

Finishers Meet at the PGF

As the number of sequenced microbial genomes has been steadily increasing over the past few years, the finishing process has become a constriction point. A discussion of ways to increase productivity and improve work efficiency was the motivation behind a two-day meeting held on June 29th and 30th at the JGI-PGF in Walnut Creek. The meeting, convened by finishing coordinator Patrick Chain from LLNL, marked the first face-to-face meeting of personnel from all institutions at all levels.

Until this meeting, each of the insti-

tutions had been generating their own approaches and protocols needed to handle the load. However, many of the steps involved in microbial finishing can be optimized to be more effective and less time consuming. For example, the meeting reached consensus that with the development of several new pieces of software, several of the steps could be completely automated, while others require human attention and decision-making skills. Further discussion and brainstorming outlined additional developments and changes which, when

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implemented, will help improve the microbial finishing process.

The JGI Microbial Program comprises teams from the PGF, LLNL, LANL, ORNL, and Stanford. The PGF has groups involved in library construction, draft sequencing, draft QC, finishing,

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FROM COSTA RICA TO CONTRA COSTA

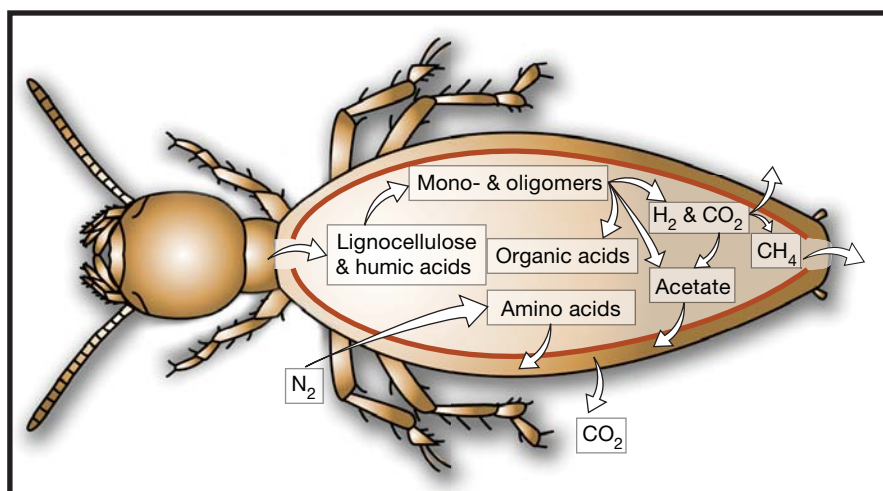
How Termite Guts Can Save the Planet

BY FALK WARNECKE

What do Costa Rica and Contra Costa have in common? They have both recently been visited by members of JGI's Microbial Ecology Program (MEP), who were there to collect samples for metagenomic Community Sequencing Program (CSP) projects. In particular, they wanted to characterize the microbial composition of the termite hindgut.

Why is the termite hindgut so interesting? It may hold the answer to efficient and economical hydrogen fuel production.

Why Costa Rica? Although the coast of Costa Rica was first visited by Europeans in 1503, led by Christopher Columbus, it was a Spaniard on a later expedition, Gil González Dávila, who termed the region *la costa rica*, i.e., the



Termite metabolic scheme. Termites are believed to be responsible for 2% of global CO₂ emissions and 4% of global CH₄ emissions.

rich coast—due to the large quantities of gold “found” among the indigenous

people. However, Costa Rica is not only rich in minerals; the country is now rec-

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JGI FACES

Sam Pitluck—Man Behind the Heavy Desk

BY DAVID GILBERT

Sam Pitluck has been analyzing scientific data longer than the average JGler has been on the planet—28 years at LBNL alone. However, you wouldn't know from looking at him, as his expansive smile and healthy tan portray a man at least a decade younger.

During his first fifteen years at LBNL, Sam worked on a radiotherapy project with Joe Castro at the 184-inch cyclotron and at the Bevatron—both long decommissioned.

“We used the 184-inch for helium therapy, targeting tumors in patients. And at the Bevatron, we used heavier ions like neon and argon—even using silicon to see which one was the best for therapy. I wrote the treatment planning software among other things. There was an entire system for allowing the physician to define the tumor region on CT scans. One of my jobs was to decode the scans and then read the data into the computer.”

A Philadelphia native with an undergraduate degree from Temple University, Sam went on to earn a Ph.D. in physics at Brown University in Providence, Rhode Island. “I got into computing because Brown's high-energy physics group was always pushing the envelope when it came to the need for high-speed computers. I was heavily involved in writing code for our experiments, working on a PDP 9, a very strange machine: an eighteen-bit computer.

“We had to write our own operating system. I remember writing subroutines to add and subtract numbers at the time, around 1966-1967. We digitized bubble chamber film and the amount of data was too much to store locally. So we dumped it to disk on the IBM system. Then we found that another cool



thing we could do was to use the IBM printers to dump our data for printout, which was much faster than anything else we had.”

In December 1970, Sam signed on as a post-doc at the Weizmann Institute in Israel, with his time there spanning the 1973 Yom Kippur War.

In 1974, Sam returned to North America to pursue a post-doc at Carleton University in Ottawa, Ontario—a position that he came to somewhat serendipitously. “It was not that easy finding jobs at that time. They overproduced [Ph.D.s] in physics and if you were not a Feynman, it was very difficult to get a position. I met a visiting professor from Carleton at Weizmann, and he told me there was an opening in Canada. Since the experiment was already going on, the department told me not to come to Canada but to travel directly to Brookhaven. After a few months on the Carleton University payroll, they told me that they needed me

to come to Canada and officially sign on because people were getting concerned about writing checks to people they hadn't seen.

At Brookhaven, Sam worked on a spark chamber experiment. “They needed to know where the particles were, what the trajectories were through each of the chambers, and then there were other calculations that had to be done just to see if everything was working properly. A few years later, the fellow who was in charge of their IT system left for LBNL.” Although Sam didn't tag along immediately, he eventually received a phone call from his former colleague. “He was looking for people to work on this new project for treating cancers in humans. The radiotherapy project was just starting, so I came out here. That was good for about fifteen years.”

In the early 1990s, the operations of both the 184-inch cyclotron—the first built by E.O. Lawrence on “The Hill” — and the Bevatron were being phased out. “So I had to look for another position. Fortunately at the time, the Human Genome Project was starting up. In the informatics group, my first job was actually working on a project for Gerry Rubin. The *Drosophila* and human groups were essentially all one group at Berkeley Lab and they hadn't yet split officially.

Sam's first application had to do with finding which well the DNA came from. “It was interactive. The user could point their mouse at certain things and it would draw lines between points and make corrections for lane drift and so on.”

Sam later developed software to determine the minimum tiling path of sub-clones that covered a BAC clone. “Later on, another large part of my job was to write a display program for the assembled data, similar to what we

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AIDS/LifeCycle 4—2005

BY JONATHAN FONG

Early June: San Francisco to Los Angeles on a bicycle—1600 cyclists riding 585 miles in seven days along the coast of California, raising \$6.8 million for AIDS services and research. I initially signed up for this ride for the physical and mental challenge, but as the miles added up and I saw the impact we were having on the people along the way, I realized that I was actively committing myself to educating the public about HIV/AIDS and to finding a cure. Getting on my bike became something much greater than my own personal accomplishment. I was part of a message from 1600 riders and 400 “roadies” (the volunteer support crew) being sent out to the global community to find a solution to the pandemic of HIV/AIDS.

Traveling along the California coast on and along Highways 1 and 101, daily rides ranged from 45 to 100 miles. During the rides, we had to brave the elements (fluctuating temperatures and gusty winds), steep hills (some with names such as



Jonathan Fong at the pinnacle of his southerly trek.

Quadbuster and The Evil Twins), and rough road conditions. At each rest stop, roadies dressed in costume according to a certain theme. Themes ranged from Mardi Gras to Harry Potter to Swan Lake. But the most memorable pit stop was the one themed “The Sound of Music.” Roadies dressed in lederhosen made from curtains and had a puppet show and performed various songs from the musical. Even after being exhausted from riding 65.8 miles that day, cyclists left the rest stop singing “The hills are alive with the sound of music” at the top of their lungs.

At the end of each day, we set up our provided tents at the designated camp sites and picked up our bags from the wonderful roadies who shipped our bags

from place to place. All meals were provided, not to mention delicious. It was in camp that I was able to chat with other riders. The participants were diverse in every way—gender, sexual preference, age, physical abilities, and ethnicity. But regardless, each person I spoke with was friendly, positive, and encouraging. Each person had their own touching story about their motivation behind doing the ride. I remember meeting a 74-year-old man who had done the ride several times, another woman who had ridden 10 of the past 12 AIDS rides, and many riders who were HIV positive.

The word that best describes the whole AIDS/LifeCycle experience is inspiring. Throughout the week, I was continually surprised by how polite and optimistic everyone was. One rider explained to me that it was because everyone had chosen to be there—to support the fight against HIV/AIDS.

I must say thank you to all of those at the JGI who donated to this great cause, as well as offered me moral support. It really helped me keep going on those long days! If you want to read more about the ride and the experience and look at more pictures, go to <http://www.aidslifecycle.org/>

Finishers Meet at the PGF

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and IMG. LLNL and LANL both have finishing groups. ORNL has an annotation group and Stanford has a sequence quality assurance group.

Most of the functions are carried out within a single institution, but the finishing duties are distributed amongst groups at the PGF, LANL, and LLNL. A primary goal of the meeting was gathering together the primary finishing stakeholders, putting faces to names, sharing procedures and experiences, evaluating

and setting finishing standards, and discussing common problems and needs. The meeting spanned management level discussions to nuts-and-bolts discussions amongst the finishers.

Patrick Chain began the meeting with a discussion of the importance of microbial finishing to the scientific community. Also present were representatives from groups both upstream (Alla Lapidus and Susan Lucas, JGI Microbial Draft Sequencing; Alex Copeland and

Kerrie Berry, JGI Draft Sequence QC) and downstream (Jeremy Schmutz, Stanford, Finish Sequence Quality Assurance). Open and wide-ranging conversation reigned between the groups. In particular, the finishers and the draft sequence QC team gained understanding and respect for one another's efforts. Also, Jeremy illuminated some common finishing errors committed by all finishing groups.

Paul Richardson discussed technologies on the horizon that will affect

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Costa Rican Termites

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ognized for its biodiversity by the United Nations Environmental Program (UNEP). Costa Rica is considered to be one of the 20 countries with the greatest biodiversity. Its geographic position, its two coasts, and its mountainous system, which provides numerous and varied microclimates, are some of the reasons for this natural wealth, both in terms of species and ecosystems. The more than 500,000 macroscopic species that are found in this small country represent nearly 4% of the total species estimated worldwide. Of these 500,000 species, just over 300,000 are insects. Conveniently, Diversa Corporation, the San Diego-based bioprospecting company and JGI collaborator, has arranged legal agreements with the Costa Rican government to harvest the biological diversity in collaboration with INBio—the country's national biodiversity institute.

The termite hindgut CSP seeks to understand the breakdown of recalcitrant plant material in the gut system of these insects. While it is well established that termites cannot perform this task without the microbial community inhabiting their gut, the important microbes have not been successfully cultured in the laboratory yet. This is where the metagenomic shotgun-sequencing approach of mixed microbial communities steps in. The effort is being advanced by the considerable experience gained from JGI's analyses of an acid mine drainage (AMD) biofilm and an enhanced biological phosphorus removal sludge community (EBPR).

It is worthwhile to note that the microbial ecosystem of termite hindguts is simple in an unusual sense of the word: it is tiny (often less than one microliter in volume) and has distinct, concrete boundaries (the gut lining). Yet because of the huge reach and great abundance of their hosts, these micro-



Falk Warnecke at the microscope.

bial ecosystems become a major site of catalysis of reactions that ultimately exert a huge impact on global carbon and nitrogen biogeochemistry, especially in tropical rainforests and similar biomes. Termites are thought to account for as much as 2% of global CO₂ emissions and 4% of global CH₄ emissions.

To reach the termite hindgut microbes, unfortunately, some termites have to die. Basically, you grab one end of the termite with a pair of tweezers, grab the other end with a second set of tweezers and pull—this neatly removes the entire digestive system (the termites are put on ice first to knock them out). I first encountered the “business of de-gutting” termites in 2004 during the Microbial Diversity course held in Woods Hole, Mass. There I also met Jared Leadbetter from Caltech, an expert in termite-related microbiology who is now the principal investigator of the termite hindgut CSP project. Jared and myself, along with members of Diversa and INBio, met in Costa Rica in May.

Two different geographic locations were sampled: The first was a pristine



The abundant *Nasutitermes ephratae* termite.

rain forest located in a reserve owned by INBio; the second was privately-owned agricultural land (coffee and sugar cane plantations). Altogether, 11 termite nests were harvested from a variety of habitats in one day—this high sampling efficiency was possible because of the organizational skills and preparations of the INBio collaborators. However, negotiations are still underway between INBio/Diversa and the agricultural landowners as to whether the samples from the second location can be exploited for the project.

After sampling, the live termites were brought back to the INBio labs and processed. It was estimated that about 300 individuals from one nest had to be “de-gutted” to provide enough biomass for metagenomic libraries. Besides the gut fluid, whole insects were preserved for morphological reference and molecular identification of the host species, as well as samples for microscopic analyses.

Then the question arose, which termite gut to sequence? Mesoamerica is home to a wide variety of termite species. In general, termites are divided phylogenetically, as well as by the struc-

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Costa Rican Termites

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Wood-eating *Nasutitermes corniger* termite.

ture of their gut systems, into “lower” and “higher” termites. “Lower” termites are characterized by a gut community consisting of bacteria—archaea as well as protists—whereas “higher” termites break down lignocellulose without the help of eukaryotic partners in their gut. This feature is considered essential for

a successful metabolic reconstruction based on genome sequences, due to the lack of large eukaryotic genomes in the extracted DNA. Despite these methodological considerations, “higher” wood-feeding termites are by far the most globally abundant and important insects active in the mineralization of plant lignocellulose.

The termite project involves the following steps: The microbial diversity in the gut system of 10-20 species of “higher” wood-feeding termites are being assessed based on a large-scale 16S rRNA sequencing effort. Subsequently, two species with comparatively low microbial diversity will be selected for metagenomic analyses. This step will be followed by genome assembly of the dominant microbial species, as well as metabolic reconstruction of the pathways for lignocellulose breakdown and H₂ metabolism. However, the success of genome assembly could be still hampered due to the expected higher diversity present in all termite guts as compared to the AMD or

EBPR systems. In the long term, MEP researchers expect the project will lead to the development of industrial applications of biomass conversion to useful products and alternative energy forms. From a microbiological point of view, based on the genome information that will surface, we hope to capture the appropriate conditions to enable the cultivation of the major microbial players in this process.

After my return to Walnut Creek, the sampling season still wasn’t over. Recently, the entire JGI Microbial Ecology group visited the local Contra Costa wastewater treatment plant to collect samples for another major project of the group—phosphorous removal from wastewater (the EBPR “sludge” project). “To some,” says Phil Hugenholtz, who heads up the JGI’s Microbial Ecology Program, “this might not seem as exciting as Costa Rica, but don’t knock it till you try it. The danger of falling into 100,000 gallons of human waste to collect a sample is quite a rush.”

PLAYING IT SAFE AT THE JGI

In response to the Environment, Health, & Safety (EH&S) presentation at the JGI June “All-Hands” meeting, several choice questions were generated and summarized below. Also, an important resource for safety information can be found at the JGI intranet EH&S site: <http://www.jgi-psf.org/EHS/index.html>

What should I do if I see an unsafe work condition in the lab?

All of us at JGI are tasked with identifying and rectifying unsafe conditions. If you feel your work environment is unsafe for any reason, you should stop work and bring the unsafe condition to

your supervisor’s attention. Similarly, if you see another worker’s environment is not safe, please bring it to their attention and to a supervisor’s. If we are ALL vigilant, we will reduce work place injuries.

I would like to implement a “stretching” period at the beginning of every work day and during breaks.

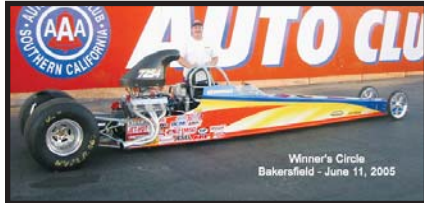
What a great idea! You can download “Stretchware” from the LBNL ergo site that gives guidance on stretching: <http://www.lbl.gov/ehs/ergo/stretch-download.shtml>

Are there pipetting alternatives? After injury what can I do?

Yes, there are alternative pipettors on the market. Some of our employees are using the *Ovation* pipette; *Rainin* “ergonomic” pipettes are also available. If you’ve been injured, or are experiencing symptoms, you must inform your supervisor, and report to your home laboratory’s health services for treatment and follow up. JGI is working on ergonomic improvements in the production line. Please contact Kathryn Nobrega (KJNobrega@lbl.gov) and/or your supervisor if

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JGI's Stanman on a Roll



Greg Stanley's dragster, with a 409-cubic-inch small block Chevy engine, can generate ~880 horsepower.

On June 11th, JGI's own facilities manager, Greg Stanley, won the 5th race of the NorCal Top Comp series as the association returned to historic Famoso Raceway's 1/4 mile in Bakersfield. Greg's win ended a year-long winless drought for the Brentwood drag racer. He used great reaction times and consistent mid 7.7 second runs at over 175 mph to work his way through the field.

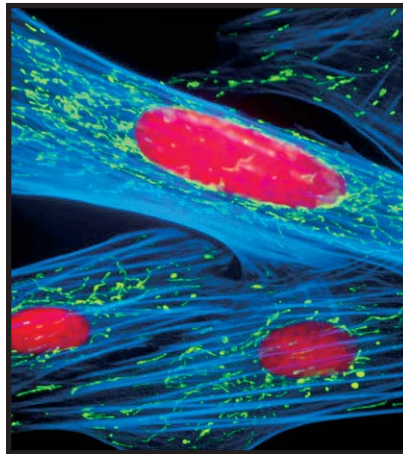
To gain his spot in the final, Greg dropped San Jose's Mike Blackburn in the opening round after taking a 0.013 to 0.058-second reaction time advantage on the starting line. Greg earned the bye run in round 2. Then, in the semi-final win over Porterville's Steven Shearer, Greg once again used a better reaction time at the starting line for the win as his .008 to 0.066 advantage was too great for Shearer to overcome. The final round found Stanley matched up with hometown favorite Eric Trubey. Trubey was almost perfect on the starting line with a great 0.009-second reaction time, but it wasn't good enough as Stanley's small-block Chevy continued the day's trend with an even better 0.006-second reaction time. At the finish, it was Stanley running a 7.769 on his 7.75-second dial, taking the win light to Trubey's slightly off 7.801 on a 7.78 dial.

The win moves Greg into 2nd place for the season's point championship.

How Much Do You Know About Your Other DNA?

Quiz Answers from *The Primer*
Vol. 2 Issue 2, Page 11:
<http://www.jgi.doe.gov/News/primer/index.html>

1. No
2. Yes
3. No
4. No
5. No—B) It is not definitive evidence because, for example, you share the exact same mitochondrial genome as your mother.
6. Yes
7. Yes
8. No
9. Yes
10. No



JDRF Walk to Cure Diabetes

Lace up your walking shoes and join the 2005 Juvenile Diabetes Research Foundation (JDRF) East Bay Walk to Cure Diabetes. The Walk will take place on Sunday, October 2 at Heather Farms Park in Walnut Creek. Last year, over 2,500 walkers participated in the event raising over \$850,000 for diabetes research. Join your JGI colleagues, family and UC colleagues for this exciting event. For more information check out:

http://www.jdrf.org/index.cfm?page_id=101759 or contact David Gilbert (gilbert21@lbl.gov or 925-296-5643)

LOST, BUT PERHAPS FOUND?

Contact Carolyn Vertuca (x5670) at the Building 100 reception desk for lost items.

CANS FOR CASH FOR EAC

The JGI Employee Activities Committee (EAC) wants your aluminum cans, which are translated into quick cash to support ongoing EAC activities. Please deposit them in the blue plastic bins in either the Building 100 or 400 lunchrooms.

FREE PILATES CLASSES AT THE JGI!

Such a deal! These classes, taught by JGI's own Wendy Schackwitz, would cost \$10-15 at a fitness studio, but here at the JGI there is no charge!

The class is designed to benefit all fitness levels and focuses on stretching and strengthening the areas that get tight and sore with desk work. The regular class meets Tuesday and Thursday evening at 5 pm and Wednesday and Friday mornings at 7am. All you need is comfortable clothing and a mat (if you need a mat, one can be borrowed, and there are new ones that can be purchased). Come join us in the 149 Conference Room and see how Pilates can help you! For more information, contact Wendy at x5634 or WSSchackwitz@lbl.gov.

More Sam

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have now in Trace View.”

When the Production Genomics Facility (then known as the Production Sequencing Facility) was opened in 1999, Sam and the rest of the bioinformatics group moved out from Berkeley.

“We came to be known as the firefighters. Those were the times when Elbert [founding JGI Director Branscomb] would come down to our office and say, ‘We need this yesterday.’ We made a decision at that time to use the Web for all of our reporting. For example, many of the displays that you see on the monitors today in the hallway, started on the Web way back, created by myself and Yunian [Lou]. These statistics were extremely important because JGI had to prove that we were worthy of being part of G5. We had to sequence something like 20 million bases in a 12-month period—this when we had done about four million collectively in the previous year. We were working like mad to meet those goals. Shows you how far we have come.”

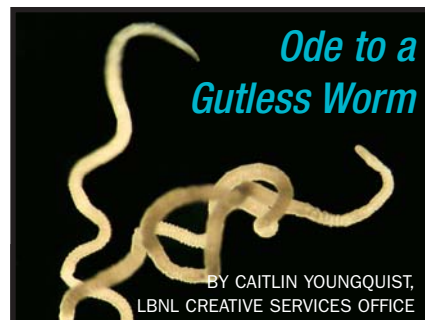
Sam eventually took over the entire archiving effort, and became the central point of contact for submission of all assembled data to GenBank—the National Institutes of Health genetic-sequence database, an annotated collection of all publicly available DNA sequences. “I am the last person to touch the data before it goes out into the world,” explains Sam. “So you want to make sure that you have the microbe named correctly. I often see data where there are errors in species names and the strain name.” To further complicate matters, some microbes have gotten renamed during the process of sequencing, he says.

An early riser, and a former avid runner, Sam has taken to swimming, which accounts for his healthy mien. Since his recent move to Building 400, his commute from home (as precisely meas-

ured by his pedometer hooked to his belt) has changed from three-quarters of a mile to nine-tenths of a mile. The distance is still too far to walk because of his heavy, throwback briefcase that accompanies him from his home. At work, it sits on Sam’s signature large wooden desk, which has followed him throughout his many office moves.

Married 36 years, Sam and his wife Riva, who is director of community programs for the Jewish Community Federation of the Greater East Bay, have two daughters. Ilana is a programmer down the block at Kaiser, and Dena works for Diablo Publications.

Being so close to work certainly has some drawbacks, in that he often makes the trip into the lab on weekends. But if he had more free time, Sam says he’d get back into his stamp collecting. His favorites are early Israel issues and the elusive phosphor-tagged errors.



Olavius algarvensis,
though you are gutless,
you’ve got critters right under your
skin!

It’s a real symbiosis:
No need for osmosis
It’s bacterial growth from within.

You, Bus Eukaryotic,
haul your tourists microbic,
it’s a cool driver/passenger thing.
There’s some real interaction,
between you and your factions,
To science, you’re quite alluring-ing!

JGI MYSTERY PIC



The April JGI Mystery Pic, care of Damon Tighe, was correctly identified by Orsaalem Kahsai, as the filtration unit on the Ciona tank in Building 400.

What and where is this one? Send your answer to gilbert21@lbl.gov



Young Investigator Award for Araceli



Araceli, left, seen here at the SMBE meeting with JGI colleagues Pilar Francino and Jeff Froula.

Araceli Huerta, of the Evolutionary Genomics Program, received a Young Investigator Award from the Society for Molecular Biology and Evolution (SMBE), which publishes the top molecular evolution journal. She earned this honor for her work on the evolution of bacterial promoter regions, which she presented in a Young Investigators workshop at the SMBE meeting in New Zealand in June.

AWARDS AND ACCOLADES

An Outstanding Performance Award was presented by Nikos Kyrpides to his team of Iain Anderson, Natalia (Natasha) Ivanova, Athanasios (Thanos) Lykidis, and Konstantinos (Kostas) Mavrommatis, comprising JGI's Microbial Genome Analysis Program. The award is in recognition of the team's outstanding efforts in providing a comprehensive microbial genome analysis system (IMG) to the JGI and the academic community at large, thus significantly improving JGI's ability to process the large volumes of data produced in-house, and ultimately achieving their biological interpretation.

Sharon Ropes of the Operations Department was recognized with a SPOT Award for her persistence and effective negotiation skills in awarding a time-sensitive off-site freezer subcontract.

JGI New Faces (April–August, 2005)

DIANE BAUER <i>Sr. Scientific Technologist Libraries Group</i>	ALAN KUO <i>Systems Analyst 2 Genome Annotation Group</i>	VASANTH SINGAN <i>Research Associate Microbial Genomics Group</i>
YE CHEN <i>Graduate Student Research Associate Genomic Technologies</i>	DUANE KUBISCHTA <i>CSE/Systems Analyst 3 Production Sequencing Group</i>	CAILYN SPURRELL <i>Sr. Researcher QC Group</i>
BRADLEY DUNHAM <i>Student Assistant Genome Biology</i>	DIANA LAWRENCE <i>Research Associate Sequencing Technology Group</i>	HANK TU <i>Systems Analyst Genome Assembly Group</i>
KATRINA EATON <i>Laboratory Technician QC Production</i>	KATHRYN NOBREGA <i>EH&S Principal Consultant Operations Department</i>	ROCHELLE VAUGHN <i>Administrative Specialist IV Informatics Department</i>
MARSHA FENNER <i>Sr. Administrator Scientific Programs</i>	GERARDO ORTEGA <i>BBE Student Assistant Production Department</i>	KARAN WADHAWAN <i>Student Assistant Genome Biology Program</i>
CARINA GALVAN <i>BBE Student Assistant Production Department</i>	DEANNA PETROCHILOS <i>Systems Analyst 1 Genome Assembly Group</i>	CORAL WEESE <i>Research Associate Cloning Technology Group</i>
CHARLOTTE DE GUZMAN <i>Sr. Human Resources Generalist Operations Department</i>	LENA PHILIP <i>Scientific Technician QC Group</i>	IRINA ZHARCHUK <i>Laboratory Technician Microbial Genomics</i>
JINAL JHAVERI <i>Software Developer 3 Genome Data Systems</i>	ALI QURESHI <i>BBE Student Assistant Cloning Technology Group</i>	LI ZHONGPING <i>Engineering Technician II Operations Department</i>
RANANDEEP KAUR <i>Student Assistant Evolutionary Genomics</i>	KATHY RICHIE <i>Sr. Recruiter Operations Department</i>	KEMIN ZHOU <i>Systems Analyst 3 Genome Annotation Group</i>
EDWIN KIM <i>Student Assistant Genome Biology</i>	REBEKAH SEHORN <i>Administrative Specialist IV Production Department</i>	
EDWARD KIRTON <i>Sr. Research Associate Genomic Technologies Program</i>		

BIRDS OF JGI

Damon Tighe of the JGI quality control group has provided a dramatic and stunning picture of the life and death struggles that happen right here on the JGI-PGF campus. He was in his office when his supervisor Sanjay Israni called him to say he had seen the bird fly into one of the trees by the neighboring Silicon Valley College. Damon grabbed his camera and snapped this picture of a juvenile red-tailed hawk (*Buteo jamaicensis*) that had killed a pigeon and carried it to a nearby perch to feed. Red-tailed hawks are the largest of the hawk family, and are the most abundant and easily observed hawk in our area. They are quite comfortable around human development, and are often seen in close proximity to urban areas.

The most famous red-tailed hawk is Pale Male, who has chosen to make his home in New York City's Central Park since 1991. His life has been the subject of a PBS Nature video (Pale Male) and a novel (Marie Winn's "Red-tails in Love, a Wildlife Drama in Central Park") that follow the first few years of Pale Male's residency. For pictures and info on Pale Male see: <http://www.pbs.org/wnet/nature/pale-male/>.

The typical adult red-tails in our area have brick-red tails, thin black bands on the underside of the wing that reach from the neck to the first bend in the wing, dark brown backs, a white throat, and a dark chest band. Juveniles, like the one Damon caught in his picture, have a banded tail instead

A Raptor's Insatiable Appetite



PHOTO BY DAMON TIGHE

of a red tail. They also have a more mottled appearance.

SOME FACTS ABOUT RED-TAILED HAWKS:

Weight of 2-4 lbs and a wingspan of up to 56" with female 1/3 larger than the male.

Eyesight is 8X as powerful as a human's, and can spot a mouse from 100 feet in the sky.

Have dramatic aerial courtship displays where the mated pair may dive at each other, clasp talons in mid-air, and tumble toward the ground together.

Are carnivores, with rodents (like our cute little squirrels we have here) making up 80-90% of their diet. But, as Damon's picture shows, they will take birds, as well as snakes, lizards, and carrion.

They are a sit-and-wait kind of predator, and are often seen perched on top of telephone poles as they peer down into the grass below, waiting for their next meal.

They have a bony ridge over their eyes that acts as a built-in visor to shade their eyes from the sun.

The cry of the red-tailed hawk is used in movies to represent any eagle or hawk.

For more information about red-tailed hawks and to listen to their cry visit Cornell's website: http://www.birds.cornell.edu/programs/AllAboutBirds/BirdGuide/Red-tailed_Hawk.html

Another good website is: <http://www.buteo.com/redtail.html>.



JGI NESTLINGS

Under the eaves of the south side roof on Building 400, some new neighbors (a clutch of house finches?) took up residence.

PHOTOS BY EUGENE GOLTSMAN

JGI's Summer Goes FaST

The Faculty and Student Teams (FaST) Program is a cooperative effort between the Department of Energy (DOE) Office of Science and the National Science Foundation (NSF). The FaST program objective is to provide hands-on summer research opportunities in DOE national laboratories for faculty and students from colleges and universities with limited research facilities, and for those institutions serving populations, women, and minorities under-represented in the fields of science, engineering, and technology.

Dr. Charles Bland, along with two undergraduate students from Jackson State University (JSU) in Mississippi—Fareedah Sabree and Teresa Ramsey—participated in research this summer at JGI Production Genomics Facility (PGF), sponsored by LBNL's Center for Science & Engineering Education and the FaST Program. Charles is an assistant professor of computer science at Jackson State University interested in data mining and bioinformatics. This summer he worked with Nikos Kyrpides, who is providing overall coordination for JGI's Integrated Microbial Genome (IMG) data management system.

The team was involved in two projects. In the first, Charles, Fareedah, and Teresa worked on developing a program to identify clustered regularly spaced palindromic repeats (CRISPRs) commonly found in the DNA of prokaryotes. CRISPRs are composed of multiple short-direct nucleotide repeats that range in size from 21 to 37 base pairs and are interspaced by similarly sized nonrepetitive DNA sequences. As far as the exact biological role of CRISPR patterns, scientists are still trying to figure this out. It has been suggested that they may be



The FaST team, collaborators, and friends, from left to right: Victor Kunin, Teresa Ramsey, Charles Bland, Fareedah Sabree, Nikos Kyrpides, Thanos Lykidis, Kostas Mavrommatis, and Hector Garcia Martin.

linked to DNA metabolism or gene expression, and also that they may be a target for DNA-binding proteins. In producing an efficient program to perform the task of finding CRISPR sequences, they explored different pattern-matching techniques. In addition, they looked at methods for increasing algorithm efficiency, such as approximation techniques and heuristic-similarity search algorithms.

The goal of the second project was to identify fusion and fission proteins using local-alignment techniques. There are two particular types of recombinations, fusion and fission, that are important in understanding the evolution of genes and proteins. Fusion proteins are formed by the binding of two or more proteins to create a composite. On the

contrary, fission proteins are formed when proteins are broken down or split from a composite into two or more single components. Once these proteins are identified, scientists can possibly begin to predict how such proteins are related, understand their functional abilities, address evolutionary issues, and ultimately understand and explain the entire function of complete genomes.

In this study, local-alignment techniques were used to find similarities between two-string protein representations. To accomplish this, a program was developed using these techniques to determine whether protein fusion/fission has occurred by comparing a large protein molecule to smaller protein molecules from the IMG data analysis system, which currently consists of 3.17 million protein sequences.

"I'm a computer scientist who has had a life-long amazement with the science of life and the inner workings of living organisms," says Charles. "It's only natural that I've gravitated towards research in the areas of genetics and bioinformatics. Until this opportunity at JGI, however, I've been unable to truly master bioinformatics because of my limited access to expertise and current research and technologies in the area."

"Thus far, the experience of working on a FaST team has proven to be more beneficial than any other internship," says Teresa. "This experience has helped me to truly understand my undergraduate and graduate profession and how it relates to other areas of study in the real world, specifically bioinformatics. For this experience, I am thankful to Lawrence Berkeley National Laboratory, JGI, and the U.S. Department of Energy."

High School Teachers Get Hands-On at PGF

The summer of 2005 was a busy time for JGI mentors and their high school teacher-trainees at the JGI-PGF. JGI partnered with Lawrence Livermore's Edward Teller Education Center (ETEC) to bring two high school teachers onboard for the summer; members of the first group to reach the final level of ETEC's four-tiered Biotechnology Research Academy. The pioneers were: Mary Shane from Canyon Springs High School in Las Vegas, Nevada and Martha Elvira Espinoza from John F. Kennedy High School in Fremont, California.

Level IV entails a 120-hour internship where teachers participate in mentored research at a research facility. Teachers are expected to produce a research paper and a classroom activity to implement in their classrooms based upon their internship program. For their efforts, the teachers receive a \$1,500 stipend and \$500 for materials for classroom implementation. *For more information, check out: <http://education.llnl.gov/biotech/description.html>*

"For my summer internship, I was assigned to Susan Lucas in the production sequencing area," says Elvira. "The minimum internship requirement is 120 hours, but most teachers enjoy their internships so much that they end up

staying longer. My first week at JGI was spent in a basic orientation of the entire JGI facility with a focus in production and mandatory lab safety training and testing. The second week at JGI, I was assigned two BAC (Bacterial Artificial Chromosome) clones from the frog *Xenopus laevis*, covering eight possible genes. My project was to process these clones from start to finish and sequence them with the aim of comparing the gene sequences with those of *Xenopus tropicalis*. I will also follow my DNA samples through assembly and annotation. I will finish up my internship by writing a paper on my project and a lesson for use in my classroom. I am totally enjoying this internship here at JGI. I can't really call my experience at JGI work. It's more like an extended field-trip. The entire staff at JGI has been ter-



Elvira Espinoza, left, and Mary Shane, right



rific. Everyone from researchers to office staff goes out of their way to be helpful and friendly. I will boast about this experience to all of my students and peers."

Mary Shane has been PCR-amplifying sludge samples in the laboratory of Phil Hugenholtz, in search of the small subunit rRNA genes from the United States and Australia, as well as termite samples from Costa Rica.

"I have become proficient in PCR, gel electrophoresis, and cloning. I am hoping to be able to use this experience to teach my students general laboratory techniques that will help those that go onto college and those that enter the growing field of lab techs. Also, I want to be able to describe the world of a research lab to them to help them understand the importance of following laboratory protocols, including the importance of safety in the lab."

Says her mentor Phil Hugenholtz: "After only a few weeks in the lab we would like to hire Mary—she is an excellent bench scientist and has contributed to our scientific program."

MEMORABLE SUMMER FOR HIGH SCHOOL STUDENT

After becoming inspired on a tour of the PGF earlier in the year with his San Ramon Valley High School class, incoming senior Igor Bogorad took it upon himself to find a summer position here.

"I am part of JGI's Microbial Genome Project. My interest is to annotate and edit sequenced genomes," Igor says. "Our group is currently working on a group of

organisms called Archaea that generally live in extreme conditions. The sequencers at JGI occasionally have errors that cannot be fixed by a program. When this occurs, we must compare the fragment that contains an error to other organisms.

"I am having fun. Being an intern in the biotech field will help me in the future with colleges and work experience."

THE JGI OMBUDS PROGRAM

The Ombuds program provides an internal neutral, confidential, and informal avenue for JGI employees to identify resources and methods for resolving work-related problems. The Ombuds program is intended to assist in the resolution of issues in a way that re-establishes or strengthens the communication link between supervisors and employees, or employees and co-workers.

Laboratory Ombuds are peers. They are nonsupervisory volunteers approved by their directorates and trained through Laboratory-mandated classes to be

resources to their fellow employees across all job classifications and at all levels of management to help resolve problems in the workplace.

An employee initiates the process by contacting an ombuds, who listens to the employee's issue. The ombuds helps the employee identify problems and potential options or solutions.

The Ombuds program is available to all employees of JGI. For more information, contact Carolyn Vertuca (vertuca1@lbl.gov or x5670).

JGI Safety

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you have additional concerns, comments, or suggestions.

Can I check out ergonomic-friendly equipment (a mouse, a chair, etc.) before ordering one?

At JGI, you can sample ergonomic equipment currently in use. Additionally, both LBNL and LLNL have ergonomic showrooms that you can visit for a greater selection. For guidance on state-of-the-art ergonomic equipment, contact JGI's EH&S Regulatory Compliance Specialist Jimmy Choy (JKLChoy@lbl.gov).

Where would I find information on how to handle chemical waste?

All lab employees must complete training in handling chemical waste (PGF 604). Procedures are located in the training materials and posted on the JGI EH&S site: <http://www.jgi-psf.org/EHS/index.html> and/or contact Jimmy Choy.

21 REASONS to Bike to Work

BY ANNETTE GREINER

1. It's fun
2. It saves gas
3. It gets you to work without polluting
4. You don't have to sit in rush-hour traffic
5. It's good for your heart
6. It's good for your muscles
7. It's a great way to burn calories
8. It's cheap
9. It makes you feel self sufficient
10. It's great to feel the wind on your face
11. It relaxes your mind, which helps you think more clearly
12. It's a good way to wind down at the end of a work day
13. The world is more beautiful when seen from outside a car
14. People smile and greet you along the way
15. You see your route to work as if you'd never been there before
16. If you bring a water bottle, you can sip from it all day
17. Starting the day with some exercise lets you feel virtuous the whole rest of the day
18. If you have a tough day, you can work out your aggressions on the way home
19. You get to brag about it to your coworkers
20. You have a great excuse to dress in loud colors
21. Helmet hair overrides bed head



JGI's FaST Summer

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The experience was gratifying for Nikos as well. "Probably one of the most rewarding events along a scientist's career is to see the results of his efforts being used by others," Nikos says. "In this case, Charles, Teresa, and Fareedah should feel very proud of what they've accomplished during their time at JGI—their results will not only be used by their colleagues here, but by the scientific community at large, through the IMG system. This, I hope, will provide additional evidence of the success of the FaST program, and help expand it further."

For more information about the FaST program and other educational partnership opportunities, see the LBNL Life Sciences and Genomics Diversity page: <http://www.lbl.gov/Workplace/GD-LS-Diversity/>

PGF's New Little Neighbors

Springfield Montessori School is moving next door to the JGI-PGF early this fall. The new site is on four private, quiet acres offering the children plenty of room to play and learn. There will be one Kindergarten, five Preschool, and two Toddler classrooms for children 2-6 years old. The 12,000-square-foot building will have eight classrooms and a multipurpose room for music, parent gatherings, and school events. The 15,000 square feet of playground will include three play structures and swing areas, three shaded sand boxes, picnic grounds, a fenced-in sport court, and a gardening area.

Springfield Montessori School has been open for 15 years and is currently located down the street at 2210 Oak Grove Road. The school curriculum is

based on the teachings of Maria Montessori. Their mission is to:

- Provide an environment that promotes a love of learning.
- Enable the child to develop physical and mental order and "Inner Discipline."
- Provide an environment and materials within it that will meet the child's emotional, cognitive, spiritual, social,



and physical developmental needs.

- Help the child to help him or herself through the processes of Independence, Responsibility, Socialization, Grace, and Courtesy.

In addition to math, language, and science programs, Springfield Montessori also has a music program, before- and after-school hours, and a summer program. The summer program is offered for children 2-9 years old.

For more information about Springfield Montessori, go to: <http://www.springfieldmontessori.com/> or contact the Director, Shashi, at (925) 944-0626.

For a personal recommendation from a Springfield Montessori parent, feel free to drop by 100-124 and talk to Kerrie Barry (x5672) or kwbarry@lbl.gov.

The JGI Summer Picnic Award-Winning Lemon Mousse Protocol

CARE OF RENÉ
PERRIER,
INFORMATICS SOFTWARE
SUPPORT
GROUP LEADER



REAGENTS:

- 6 eggs
- 1/2 lb. sugar
- Juice of 3 lemons (Meyers are best)

PRODUCTION:

Place all ingredients in a 2-qt. pan (4-5 in. deep, pressure cooker okay) and allow sugar to melt a bit before heating. Whip ingredients with hand mixer for 5-7 mins. Turn on heat to lowest possible level, keep on whipping. Every 2 mins., increase heat by one level. Keep on whipping. After 10-12 mins., you should notice that the mixture has doubled volume and that the

texture is nice and fluffy (like a mousse, which means foam in French). Stop whipping and heating when the mousse has a nice texture, but before it curds (the warmer the mixture, the more chances of curdling). Pour the mousse in a serving bowl and give it a last mix with the hand mixer. Let cool before serving.

FINISHING:

Add lemon zests on top before serving. Serve with fresh strawberries. If this is not strawberry season, you can dip using rolled waffles or similar cookies.

QA:

If this sounds too complicated, you can make a lemon curd instead of a lemon mousse by heating as soon as you start whipping and stopping when the texture is creamy. A lemon curd is

not as fluffy as a lemon mousse, but it tastes pretty much the same.

If the mousse texture is too runny, return it to the pan to whip/heat again. If it's still too runny, increase the heat and make a curd instead of the mousse. Better a curd than a runny mousse.

As the song from the 1972 Albert Hammond hit goes, "it never rains in California . . . it pours!" the JGI Annual Summer Picnic defied the unseasonable showers on June 16th long enough to afford over 220 JGlers, family, and friends a respite from our labors. Photos from the day can be found at: <http://cayman.jgi-psf.org/news/picnic2005/>

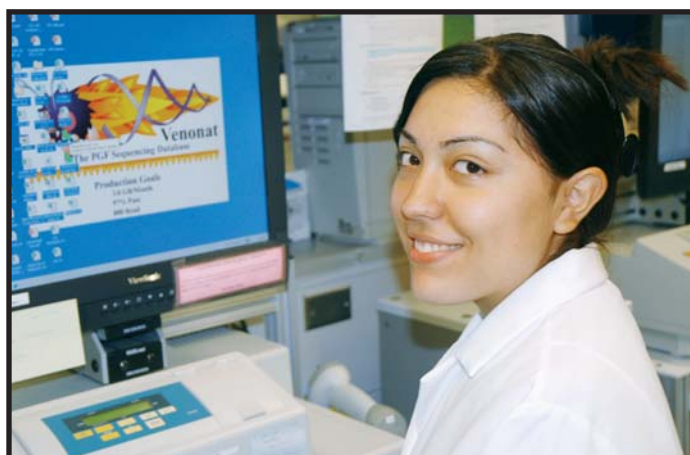
Latest BBEI Students In Training

In a continuing partnership with the non-profit education-to-career program Berkeley Biotechnology Education Inc (BBEI), JGI-PGF is hosting three aspiring biotechnologists—Gerardo Ortega, Carina Galvan, and Ali Qureshi—in the Library Support, Quality Control (QC), and Cloning Technology groups.

Gerardo, a Life Academy (Oakland High School) graduate, has been working under the guidance of such mentors as Danielle Mihalkanin, Eric Abbott, and Damon Tighe. He spent the first four weeks of his stay working in the Library Support group becoming familiar with such processes as RCA (Rolling Circle Amplification) gels and doing the ABI3730xl “walkthrough,” followed by an immersion in the operations of the MegaBace 4500, learning to load the instrument and determining how buffer concentration

influences read-lengths. “We have tried a higher concentration buffer than the 1.5x control and saw an increase in lower-quality reads. We then repeated the experiment with a lower buffer concentration and will proceed to analyzing the results,” said Gerardo. Going back to school at Laney Community College in Oakland on August 17th, Gerardo will continue his work at JGI part-time throughout the school year.

Carina’s first few weeks at JGI have been spent working in the QC group learning how to run RCA gels, plating,



and OD (Optical Density)/fixing. “This has been a great learning experience for me. I have learned things that I never imagined learning,” said Carina. Rotating to a different group, Carina has recently started her work at the Library Support group.

Ali’s experience at JGI began with the Cloning Technology group under the

supervision of Chris Detter and his staff. “Thanks to Chris’ group, I have learned much more than I expected to when I enrolled in the program,” says Ali. “Chris and his group have provided me the training and skills that I personally found more educational than those taught in college science classes. They gave me the opportunity to take part in their projects and provided me with the



Clockwise from the top, Ali, Gerardo, and Carina

explanations and details about how and why certain things are done.”

Aligned with the goals of BBEI, these three students have embarked on a path toward promising biotech career options. BBEI program grads hired by JGI include Sanna Anwar in the Sequencing Department and Tori Takaoka in the Evolutionary Genomics Group.

For those interested in future mentoring opportunities, see: www.bbei.org or contact BBEI Executive Director Debbi Bellush at 510-705-5192 or debbi.bellush.b@bayer.com.

JGI G-nomes Go AWOL, All the Way



Left to right: Jason Baumohl, Sanjay Israni, Cathy Olsen, Simona Necula, Brian Siminson, Kecia Duffy-Wei, Danielle Mihalkanin, Kristen Taylor, Susan Lucas, Steve Wilson, Chris Hack, David Pletcher, Victor Hepa. Not pictured: Phil Bach, Dan Baker, Jeremy Brand, Eileen Dalin, Carina Galvan, Chris Detter, David Hillman, Jamie Jett, Gerardo Ortega.

Thirteen was lucky for the JGI's Co-ed softball squad, the "G-nomes," as they swept the three-game Orinda Adult Recreational Softball League championship tournament on Saturday, August 13th.

Game One: A sweet comeback 16-12 victory over the "Chameleons," who beat the G-nomes twice in the regular season. Small ball won it: All hits were singles; walks cost the dastardly lizards big time, for the good guys' first-ever playoff win.

Game Two: A 20-13 win versus "Mangia Pizza," who beat the G-nomes decisively 18-3 in the regular season, and were previously undefeated in this season and last.

Game Three: G-nomes bats came alive in a tension-filled seesaw battle against "AWOL" for the 20-14 frosting on the surprising championship season. The G-nome's MVP line-up included:

- Best Eye Kristen Taylor
- Most Improved Hitter . . Sue Lucas
- Best Relief Pitcher . . . Sanjay Israni
- Most Acrobatic Danielle Mihalkanin
- Biggest Mouth Victor Hepa
- Best Former College Baseball Player Brian Siminson
- Best Manager Chris Hack
- Best Base Running . . . Steve Wilson
- Hustle Award David Pletcher
- Most Amazing Fielder with a Child's Glove . . . Kecia Duffy-Wei
- Super Sub Simona Necula

For the full compilation of 2005 season statistics, video clips and action photos, check out <http://socrates.berkeley.edu/~simey/genomes/>

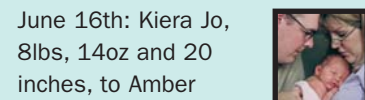
Joel Martin, of JGI's Quality Assurance Group in the Sequencing Department, had the distinction of having Gavin Newsom, San Francisco Mayor, as his warm-up act for a presentation on the sequencing and characterization of Chromosomes 5 and 16, held at the City College of San Francisco 70th Anniversary Com-memoration at the Southeast Campus in the Bayview/Hunter's Point District on August 12. Joel is the only ex-bicycle messenger and veteran of the CCSF biotechnology program with a first-name publication in the journal *Nature*.



SUMMER'S BABY SEASON— FUTURE JGI WORKFORCE



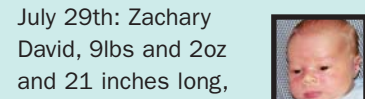
June 13th: Tiffany, 6lbs and 6oz; 18 inches long, to Sandy Huyhn.



June 16th: Kiera Jo, 8lbs, 14oz and 20 inches, to Amber Nivens.



July 18th: Emma, 7lbs 8oz and 20.5 inches long, to Miranda Harmon-Smith.



July 29th: Zachary David, 9lbs and 2oz and 21 inches long, to Jenny White.



August 12th: Mailie Lian (pronounced lee-ahn, Chinese for "graceful willow") 8lb, 2 oz. 20 inches, to Juanan "Sako" Boen.

Finishers Meet at the PGF

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finishing. Paul reviewed progress in optical mapping, alternate sequence assemblers, and sequence generated by the 454 sequencing system. All of these technologies will impact the finishing process.

In the final session of the meeting, Tom Brettin (Informatics Team Leader, LANL) led a brainstorming session focused on common finishing informatics needs. The meeting was a successful cross-institutional camaraderie-building enterprise and will be repeated in the future.



Participants in the JGI Finishers Meeting, from left to right: Elizabeth Saunders (LANL), Thomas S. Brettin (LANL), Christine A. Munk (LANL), Stephanie Malfatti (LLNL), Yunian Lou (PGF), Stephan Trong (PGF), Vasanth Singan (PGF), Patrick Chain (LLNL), David Sims (LANL), Stephen R. Lowry (PGF), Olga Chertkov (LANL), Cliff S. Han (LANL), Sue Thompson (LANL), Darren Platt (PGF), Irina Zharchuk (PGF), Eugene Goltsman (PGF), Kerrie Barry (PGF), Alla Lapidus (PGF), David Bruce (LANL), Alex Copeland (PGF), Roxanne Tapia (LANL), Paul Richardson (PGF), Michele Martinez (PGF).

EDDY DOES THE BIZARRE CAFÉ

To a rapt standing-room-only crowd in San Francisco's Bizarre Café on August 3rd, JGI Director Eddy Rubin described the challenges of the proof-of-principle sequencing of ancient extinct cave bear DNA, the subject of a publication in the journal *Science* (*Science* 22 July 2005; 309: 597-599; published online 2 June 2005). Eddy's talk was part of an ongoing series, "Ask A Scientist": <http://www.askascientistsf.com>



Teacher Adapting IMG for Students

Karen Kelly, a biology teacher from nearby Clayton Valley High School, is no stranger to the JGI. Over the last couple of years, Karen has helped out with tours and educational outreach at the both the PGF and Building 84 on "The Hill." This summer Karen was the beneficiary of support from Berkeley Lab's Center for Science & Engineering Education (CSEE) and their segment of the Laboratory Science Teacher's Professional Development program (LSTPD) for a computational project in the laboratory of Nikos Kyrpides.

LSTPD, with funding provided through DOE's Office of Science, provides science teachers with first-hand experience with research at a national lab: <http://www.scienced.gov/scied/LSTPD/about.htm>

Last year, Karen served in the capacity of "Teacher as Research Associate" working with Marcelo Nobrega in Building 84.

"This year, I was in the "Teacher as Investigator" program where I have been developing a microbial bioinformatics workshop that is going to be a great next step for students in the local area who already love microbiology and computers. They'll get an up-close and personal look from the researchers themselves at how JGI tackles microbial genomics. From this population, Nikos is hoping to harness a new generation of intern bioinformaticists that may help the IMG with annotation."

Karen has one more year in the LSTPD program and may seek an appointment at Oak Ridge for the summer.