# Biological Imaging Chamber

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**Function**

Construct a live cell imaging chamber to be used for laser-based confocal and multiphoton imaging. Device needs to control temperature and gas-environment inside as well as enable the use of perfusion.

**Client Requirements**

- Maintain environment with 95% air, 5% $CO_2$
- Device must allow control of air temperature
- Allow perfusion to sample
- Mechanism for control of X, Y, theta of cell culture

**Design Requirements**

1. **Physical and Operational Characteristics**

a. *Performance Requirements:* Imaging chamber should allow live cell imaging to occur in a controlled environment. Gas make-up, gas temperature, and perfusion need to be controlled.
b. *Safety:* Chamber must not damage microscope or surrounding equipment in the client's lab. Use of pressurized gas tanks including $CO_2$ needs to be done in a safe manner.
c. *Accuracy & Reliability:* pH level must be maintained between 6-8 in culture media. CO2 level must remain close enough to 5% to maintain cell life. Testing will show what level is too high.
d. *Life in Service:*
e. *Shelf Life:* Chamber itself will not degrade with time. Shelf life of whole system will depend on size of input gas tank and flow rates which will be determined by testing.
f. *Operating Environment:* Chamber will be used with an Inverted Nikon TE2000 U microscope in W.M. Keck Laboratory on the UW campus.
g. *Ergonomics:* Chamber must allow for easy-access to put in and remove samples.
h. *Size:* Must fit on moveable XY stage in between lens and base of microscope. 30 x 27.6 x 3 cm.
i. *Weight:* Must not damage microscope stage.
j. *Materials:* No plastic in microscope image field.
k. *Aesthetics, Appearance, & Finish:* Chamber must be easy to sterilize. Good organization of peripheral tubes, etc.

**2. Production Characteristics**

a. *Quantity:*1

b. *Target Production Cost:* $500

**3. Miscellaneous**

a. *Standards & Specifications:* N.A.

b. *Customer:* N.A.

c. *Patient-related Concerns:* N.A.

d. *Competition:*

Incubator 2000; 20/20 Technology, Inc. Incubator 2000 is a miniature imaging chamber with control for temperature, humidity, and atmosphere. PRICE

Focht Chamber System 3: Bioptechs, Inc. FCS3 is a live cell imaging chamber with control for gas flow speed, temperature, and gas make-up as and is perfusion compatible. The FCS3 system starts at $4000.