineering*

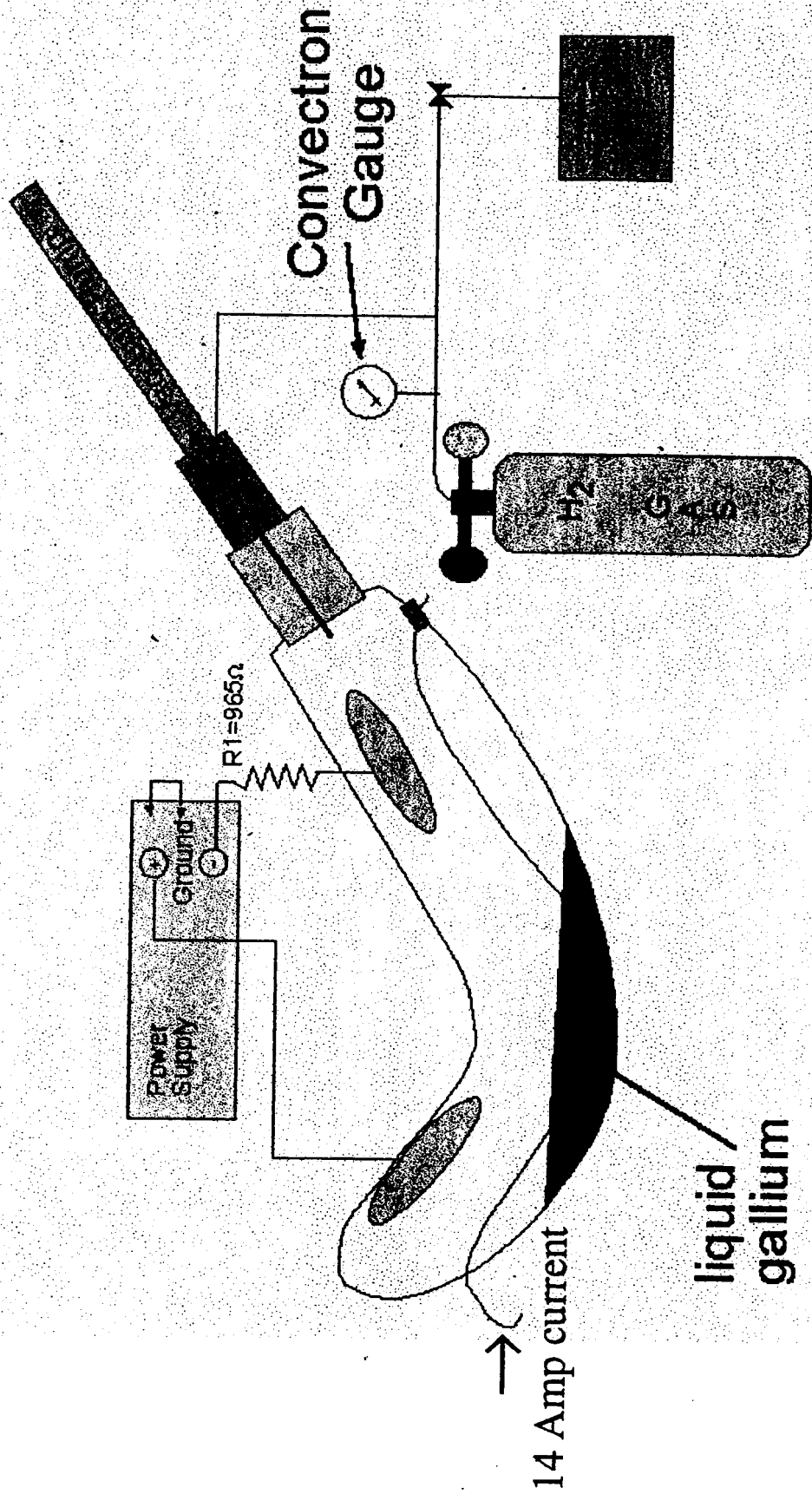
University of Illinois
at Urbana Champaign



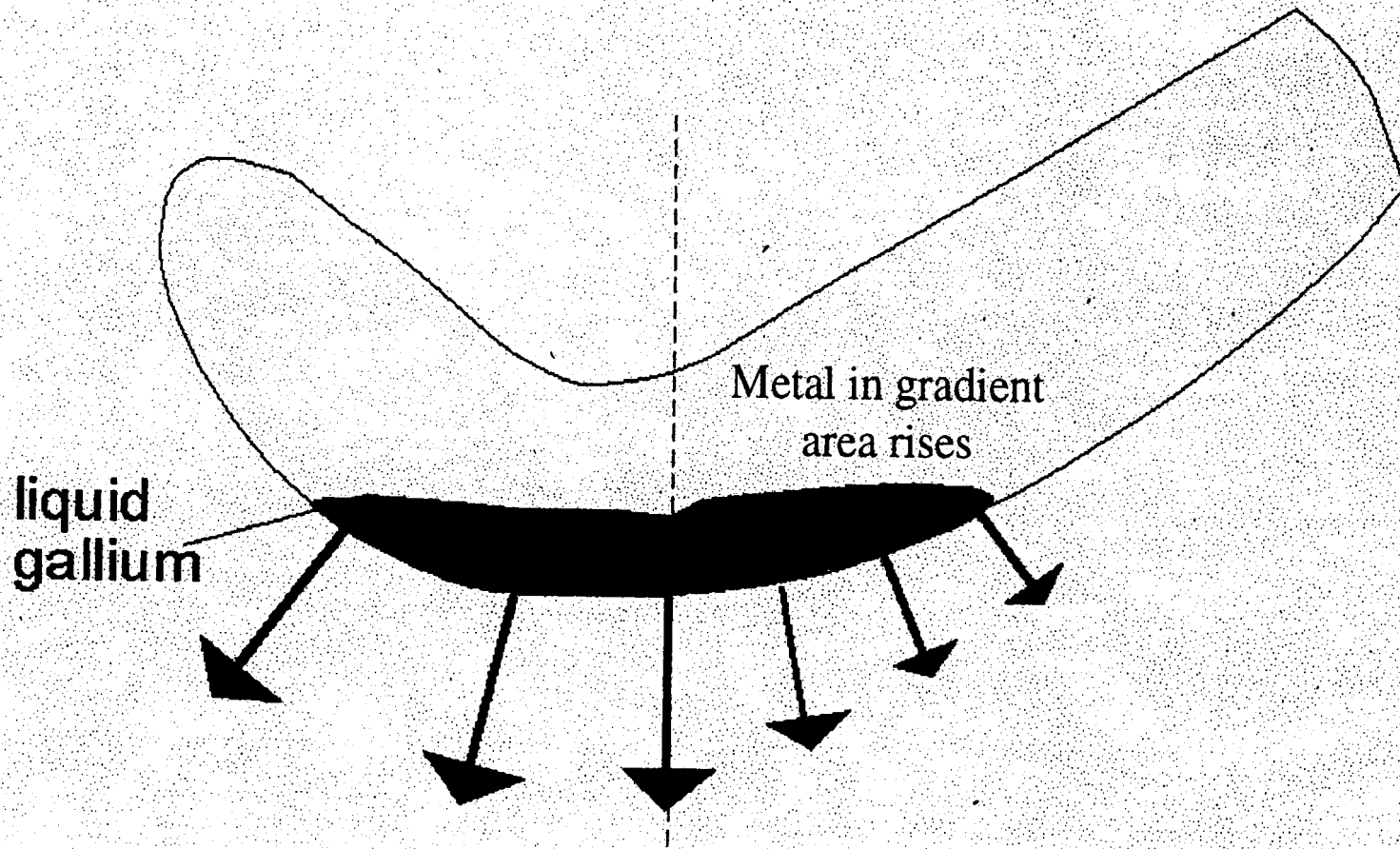
Magnetic Field Gradient



General Schematic of Experiment



JXB Force downward



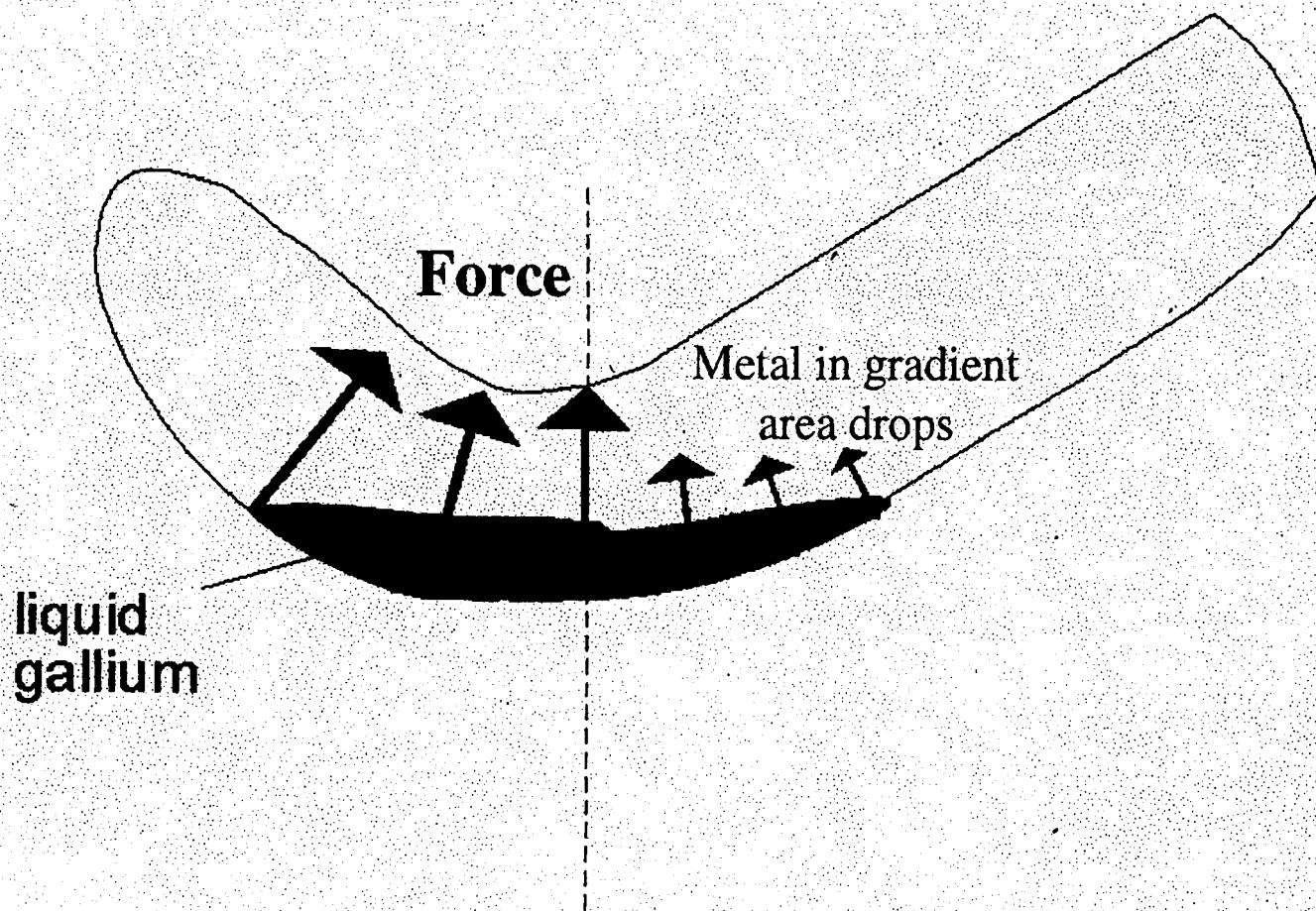
Force

Liquid gallium experiments

- Metal in gradient area is not pushed down as hard as metal in stronger field.
- Level rises about 3 mm.
- Metal does not flow up the curved wall.

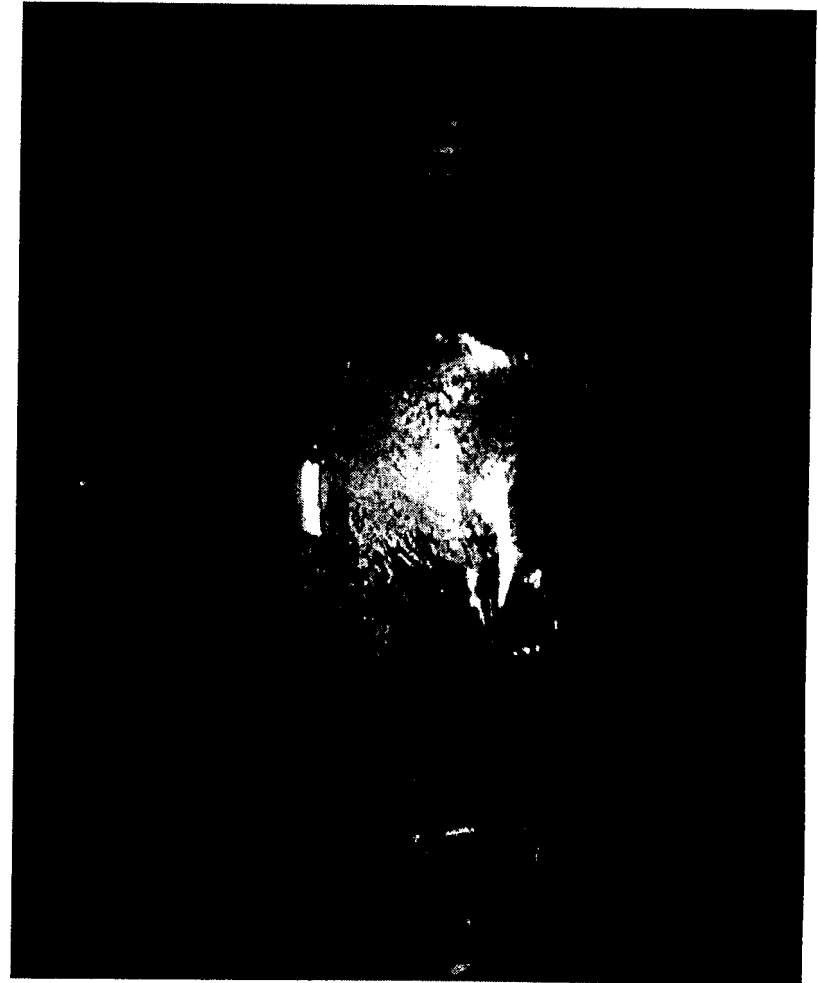


J X B force upward



Liquid Gallium ----- Reverse Field

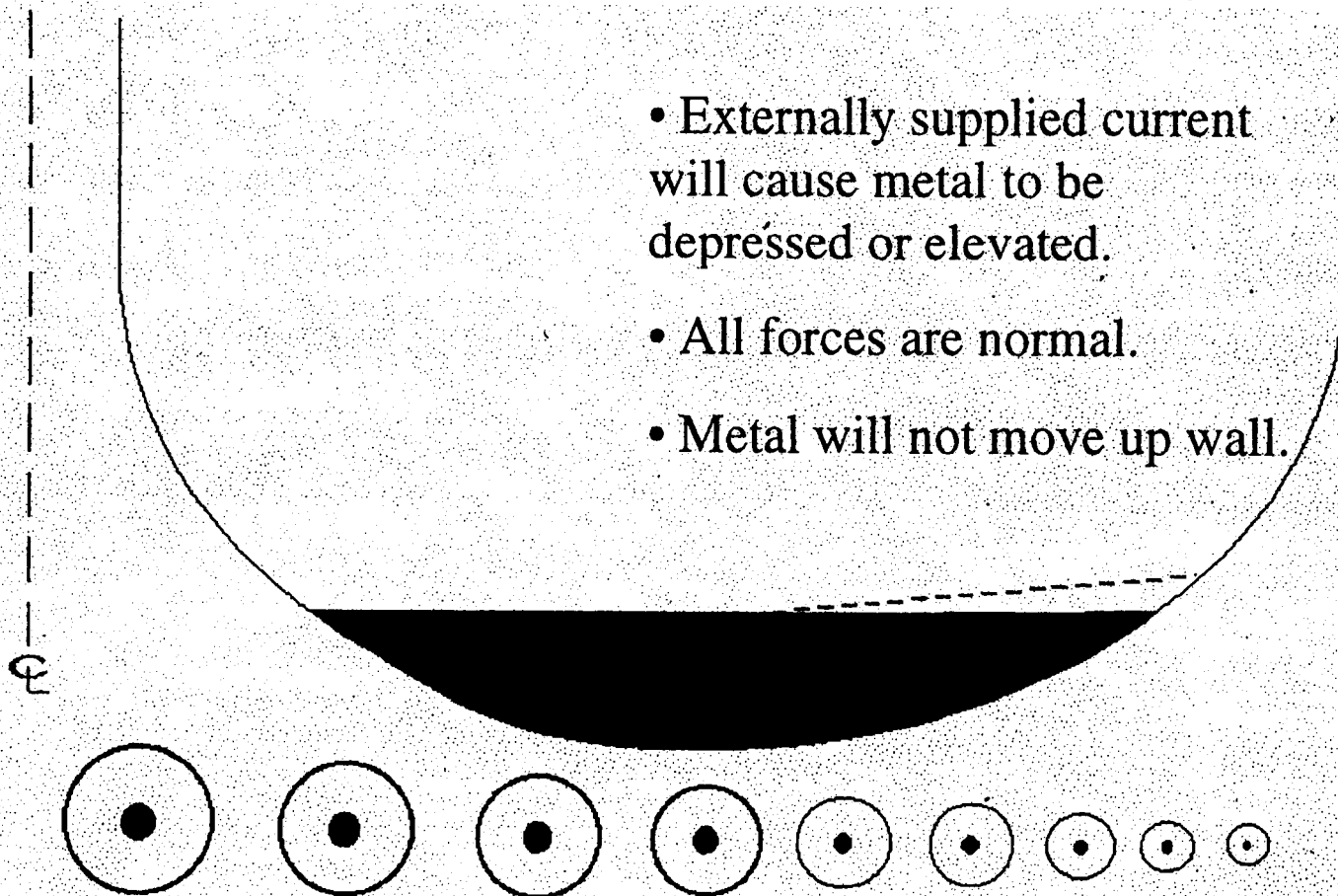
- Metal in gradient area is not pushed up as hard as metal in stronger field.
- Level drops about 3 mm.
- Metal does not flow down the curved wall.



Expected Result :

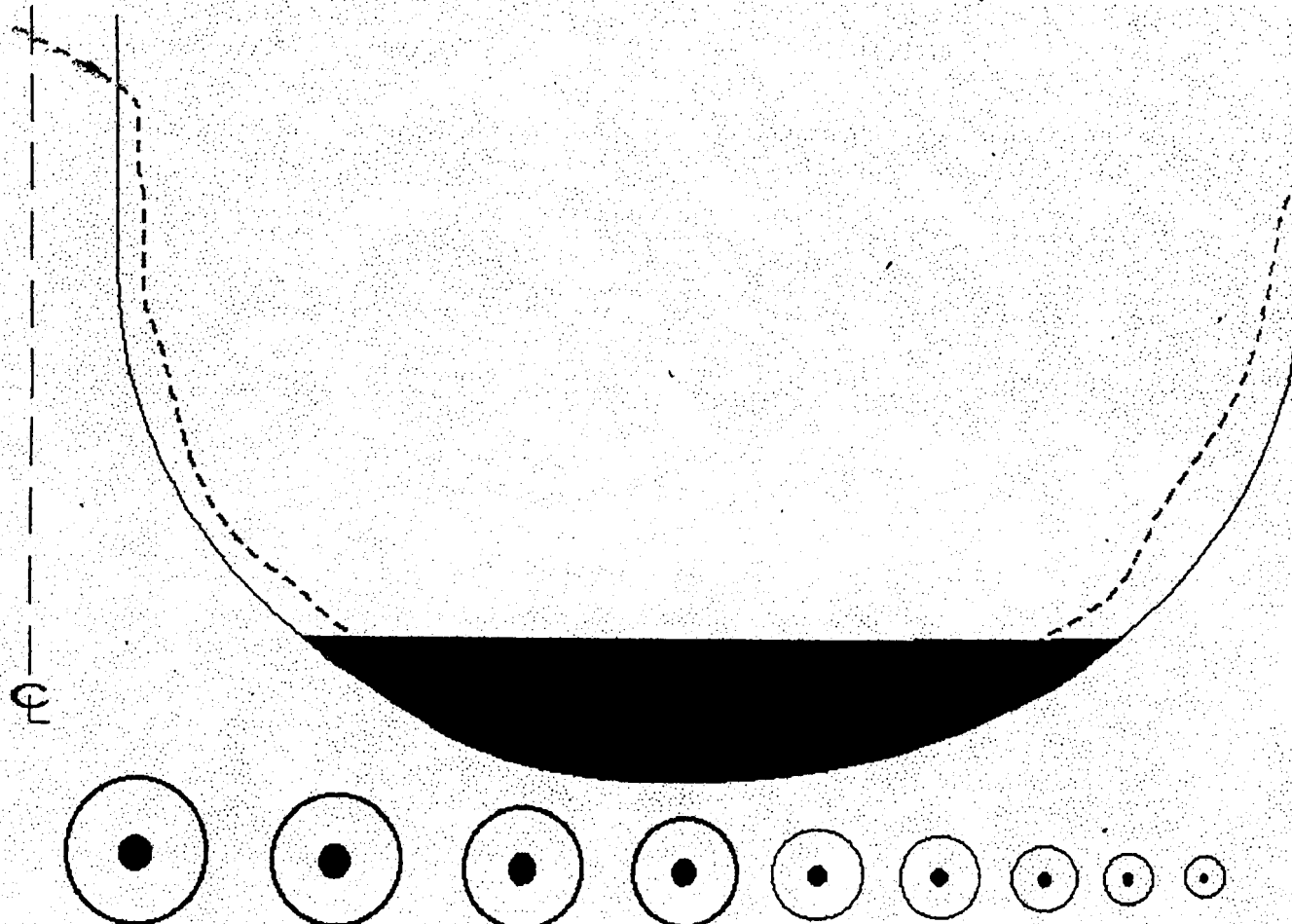
liquid metal will not flow up wall

- Externally supplied current will cause metal to be depressed or elevated.
- All forces are normal.
- Metal will not move up wall.



$$B \propto \frac{1}{R}$$

Tokamak First Wall : self propelled metal concept



externally supplied
current
may cause metal to
flow up outboard
wall

$$B \propto \frac{1}{R}$$

Hydrogen plasma discharge interaction with liquid gallium

- A current through the liquid gallium metal was not shorted when a hydrogen plasma was present even with a large current flow through liquid metal.



- Most work in APEX is simulation + theory

- Sam's talk:

"budget adjustments...."

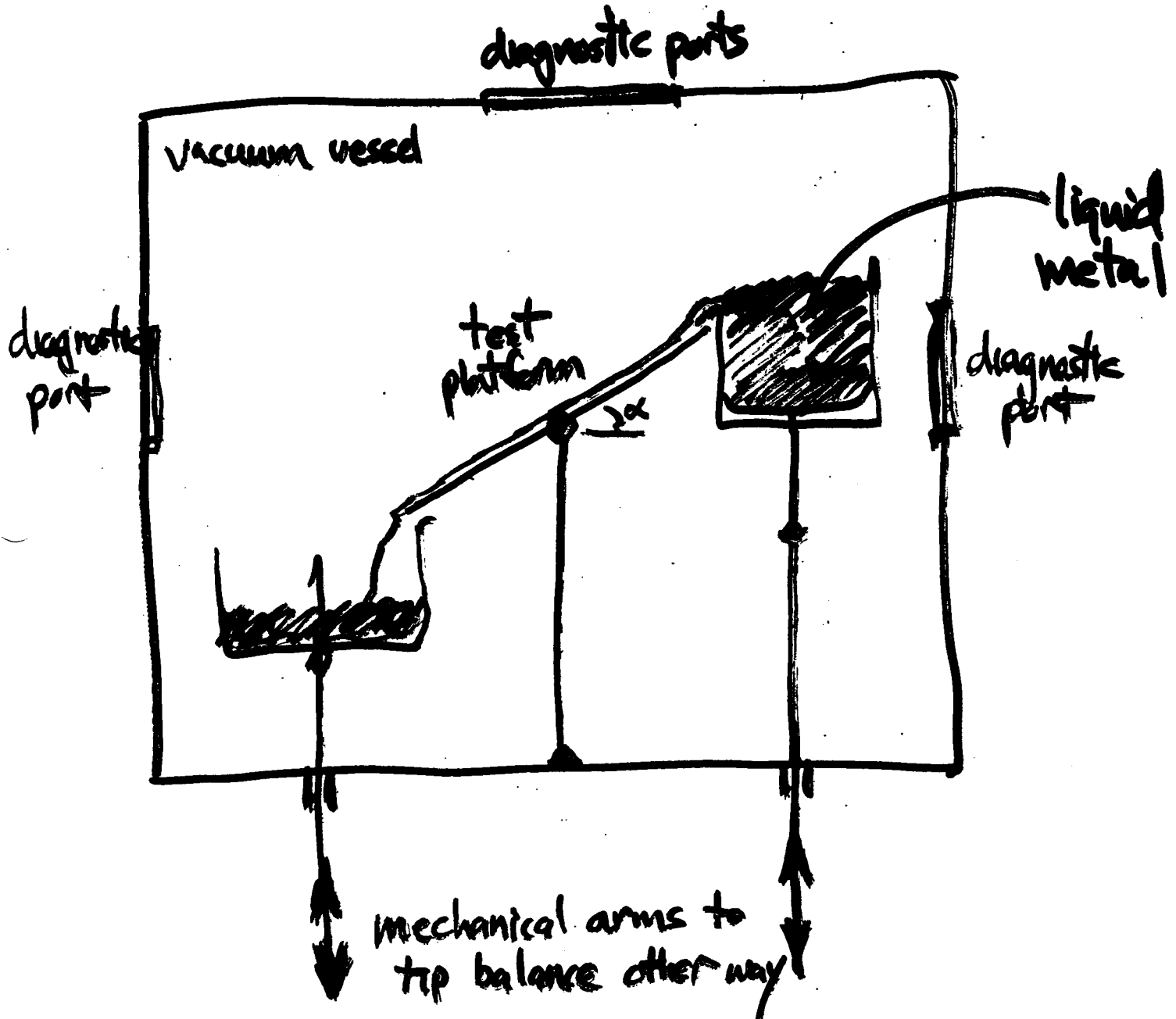
"adjust the skill mix..."

"The APEX meeting will provide the opportunity to update the work plan, to reprioritize tasks, and to scrutinize/adjust the skill mix."

- "5 Year Goals" unfortunately spells out the whole budget in detail. I would like to ask for some....

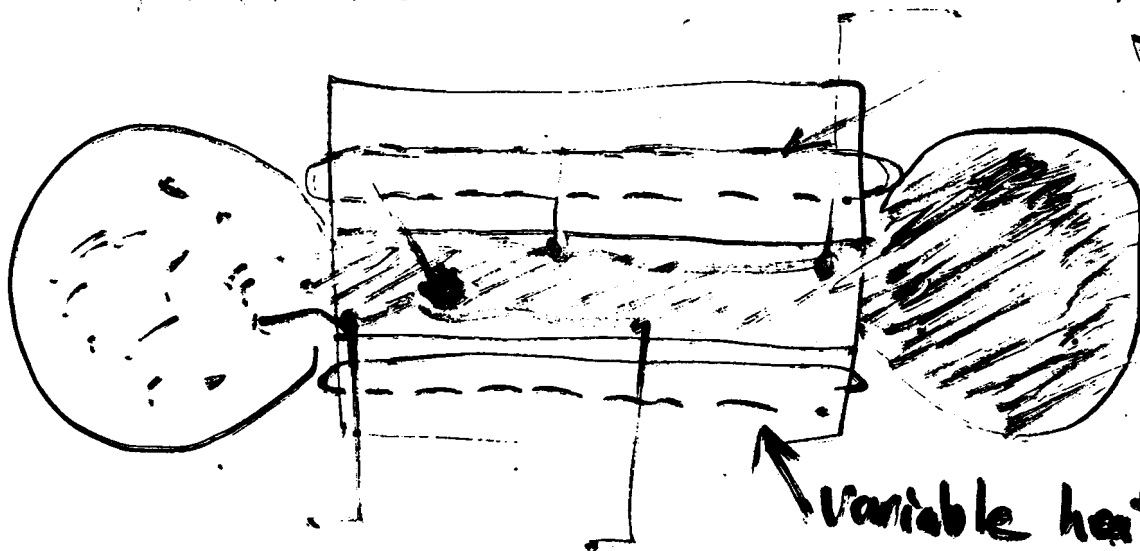
JUSTICE

Joint University-Simulation-Theory Integrated Chamber Exp



Top view:

opportunities
for penetrations



Magnetic
field
coils to
produce
gradients
as
needed.

variable heater built in
taps for currents to run \perp or \parallel

- measure thickness
- measure temperature changes.
- view flow
-

- Simple, I have the parts lying around
- Inexpensive ~ 50k per year out of 2,277k in tasks I → II.
- Can test theory and simulations to enable more faith to be developed in the theory and simulations.

Such as ...

- magnetic propulsion
- flow by penetrations
- surface instabilities

-
-
-
- (the list can go on and on with imagination and co-operation.)