#1394

Inexpensive DNA Microarrays and Analysis for Undergraduates

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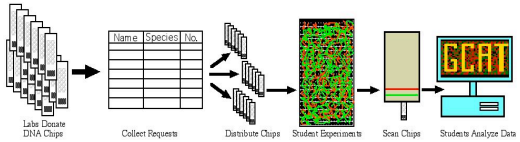
1 Goals

- ✓ Engage Students with Current Research Trends
- ✓ Make DNA Microarrays Affordable for All Students
- ✓ Develop Student-Friendly DNA Microarray Protocols
- ✓ Produce Public Domain Microarray Analysis Software
- ✓ Create High Success Rate RNA-Free Methods
- ✓ Create Virtual Community of Teachers
- ✓ Share Lessons, Protocols, Advice
- ✓ Assess Learning Influenced by Hands-on Learning
- ✓ Disseminate Results Widely Through Many Venues

2 GCAT

Genome Consortium for Active Teaching



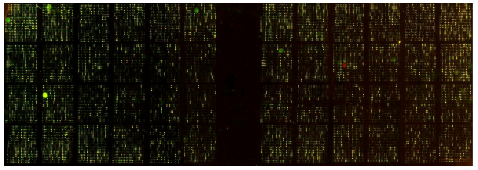
GCAT is dedicated to bringing genomics into the undergraduate curriculum.

- Affordable DNA Microarrays
- Student Friendly Protocols
- GCAT-L Listserv
- Free Software and Datasets
- Instant Community of Faculty
- Active Learning Assessment

www.bio.davidson.edu/GCAT

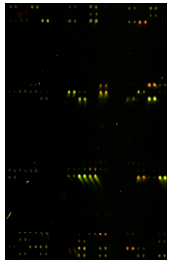
3 Full Genome Microarrays

Yeast
Mouse
Fly
E. coli
Maize
Human (partial)

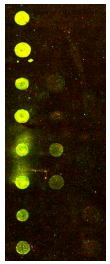


GCAT members at NSF-funded workshop hosted by Lee Hood at the Institute for Systems Biology, summer 2003. Image above is from this workshop.

4 RNA-free Teaching Chips



Emily prepares her next hybridization.
Dan prints his custom DNA chip.

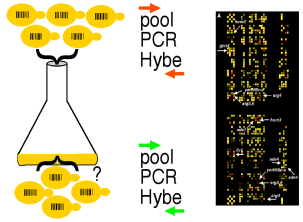


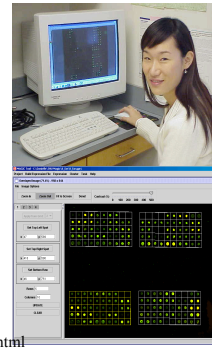
Chips require no RNA isolation, have high success rates and are inexpensive.

www.bio.davidson.edu/projects/GCAT/teachingchip.html

5 Bar Code Microarrays

Helpin





In collaboration with Jef Boeke at Johns Hopkins, senior Danielle Choi designed, printed and developed a protocol for yeast bar code DNA microarrays which are ideal for undergraduates

www.bio.davidson.edu/people/macampbell/ASCB/2000/barcode.html

6 Bioinformatics

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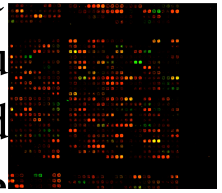
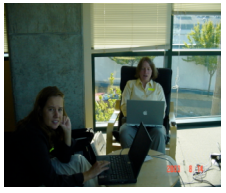
MAGIC Tool

MicroArray Genome Imaging & Clustering Tool

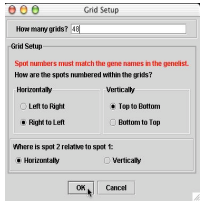


Mathematicians Laurie Heyer and Jo Hardin assess data analysis and design optimal teaching data sets.

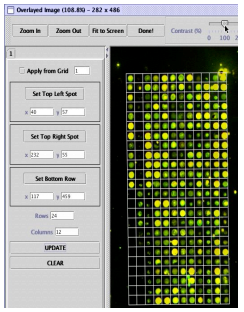


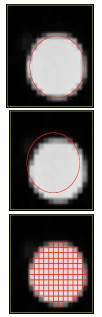
www.bio.davidson.edu/MAGIC

7 Image Analysis

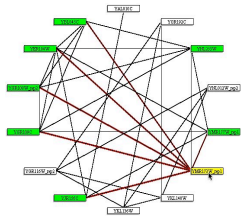


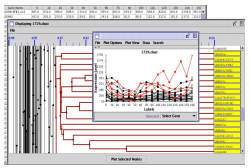
MAGIC Tool finds the spots, quantifies the signals, and allows the users to choose from many options with total control on the image analysis process.

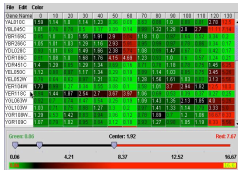




8 Data Analysis







Ratios can be explored through queries and dynamic displays. Clustering can be performed with users exercising preferences for several parameters.

9 Outcomes

Over 800 Students
70 Campuses/ 3 Countries
More Than 2000 Chips

"I came into the class with little to no understanding of what genomics entailed.… Now I find myself fascinated by the subject. My friends and family get annoyed with me trying to explain it to them, but I feel like the things I've learned are so revolutionary, I want to share my new found knowledge."

"I've never been as interested in the reading and as motivated to continue learning as I have been this semester in Genomics.… I came in thinking it would be a lot of work that would be difficult to get myself to do; I will leave thinking that it was a lot of work that was enthralling and that I did as willingly as is possible."

www.bio.davidson.edu/projects/GCAT/assessment/assess.html

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