

## Mitochondrial DNA sequencing. It has a ring to it, and there are a dozen Convent High School students who have done the lab work in Ray Cinti's Advanced Placement Biology class.

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*Like real scientists, they were not attached to their lab handout anymore. They knew what they were doing - they were independent. It was unbelievable."*

*Ray Cinti, CSH  
AP Biology Instructor.*

"The AP Biology course is a survey class that handles each subject separately," said Cinti. "Botany, zoology, genetics, etc. But I also teach the class in terms of what is relevant in today's issues in biology and what is interesting to the students. In addition, the class goes on a journey in genetics that isn't necessarily going to help them on the AP exam," he added. "We do devote an extra two and a half weeks to genetics."

"We start off with the basic principals, which I find interesting, because they weren't basic just a few years ago. We grow bacteria, and we take DNA from another organism, like a jellyfish, and genetically engineer it into bacteria, then grow it on Petri dishes. We also take DNA and send it through a gelatin material. The results are what is called genetic or DNA fingerprinting," said Cinti.

This only sets the stage for the students' more advanced work. "We are really reaching for the gold ring," said Cinti. "What is new is in the last two years we have been taking the students' DNA from a saline mouthwash. The wash is centrifuged down to a pellet of cells containing the DNA which are then treated to expose the DNA helix for experiments.

"The students, using micro test tubes and micropipets, expose the DNA to enzymes that

attach to specific portions of the DNA strand. The region selected is then amplified so it can be experimented on. This is the same process a genetic paleontologist would use to magnify a tiny amount of dinosaur DNA to get enough to really work with," Cinti added.

The class also uses a thermocycler, which, by alternating heat and cold, promotes accelerated reproduction, resulting in usable DNA in a few hours. The actual samples can be seen after being treated and viewed under an ultraviolet light.

"The quantities are all extremely small, measured in micro liters, and the enzymes and buffers are just little drops that look like water," said Cinti.

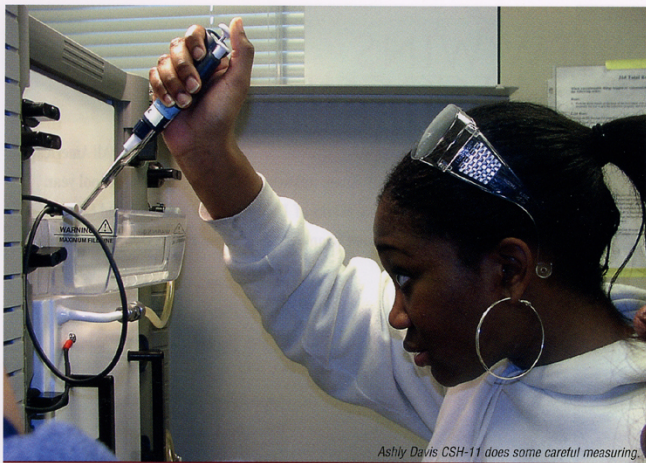
"The students ran a series of experiments in order to become proficient at the process. Like real scientists, they were not attached to their lab handout anymore. They knew what they were doing - they were independent. It was unbelievable," Cinti added.



*Joanna Wendel CSH-11 is excited by many aspects of science.*

The lab process culminates with a field trip to Applied Biosystems, a Foster City company that provides DNA analysis equipment and services, where the women can use state-of-the-art equipment. "The scientists are really supportive and complimentary of the students on their technique," Cinti said.

"We had a really great experience when we went to Applied Biosystems and we were able to amplify DNA," said **Joanna Wendel**, a CSH junior. "I just thought it was so amazing that students like me can do that when maybe twenty years ago this method of amplifying DNA wasn't even in use."



Ashly Davis CSH-11 does some careful measuring.

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*Joanna Wendel, CSH-11.*

# CSH, DNA, CSI & AP BIOLOGY

Wendel has a long-standing interest in biology. "In my freshman year, I took honors biology and I really enjoyed that class. It's equal parts that I really enjoy. Biology, the subject matter itself, and also that Mr. Cinti, I feel, is a really great teacher - that's why I wanted to do AP biology this year," she said.

The trip to Applied Biosystems gave the young women real exposure to professional lab work. Frank Stephenson, Technical Training Manager at Applied Biosystems, said they have high school students in three or four times a month and "it is always energizing."

He's sees plenty of women at the lab, and not just as students. "I think there are more women in science than men," Stephenson said, "particularly in the biological sciences. I think the latest surveys are saying that women are beating the men.

"I think the attraction of science has a lot to do with the things they are seeing on television: shows like CSI, that are wildly popular. Many of the shows center around DNA evidence. I think there was an awareness

all this time that more women need to be in science and I think teachers, throughout the school systems, knowing that, have also encouraged their students," Stephenson said.

The Bay Area Biotechnology Education Consortium is based at Applied Biosystems to encourage students and assist biology teachers, according to Shalini Prasad, Education Outreach Coordinator.

"Most of the schools that have AP Biology or biotech classes make lab visits," Prasad said. "It is usually the high-end schools that do the mitochondrial DNA analysis," she said.

Women have some advantages in biology, Prasad said, including "being aware of all the disciplines, and focusing on diseases that affect women the most. Also, exposure to classes like Ray's and other classes in AP biology and biotech make them more aware of things that are out there in science that they can go ahead and try. The process the women were practicing is pretty sophisticated," she added.

For Wendel, the only downside to the class is that she can't explore endlessly. "There is so much material to learn and there's an AP test at the end," she said. "The time constraint doesn't allow a student who is naturally curious about everything, like me, to delve deeply in to one subject for too long because the course has more stuff to cover. I really liked ecology at the beginning of the year and would have loved to study more of that, but we had to move on."

Wendel said labs and lectures were both great, and it was a thrill to work in a professional lab. "I think it was really exciting to see the same equipment at school and at Applied Biosystems, like the thermocyclers. It makes me very appreciative of our school that we get to use all this wonderful technology. Being able to do this in someone else's lab under complete different conditions, using someone else's equipment and still work with it, that's exciting."