NASA SBIR/STTR Technologies

An Instrument for Detecting Protein Expression under Radiation and Microgravity

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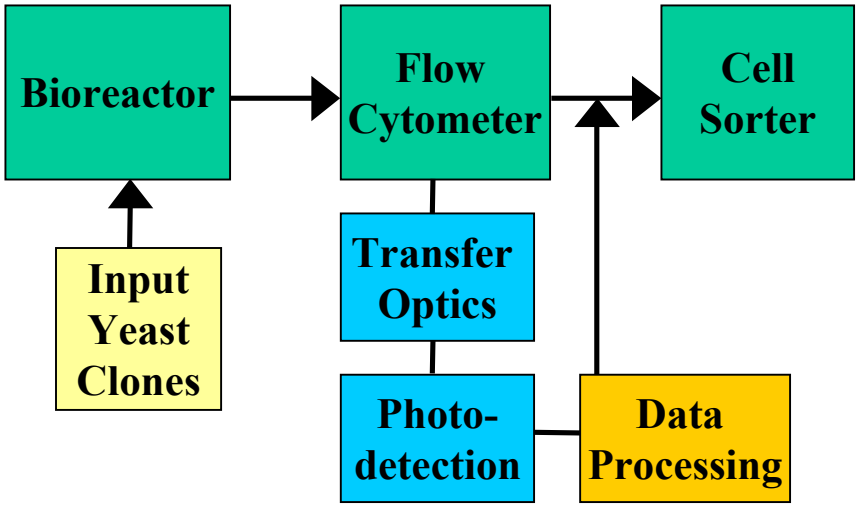
Identification and Significance of Innovation

Measure changes in green fluorescent protein (GFP)-fusion proteins by fluorescence

- Measurements on single, living cells
- No sample processing necessary
- Entire set of yeast GFP-protein clones available

Designed with space applications in mind

- Continuous, self-contained bioreactor
- Microfluidics-based flow cytometer and cell sorter
- Automated, high-throughput capability



Instrument System Block Diagram

Technical Objectives

Phase I: Build bioreactor and cytometer
Measure proteins folllowing X-ray exposure

Phase II: Build cell sorter, add high throughput capability
Measure proteins following heavy ion irradiation

Work Plan

Task 1: Fabricate continuous cell bioreactor
Show constant growth rate, protein expression

Task 2: Construct pumping and switching manifold

Task 3: Construct light detectors within µfluidic channel

Task 4: Detect changes in protein expression

NASA Applications

- Measure changes in protein expression in space lab
- Screen compounds for radioprotection
- Use fluorescent-based cell sorting to isolate mutants

Non-NASA Applications

- High-throughput drug testing
- Combinatorial screening
- Stem cell differentiation

Firm Contacts

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